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New York State
Department of Environmental Conservation
Division of Hazardous Waste Remediation

REMEDIAL INVESTIGATION AND FEASIBILITY STUDY

BECKER ELECTRONICS SITE
TOWN OF DURHAM
GREENE COUNTY , NEW YORK
SITE I.D. NO. 4-20-007

Final
~~DRAFT~~ PHASE I REMEDIAL
INVESTIGATION REPORT
VOLUME 2 - APPENDICES E - G

MARCH 1992

Prepared By:

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PREPARED FOR

NEW YORK STATE DEPARTMENT
OF ENVIRONMENTAL CONSERVATION

BY
METCALF & EDDY OF NEW YORK, INC.
TARRYTOWN, NEW YORK

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Appendix E

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233 -3508

Thomas C. Jorling
Commissioner

November 15, 1991

MEMORANDUM

TO: Bureau Directors, Regional Water Engineers, Section Chiefs

SUBJECT: Division of Water Technical and Operational Guidance Series (1.1.1.)
AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES
(Originator: John Zambrano)

I. Purpose

The attachment to this memorandum provides a compilation of ambient water quality standards and guidance values for toxic and non-conventional pollutants for use in department programs, including the SPDES permit program.

II. Discussion

This edition is being issued as a result of amendments to 6 NYCRR Parts 700-705, Water Quality Regulations for Surface Waters and Groundwaters that became effective on September 1, 1991. This edition includes the following major changes:

1. revision or addition of standards for benzene, chloroform, ammonia, cadmium, nitrilotriacetic acid, copper, total residual chlorine and radium 226;
2. revision or addition of guidance values for 4-chlorobenzotrifluoride, 3,4-dichlorobenzotrifluoride, dichloropropane, dinoseb, Dechlorane Plus, dichlorotoluenes, niacinamide, PCBs, 2,3,6-trichlorotoluene, 2,4,5-trichlorotoluene, terbufos and zinc;
3. deletion of nine groundwater standards obtained by reference to regulations of the Department of Health, including the general standard for Unspecified Organic Contaminants (UOC);
4. identification of approximately 54 additional substances included in the general standard for Principal Organic Contaminants (POC) for groundwater;

5. identification of 208 substances not included in the general standard for POCs for groundwater;

6. expanded instructions to determine whether additional substances (not specifically identified in this document) are included in the general POC standard for groundwater; and

7. revision of the systems for "Type" of standard and "Basis Code" to conform to the systems used in the amended regulations.

III. Guidance

The Quality Allocation Section will use the attachment for development of water quality-based effluent limits. The Criteria and Standards Section will maintain and revise it on a regular basis.

Salvatore Pagano
Director
Division of Water

Attachment

cc: Dr. Banks
Mr. Campbell
Ms. Chrimes
Mr. Bruening
Regional Directors for Environmental Quality

WATER QUALITY STANDARDS AND GUIDANCE VALUES

New York State
Department of Environmental Conservation
Division of Water
Albany, New York

November 1991

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INTRODUCTION

This document presents Division of Water ambient water quality standards and guidance values. The authority for these values is derived from Article 17 of the Environmental Conservation Law and 6 NYCRR Parts 700-705, Water Quality Regulations.

Standards and guidance values for toxic and non-conventional pollutants are presented in Table 1. This Table includes all of the division's numerical standards and guidance values established as of the date of this document except standards for dissolved oxygen, dissolved solids, coliforms, pH, color, odor and turbidity. The reader is referred to Part 703 for the excepted standards.

Section I of this Introduction provides a description of the columns in Table 1. Section II provides guidance on certain aspects of development, interpretation and use of standards and guidance values. Section III provides detailed instructions on determining the applicability of the principal organic contaminant (POC) groundwater standard, which is a general standard, to specific substances.

I. DESCRIPTION OF COLUMNS IN TABLE 1

A. Standard and Guidance Value

1. Standard

A standard is an ambient water quality value that has been promulgated and placed into regulation. The standards for the surface water and groundwater classes are extracted from Part 703 of Title 6. Surface water and groundwater standards were last revised effective September 1, 1991.

2. Guidance Value

A guidance value may be used where a standard for a substance or group of substances has not been established for a particular water class and type of value (section 702.15). Individual guidance values are derived according to the same scientific procedures used to derive standards. These scientific procedures are in regulation (6NYCRR Part 702).

In addition to specific guidance values, the regulations (702.15(a)(1)(ii)) allow the department to develop a health (water source) "general organic guidance value" of 50 ug/L for an individual organic substance. The department can derive this value where procedures in 702.3 - 702.7 do not yield a more stringent value and where adequate and sufficient oncogenic and non-oncogenic data to justify a value greater than 50 ug/L are not available.

As with other guidance values for specific substances, all guidance values derived from the general organic guidance value as of the date of this document are listed in Table 1 of this TOGS.

3. Units

Standards and guidance values are the maximum allowable concentration in units of ug/L, unless otherwise indicated. Where standards or guidance values are expressed as a function of hardness, hardness is in units of parts per million (ppm), expressed as calcium carbonate, and the resulting value is in ug/L. "ND" means a non-detectable concentration by the approved analytical methods in section 700.3.

B. Substance (CAS No.)

The substance or group of substances (entry) for which a standard or guidance value has been derived is presented in this column in alphabetical order. The Chemical Abstract Service Registry (CAS) Number(s) are given, where applicable, to provide positive identification. Because a substance may be known by names other than the one used in this document, identification of the CAS number can be useful for locating the substance. An index of CAS numbers begins on page 49.

Some of the groups contain a large or unlimited number of substances that are not identified specifically; therefore, a determination of the specific substances encompassed by a standard or guidance value may be necessary. Group entries fit into one of three categories, as described below. For each such entry, a Remark will indicate whether the standard(s) or guidance value(s) apply to the sum of the substances or to each substance individually.

<u>Interpretation of Group Entries</u>

1. Where the entry consists of two or more <u>specific</u> substances, with or without CAS Numbers (e.g.: Aldrin and Dieldrin), the entry includes only the specific substances listed.

2. Where the entry is the name of a group of substances, with CAS numbers listed (e.g.: Dichlorotoluenes), the entry includes only those substances for which the CAS Numbers are listed.

3. Where the entry is the name of a group of substances, without CAS Numbers (e.g.: Principal organic contaminant), the entry includes all substances that belong to the group, unless otherwise noted. These specific substances may not be listed in the entry or the index. **A determination of the specific substances encompassed by the standard(s) or guidance value(s), therefore, may be necessary.**

   The principal organic contaminant (POC) standard for groundwater is the largest and most complex of this type of group entry. It is a general standard that applies individually to a virtually unlimited number of substances in six chemical classes. Because of the importance of this general groundwater standard, instructions for determining its applicability to specific substances are included in Section III, below.

   The other group entries in Table 1 without CAS Nos. are identified below for convenience:

   Alkyl diphenyl oxide sulfonates
   Aminomethylene phosphonic acid salts
   Aryltriazoles
   Boric acid, Borates and Metaborates
   Chlorinated dibenzo-p-dioxins and Chlorinated dibenzofurans
   Foaming agents
   Isothiazolones, total
   Linear alkyl benzene sulfonates (LAS)
   Methylbenz(a)anthracenes
   Phenolic compounds (total phenols)
   Phenols, total chlorinated
   Phenols, total unchlorinated
   Polychlorinated biphenyls
   Quaternary ammonium compounds
   Sulfides, total

C. Water Classes and Type

Standards and guidance values are developed for specific classes of fresh and saline surface waters and fresh groundwaters for protection of the best usages assigned to each class. Best usages are described in Part 701. Standards and guidance values are further designated as to "Type." Values for protection of sources of drinking water are designated Health (Water Source) and noted by H(WS). Similarly, values for protection of human consumers of fish are designated as Health (Bioaccumulation) and noted by H(B). Values for protection of aquatic life and for wildlife consumers of fish are designated as Aquatic and noted by A. Designation of the Type of value determines the applicability of section 702.17, which concerns variances for aquatic type values, and section 702.15, which concerns derivation of guidance values.

A summary description of best usage protections, water classes and type of values related to toxic pollutants is presented below. The groupings of Water Classes and Type presented for the summary description are those that frequently appear in Table 1.

Water Classes	Type	Protection For
A, A-S, AA, AA-S	H(WS)	Source of Drinking Water
GA	H(WS)	Source of Drinking Water
A, A-S, AA, AA-S, B, C	A	Fish Propagation or Wildlife Consumption of Fish
D	A	Fish Survival or Wildlife Consumption of Fish
A, A-S, AA, AA-S, B, C, D	H(B)	Human Consumption of Fish
SA, SB, SC, I	A	Fish Propagation or Wildlife Consumption of Fish
SD	A	Fish Survival or Wildlife Consumption of Fish
SA, SB, SC, I, SD	H(B)	Human Consumption of Fish

For many substances, more than one Type of value will be listed for a specific water class. In these situations, all values apply and may be used to derive the most stringent limitations.

D. Basis Code

The letters in this column designate the specific procedure used to derive the standard or guidance value. The key to the letter designations is provided on page 42, following Table 2.

II. DEVELOPMENT, INTERPRETATION AND USE

A. Development of Standards and Guidance Values

Guidance values are developed as needed with priorities primarily reflecting greater expected or observed occurrence in the environment and greater toxicity. Most requests for development of guidance values originate through the use and discharge information that is generated through the State Pollutant Discharge Elimination System (SPDES) permit program. Standards are proposed for rule making with similar priority considerations.

As stated previously, a guidance value is utilized where a standard has not been adopted for a substance. Guidance values that have been developed for surface waters and groundwaters are presented in Table 1. If a substance is judged to pose a threat to the environment and if no standard or guidance value is presented in Table 1 for that substance and water class, a request for development of a guidance value should be made to the Criteria and Standards Section.

B. Analytical Methods

Section 700.3 provides the analytical requirements to determine compliance with water quality standards and guidance values. These regulations include specific analytical references and also refer to "...other methods approved by the department..." The Division of Water maintains a compilation of methods approved by the department in a separate Technical and Operational Guidance Series (TOGS) document.

There are a number of water quality standards and guidance values for which there is no approved analytical procedure. Use of these values should be accompanied by the identification of an acceptable analytical method.

C. SPDES Effluent Limits

Ambient water quality standards and guidance values are used to derive water quality-based effluent limitations for use in SPDES permits. Guidance for the derivation of these limitations is provided in a separate TOGS document. There are, however, a number of topics that warrant discussion here.

1. Hydrologic Flow Base and Averaging Period

The use of ambient water quality standards or guidance values to derive water quality-based effluent limitations requires selection of a receiving water flow and the specification of an averaging period for the effluent limitation. Their selection will be a function of the variability of the receiving water flow and effluent load and the time period associated with the critical health or aquatic effect. In general, health or aquatic standards and guidance values that are based on adverse effects that develop over time periods greater than a month will receive effluent limitations based on the minimum average 30 consecutive day receiving water flow with a one-in-ten year occurrence (MA30CD/10) and calculated as a monthly average. Values based on shorter-term adverse effects will generally receive effluent limitations based on MA7CD/10 flow and calculated as a daily maximum. Specific determinations, however, are made at the time of permit issuance.

2. Chemical Species

Certain ambient standards and guidance values apply to a specific toxic species rather than all forms (total) of the substance. Changes in the form of a substance can occur in the receiving water. As a result, the form of the substance that is specified as an effluent limitation may differ from the form of the ambient standard or guidance value.

3. Groundwater Effluent Limitations

Section 702.16 provides authority for groundwater effluent limitations. Section 703.6 of the water quality regulations provides specific effluent standards for discharges to class GA waters. For substances for which there is <u>no</u> groundwater effluent standard in 703.6, groundwater effluent limitations shall apply as follows:

- for substances with an ambient guidance value for groundwater, the groundwater effluent limitation shall be equal to the ambient guidance value;
- for substances to which the groundwater POC standard applies, the groundwater effluent limitation shall be 5 ug/L;
- for substances that have an ambient groundwater standard of 50 ug/L, the groundwater effluent limitation shall be 50 ug/L; and

- for substances that have an ambient groundwater standard other than 50 ug/l, the groundwater effluent limitation shall be determined using site specific considerations.

4. Total of Organic Chemicals [§]

Subparagraph 702.16(b)(3) of the water quality regulations specifies, for the purpose of deriving effluent limitations for surface water, an ambient value of 100 ug/L for the total of organic substances having a standard or guidance value established pursuant to the human-health methodologies. The only substances included in this total are those listed in Table 1 of this TOGS that have both the symbol "§" above the name and a health (water source) [H(WS)] type standard or guidance value for surface water.

A groundwater effluent limitation shall be established at 100 ug/L for the total of certain organic substances. The substances included in this total are those listed in Table 1 of this TOGS that have both the symbol "§" above the name and a standard or guidance value for groundwater. This includes all substances covered by the principal organic contaminant groundwater standard (Table 1, page 33), whether they are listed in this TOGS or not. (See I.C. above and III below).

III. PRINCIPAL ORGANIC CONTAMINANT (POC) GENERAL STANDARD FOR GROUNDWATER - DETERMINATION OF APPLICABILITY TO SPECIFIC SUBSTANCES

A. Introduction

The POC standard for groundwater (Table 1, page 33) is a general standard that applies individually to an unlimited number of substances in six chemical classes. Consequently, its applicability to specific substances must be determined.

The POC standard was developed by the New York State Department of Health (DOH) for drinking water. The definitions of the six POC classes (6NYCRR section 700.1 and Table 4 of this TOGS), obtained from the DOH regulations, are definitive for the first two classes, but require interpretation for the others. Furthermore, some substances that meet the definition of a particular POC class may not be regulated by the POC standard because they have a more stringent specific standard. It is, therefore, important to follow sequentially the steps below for determining the applicability of the POC groundwater standard.

It should be noted that the POC applies as a general standard only to groundwater.

B. Steps for Determining Applicability of the POC Groundwater Standard (not to be used for surface water)

This procedure consists of five steps. These steps must be followed in sequential order to avoid making an incorrect determination. They include reference to three tables within this TOGS, the use of definitions for two POC classes, and how to obtain assistance.

Step 1: Check Table 1 of this TOGS. If the substance is listed in Table 1 as having either a specific groundwater standard or groundwater guidance value, that listed value applies and the reader should not go further. If not, go on to Step 2.

Step 2: Check Table 2 of this TOGS, which is a partial list of substances regulated by the POC groundwater standard. If the substance is listed in Table 2, the POC groundwater standard of 5 ug/L applies and the reader should not go further. If the substance is not in Table 2, go on to Step 3.

Step 3: Check Table 3 of this TOGS, which is a partial list of substances to which the POC groundwater standard does not apply. If the substance is listed in Table 3, the standard does not apply and the reader should not go further. If the substance is not in Table 3, go on to Step 4.

[Note: The lists in both Tables 2 and 3 will increase as determinations of POC applicability are made to additional substances, but the lists can never be complete.]

Step 4: Compare the substance with the definitions of POC classes 1 and 2, below. If it meets either of these definitions, the POC groundwater standard applies and the reader should not go further. If it does not meet either definition, or if the reader is uncertain whether it does, go on to Step 5.

Definitions of POC Classes 1 and 2:

Class 1 - Halogenated alkane*: Compound containing carbon (C), hydrogen (H) and halogen (X) where X = fluorine (F), chlorine (Cl), bromide (Br) and/or iodine (I), having the general formula $C_nH_yX_z$, where $y + z = 2n + 2$; n, y and z are integer variables; n and z are equal to or greater than one and y is equal to or greater than zero.

Class 2 - Halogenated ether: Compound containing carbon (C), hydrogen (H), oxygen (O) and halogen (X) (where X = F, Cl, Br and/or I) having the general formula $C_nH_yX_zO$, where $y + z = 2n + 2$; the oxygen is bonded to two carbons; n, y and z are integer variables; n is equal to or greater than two, y is equal to or greater than zero and z is equal to or greater than one.

Step 5: Determinations beyond this point involves interpretations, including chemical comparisons with previously determined substances. The reader should contact the Criteria and Standards Section (CSS) staff (Scott Stoner or Arline Sumner, 518-457-3651) for assistance. The CSS will make the determination, consulting with the DOH as needed. Provision of the CAS number and structure of the substance will facilitate the determination process.

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*Note: This definition does not mention the specific exclusions listed in the definition in regulation (6 NYCRR 700.1 and Table 4) because those excluded substances are listed in Table 1 of this TOGS and thus covered by Step 1 of this procedure.

TABLE 1

NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES

Date of Revision: November 1991

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	BASIS CODE
$ Acenaphthene (83-32-9)	A, A-S, AA, AA-S	20		H(WS)	D
	GA		20	H(WS)	D
$ Acrylic acid (79-10-7)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA		50	H(WS)	Z
$ Acrylonitrile (107-13-1)	A, A-S, AA, AA-S		0.07	H(WS)	A
	GA	5		H(WS)	J
$ Alachlor (15972-60-8)	GA	35		H(WS)	F
$ Aldicarb (116-06-3)	A, A-S, AA, AA-S	7		H(WS)	B
$ Aldicarb & Methomyl (116-06-3; 16752-77-5)	GA	0.35		H(WS)	F
Remarks: Values listed apply to sum of these substances.					
$ Aldrin (309-00-2)	A, A-S, AA, AA-S		0.002	H(WS)	A
	GA	ND		H(WS)	F
	A, A-S, AA, AA-S, B, C, D	*		H(B)	
	SA, SB, SC, SD	*		H(B)	
	I		*	H(B)	
Remarks: * Refer to entry for "Aldrin and Dieldrin."					
$ Aldrin & Dieldrin (309-00-2; 60-57-1)	A, A-S, AA, AA-S, B, C, D	0.001		H(B)	K
	SA, SB, SC, SD	0.001		H(B)	K
	I		0.001	H(B)	K
Remarks: Values listed apply to sum of these substances.					
$ Alkyl dimethyl benzyl ammonium chloride (68391-01-5)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA		50	H(WS)	Z
	A, A-S, AA, AA-S, B, C	*		A	
Remarks: * Refer to entry for "Quaternary ammonium compounds."					

TABLE 1 (continued)

NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES

Date of Revision: November 1991

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	BASIS CODE
§ Alkyl diphenyl oxide sulfonates (Not Applicable)	A, A-S, AA, AA-S		50*	H(WS)	Z
	GA		50*	H(WS)	Z
Remarks: * Applies to each alkyl diphenyl oxide sulfonate individually.					
Aluminum, Ionic (Not Applicable)	A, A-S, AA, AA-S, B, C	100		A	N
§ Ametryn (834-12-8)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA	50		H(WS)	J
§ Aminocresols (95-84-1; 2835-95-2; 2835-99-6)	A, A-S, AA, AA-S	*		H(WS)	
	GA	*		H(WS)	
	A, A-S, AA, AA-S, B, C	**		A	
	D	**		A	
Remarks: * Refer to entry for phenolic compounds. ** Refer to entry for phenols, total unchlorinated.					
§ Aminomethylene phosphonic acid salts (Not Applicable)	A, A-S, AA, AA-S		50*	H(WS)	Z
	GA		50*	H(WS)	Z
Remarks: *Applies to each aminomethylene phosphonic acid salt individually.					
§ Aminopyridines (462-08-8; 504-24-5; 504-29-0; 26445-05-6)	A, A-S, AA, AA-S		1	H(WS)	B
	GA		1	H(WS)	B
Remarks: Values listed apply to sum of these substances.					

TABLE 1 (continued)

NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES

Date of Revision: November 1991

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	BASIS CODE
Ammonia and Ammonium (7664-41-7; Not Applicable)	A, A-S, AA, AA-S	2,000*		H(WS)	H
	GA	2,000*		H(WS)	H
	A, A-S, AA, AA-S, B, C	**		A	N
	D	**		A	Q

Remarks: * $NH_3 + NH_4^+$ as N.

** Un-ionized ammonia as NH_3; tables below provide the standard in ug/l at varying pH and temperature for different classes and specifications. Linear interpolation between the listed pH values and temperatures is applicable.

Classes A,A-S, AA, AA-S, B, C with the (T) or (TS) Specification

pH	0°C	5°C	10°C	15°-30°C
6.50	0.7	0.9	1.3	1.9
6.75	1.2	1.7	2.3	3.3
7.00	2.1	2.9	4.2	5.9
7.25	3.7	5.2	7.4	11
7.50	6.6	9.3	13	19
7.75	11	15	22	31
8.0-9.0	13	18	25	35

Classes A, A-S, AA, AA-S, B, C without the (T) or (TS) Specification

pH	0°C	5°C	10°C	15°C	20°-30°C
6.50	0.7	0.9	1.3	1.9	2.6
6.75	1.2	1.7	2.3	3.3	4.7
7.00	2.1	2.9	4.2	5.9	8.3
7.25	3.7	5.2	7.4	11	15
7.50	6.6	9.3	13	19	26
7.75	11	15	22	31	43
8.0-9.0	13	18	25	35	50

Class D

pH	0°C	5°C	10°C	15°C	20°C	25°-30°C
6.50	9.1	13	18	26	36	51
6.75	15	21	30	42	59	84
7.00	23	33	46	66	93	131
7.25	34	48	68	95	140	190
7.50	45	64	91	130	180	260
7.75	56	80	110	160	220	320
8.0-9.0	65	92	130	180	260	370

TABLE 1 (continued)

NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES

Date of Revision: November 1991

Total Ammonia (mg/l NH_3)

Classes A,A-S, AA, AA-S, B, C with the (T) or (TS) Specification

pH	0°C	5°C	10°C	15°C	20°C	25°C	30°C
6.50	2.5	2.4	2.2	2.2	1.5	1.0	.73
6.75	2.5	2.4	2.2	2.2	1.5	1.0	.73
7.00	2.5	2.4	2.2	2.2	1.5	1.0	.74
7.25	2.5	2.4	2.2	2.2	1.5	1.0	.74
7.50	2.5	2.4	2.2	2.2	1.5	1.1	.74
7.75	2.3	2.2	2.1	2.0	1.4	.99	.71
8.00	1.5	1.4	1.4	1.3	.93	.66	.47
8.25	.87	.82	.78	.76	.54	.39	.28
8.50	.49	.47	.45	.44	.32	.23	.17
8.75	.28	.27	.26	.27	.19	.15	.11
9.00	.16	.16	.16	.16	.13	.10	.08

Classes A, A-S, AA, AA-S, B, C without the (T) or (TS) Specification

pH	0°C	5°C	10°C	15°C	20°C	25°C	30°C
6.50	2.5	2.4	2.2	2.2	2.1	1.5	1.0
6.75	2.5	2.4	2.2	2.2	2.1	1.5	1.0
7.00	2.5	2.4	2.2	2.2	2.1	1.5	1.0
7.25	2.5	2.4	2.2	2.2	2.1	1.5	1.1
7.50	2.5	2.4	2.2	2.2	2.1	1.5	1.1
7.75	2.3	2.2	2.1	2.0	1.9	1.4	1.0
8.00	1.5	1.4	1.3	1.3	1.3	.93	.67
8.25	.87	.82	.78	.76	.76	.54	.40
8.50	.49	.47	.45	.44	.45	.33	.25
8.75	.28	.27	.26	.27	.27	.21	.16
9.00	.16	.16	.16	.16	.17	.14	.11

Class D

pH	0°C	5°C	10°C	15°C	20°C	25°C	30°C
6.50	35	33	31	30	29	29	20
6.75	32	30	28	27	27	26	19
7.00	28	26	25	24	23	23	16
7.25	23	22	20	20	19	19	14
7.50	17	16	16	15	15	15	10
7.75	12	11	11	11	10	10	7.3
8.00	8.0	7.5	7.1	6.9	6.8	6.8	4.9
8.25	4.5	4.2	4.1	4.0	3.9	4.0	2.9
8.50	2.6	2.4	2.3	2.3	2.3	2.4	1.8
8.75	1.4	1.4	1.3	1.4	1.4	1.5	1.1
9.00	.86	.83	.83	.86	.91	1.0	.82

This table provides total ammonia concentrations that will contain the un-ionized ammonia concentration at the level of the standard at the respective pH and temperatures based on relationships established in USEPA 1985, Ambient Water Quality Criteria for Ammonia - 1984. Office of Water, Criteria & Standards Division, Washington, D.C. 20460. EPA 440/5-85-001. January 1985. (Cited, Thurston, R.V., R.C. Russo, and K. Emerson. 1979. Aqueous ammonia equilibrium - tabulation of percent un-ionized ammonia. EPA Ecol. Res. Ser. EPA-600/3-79-091. Environmental Research Laboratory, U.S. Environmental Protection Agency, Duluth, MN: 427 p.)

TABLE 1 (continued)

NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES

Date of Revision: November 1991

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	BASIS CODE
§ Aniline (62-53-3)	A, A-S, AA, AA-S		1	H(WS)	A
	GA	5		H(WS)	J
§ Anthracene (120-12-7)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA		50	H(WS)	Z
Antimony (Not Applicable)	A, A-S, AA, AA-S		3	H(WS)	B
	GA		3	H(WS)	B
Arsenic (Not Applicable)	A, A-S, AA, AA-S	50		H(WS)	G
	GA	25		H(WS)	F
	A, A-S, AA, AA-S, B, C	190*		A	N
	D	360*		A	Q
	SA, SB, SC	63*		A	N
	I		36*	A	N
	SD	120*		A	Q
Remarks: * Dissolved arsenic form.					
§ Aryltriazoles (Not Applicable)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA		50	H(WS)	Z
Remarks: Applies to each aryltriazole individually.					
§ Atrazine (1912-24-9)	GA	7.5		H(WS)	F
§ Azinphosmethyl (86-50-0)	A, A-S, AA, AA-S		0.07	H(WS)	A
	GA	4.4		H(WS)	F
	A, A-S, AA, AA-S, B, C	0.005		A	N
	SA, SB, SC	0.01		A	N
	I		0.01	A	N
§ Azobenzene (103-33-3)	A, A-S, AA, AA-S		0.5	H(WS)	A
	GA	5		H(WS)	J
Barium (Not Applicable)	A, A-S, AA, AA-S	1,000		H(WS)	G
	GA	1,000		H(WS)	F
§ Benefin (1861-40-1)	GA	35		H(WS)	F
§ Benz(a)anthracene (56-55-3)	A, A-S, AA, AA-S		0.002	H(WS)	A,E
	GA		0.002	H(WS)	A,E

TABLE 1 (continued)

NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES

Date of Revision: November 1991

		MICROGRAMS/LITER			
SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD	GUIDANCE VALUE	TYPE	BASIS CODE
§	A, A-S, AA, AA-S	0.7		H(WS)	A
Benzene	GA	0.7		H(WS)	A
(71-43-2)	A, A-S, AA, AA-S, B, C, D		6	H(B)	K
	SA, SB, SC, I, SD		6	H(B)	K
§	A, A-S, AA, AA-S		0.02	H(WS)	A
Benzidine	GA	5		H(WS)	J
(92-87-5)	A, A-S, AA, AA-S, B, C	0.1		A	N
	D	0.1		A	Q
§	A, A-S, AA, AA-S		50	H(WS)	Z
Benzisothiazole	GA		50	H(WS)	Z
(271-61-4)					
§	A, A-S, AA, AA-S		0.002	H(WS)	A,E
Benzo(b)fluoranthene	GA		0.002	H(WS)	A,E
(205-99-2)					
§	A, A-S, AA, AA-S		0.002	H(WS)	A,E
Benzo(k)fluoranthene	GA		0.002	H(WS)	A,E
(207-08-9)					
§	A, A-S, AA, AA-S		0.002	H(WS)	A
Benzo(a)pyrene	GA	ND		H(WS)	F
(50-32-8)	A, A-S, AA, AA-S, B, C, D		0.0012	H(B)	K
	SA, SB, SC, I, SD		0.0006	H(B)	K
Beryllium	A, A-S, AA, AA-S		3	H(WS)	B
(Not Applicable)	GA		3	H(WS)	B
	A, A-S, AA, AA-S, B, C	*		A	N

Remarks: * 11 ug/L, when hardness is less than or equal to 75 ppm; 1,100 ug/L, when hardness is greater than 75 ppm.
Aquatic standards apply to acid-soluble form.

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD	GUIDANCE VALUE	TYPE	BASIS CODE
§	A, A-S, AA, AA-S		0.03	H(WS)	A
Bis(2-chloroethyl) ether	GA	1.0		H(WS)	F
(111-44-4)					
§	A, A-S, AA, AA-S		4	H(WS)	A
Bis(2-ethylhexyl)	GA	50		H(WS)	J
phthalate	A, A-S, AA, AA-S, B, C	0.6		A	N
(117-81-7)					
Boric acid, Borates &	A, A-S, AA, AA-S		125	H(WS)	B
Metaborates	GA		125	H(WS)	B
(Not Applicable)					

Remarks: Applies as boron equivalents.
Values listed apply to sum of these substances.

TABLE 1 (continued)

NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES

Date of Revision: November 1991

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	BASIS CODE
Boron (Not Applicable)	GA	1,000		H(WS)	H
	A, A-S, AA, AA-S, B, C	10,000		A	N
	SA, SB, SC	1,000		A	N
	I		1,000	A	N
Remarks: Aquatic standards and guidance value apply to acid-soluble form.					
§ Bromacil (314-40-9)	GA	4.4		H(WS)	F
Bromide (Not Applicable)	A, A-S, AA, AA-S		2,000	H(WS)	B
	GA		2,000	H(WS)	B
§ Bromodichloromethane (75-27-4)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA		50	H(WS)	Z
§ Bromoform (75-25-2)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA		50	H(WS)	Z
§ Butachlor (23184-66-9)	GA	3.5		H(WS)	F
§ Butoxyethoxyethanol (112-34-5)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA		50	H(WS)	Z
§ Butoxypropanol (5131-66-8)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA		50	H(WS)	Z
§ Butylate (2008-41-5)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA	50		H(WS)	J
§ Butyl benzyl phthalate (85-68-7)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA		50	H(WS)	Z
§ Butyl isopropyl phthalate (Not Applicable)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA		50	H(WS)	Z

TABLE 1 (continued)

NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES

Date of Revision: November 1991

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER		TYPE	BASIS CODE
		STANDARD	GUIDANCE VALUE		
§	A, A-S, AA, AA-S		5	H(WS)	I
4-Chlorobenzotrifluoride	GA	5		H(WS)	J
(98-56-6)					
§	A, A-S, AA, AA-S	7		H(WS)	A
Chloroform	GA	7		H(WS)	A
(67-66-3)					
§	A, A-S, AA, AA-S	10		H(WS)	D,E
2-Chloronaphthalene	GA		10	H(WS)	D,E
(91-58-7)					
§	A, A-S, AA, AA-S		0.7	H(WS)	A
5-Chloro-o-toluidine	GA	5		H(WS)	J
(95-79-4)					
Chromium	A, A-S, AA, AA-S	50		H(WS)	G
(Not Applicable)	GA	50		H(WS)	G
	A, A-S, AA, AA-S, B, C	*		A	N
	D	**		A	Q

Remarks: * exp(0.819 [ln (ppm hardness)] + 1.561)
** exp(0.819 [ln (ppm hardness)] + 3.688)
Aquatic standards apply to acid-soluble form.

Chromium (hexavalent)	GA	50		H(WS)	F
(Not Applicable)	A, A-S, AA, AA-S, B, C	11		A	N
	D	16		A	Q
	SA, SB, SC	54		A	N
	I		50	A	N
	SD	1,200		A	Q

Remarks: * Aquatic standards and guidance value apply to acid-soluble form.

§	A, A-S, AA, AA-S		0.002	H(WS)	A,E
Chrysene	GA		0.002	H(WS)	A,E
(218-01-9)					
Cobalt	A, A-S, AA, AA-S, B, C	5		A	N
(Not Applicable)	D		110	A	Q

Remarks: Aquatic standard and guidance value apply to acid-soluble form.

Copper	A, A-S, AA, AA-S	200		H(WS)	H
(Not Applicable)	GA	200		H(WS)	H
	A, A-S, AA, AA-S, B, C	*		A	N
	D	**		A	Q
	SA, SB, SC, I	2.9		A	N
	SD	2.9		A	Q

Remarks: * exp(0.8545 [ln (ppm hardness)] - 1.465)
** exp(0.9422 [ln (ppm hardness)] - 1.464)

Aquatic standards apply to dissolved form.

TABLE 1 (continued)

NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES

Date of Revision: November 1991

		MICROGRAMS/LITER			
SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD	GUIDANCE VALUE	TYPE	BASIS CODE
Cyanide	A, A-S, AA, AA-S	100		H(WS)	H
(Not Applicable)	GA	100		H(WS)	H
	A, A-S, AA, AA-S, B, C	5.2*		A	N
	D	22*		A	Q
	SA, SB, SC	1.0*		A	N
	I		1.0*	A	N
	SD	1.0*		A	Q
Remarks: * As free cyanide - the sum of HCN and CN^- expressed as CN.					
§	A, A-S, AA, AA-S		50	H(WS)	Z
Dalapon	GA	50		H(WS)	J
(Not Applicable)					
Remarks: Includes: related forms that convert to the organic acid upon acidification to a pH of 2 or less; and esters of the organic acid.					
§	A, A-S, AA, AA-S	0.01		H(WS)	A
DDT, DDD & DDE	GA	ND		H(WS)	F
(50-29-3; 72-54-8;	A, A-S, AA, AA-S, B, C, D	0.001		A	S
72-55-9)	SA, SB, SC, SD	0.001		A	S
	I		0.001	A	S
Remarks: Values listed apply to sum of these substances.					
§	A, A-S, AA, AA-S		5	H(WS)	I
Dechlorane Plus	GA	5		H(WS)	J
(13560-89-9)					
§	A, A-S, AA, AA-S, B, C	0.1		A	N
Demeton	SA, SB, SC	0.1		A	N
(8065-48-3; 298-03-3;	I		0.1	A	N
126-75-0)					
Remarks: Values listed apply to sum of these substances.					
§	GA	0.7		H(WS)	F
Diazinon	A, A-S, AA, AA-S, B, C	0.08		A	N
(333-41-5)					
§	A, A-S, AA, AA-S		50	H(WS)	Z
Dibromochloromethane	GA		50	H(WS)	Z
(124-48-1)					
§	A, A-S, AA, AA-S		5	H(WS)	I
Dibromodichloromethane	GA	5		H(WS)	J
(594-18-3)					

TABLE 1 (continued)

NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES

Date of Revision: November 1991

		MICROGRAMS/LITER			
SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD	GUIDANCE VALUE	TYPE	BASIS CODE
§	A, A-S, AA, AA-S		50*	H(WS)	Z
2,2-Dibromo-3-nitrilo-	GA		50*	H(WS)	Z
propionamide &	A, A-S, AA, AA-S, B, C		20	A	N
Dibromoacetonitrile	D		50	A	Q
(10222-01-2; 3252-43-5)					
Remarks: Values listed apply to sum of these substances, except as noted below. * Applies to 2,2-dibromo-3-nitriIopropionamide only.					
§	A, A-S, AA, AA-S		50	H(WS)	Z
Di-n-butyl phthalate	GA	50		H(WS)	J
(84-74-2)					
§	GA	0.44		H(WS)	F
Dicamba					
(1918-00-9)					
§	A, A-S, AA, AA-S	30*		H(WS)	D
1,2-Dichlorobenzene &	GA	4.7		H(WS)	F
1,4-Dichlorobenzene	A, A-S, AA, AA-S, B, C	**		A	
(95-50-1; 106-46-7)	D	**		A	
	SA, SB, SC, I		**	A	
	SD		**	A	
Remarks: Value applies to the sum of these substances, except as noted below. * Applies to 1,4-Dichlorobenzene only. ** Refer to entry for Dichlorobenzenes.					
§	A, A-S, AA, AA-S	20		H(WS)	D
1,3-Dichlorobenzene	GA	5		H(WS)	J
(541-73-1)	A, A-S, AA, AA-S, B, C	*		A	
	D	*		A	
	SA, SB, SC, I		*	A	
	SD		*	A	
Remarks: * Refer to entry for Dichlorobenzenes.					
Dichlorobenzenes	A, A-S, AA, AA-S, B, C	5		A	N,T
(95-50-1; 106-46-7;	D	50		A	R
541-73-1; 25321-22-6)	SA, SB, SC, I		5	A	N,T
	SD		50	A	R
Remarks: Values listed apply to sum of these substances.					
§	A, A-S, AA, AA-S		5	H(WS)	I
3,4-Dichlorobenzo-trifluoride	GA	5		H(WS)	J
(328-84-7)					
§	A, A-S, AA, AA-S		5	H(WS)	I
1,1-Dichloroethane	GA	5		H(WS)	J
(75-34-3)					
§	A, A-S, AA, AA-S	0.8		H(WS)	A
1,2-Dichloroethane	GA	5		H(WS)	J
(107-06-2)					

TABLE 1 (continued)

NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES

Date of Revision: November 1991

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	BASIS CODE
§	A, A-S, AA, AA-S		0.07	H(WS)	A
1,1-Dichloroethylene	GA	5		H(WS)	J
(75-35-4)					
§	A, A-S, AA, AA-S		5	H(WS)	I
trans-1,2-Dichloroethylene	GA	5		H(WS)	J
(156-60-5)					
§	A, A-S, AA, AA-S		5	H(WS)	I
Dichlorofluoromethane	GA	5		H(WS)	J
(75-43-4)					
§	A, A-S, AA, AA-S	0.3		H(WS)	D
2,4-Dichlorophenol	GA	*		H(WS)	
(120-83-2)	A, A-S, AA, AA-S, B, C, D	**		A	
Remarks: * Refer to entry for Phenolic compounds (total phenols). ** Refer to entry for Phenols - total chlorinated.					
§	A, A-S, AA, AA-S	100		H(WS)	G
2,4-Dichlorophenoxyacetic acid	GA	4.4		H(WS)	F
(94-75-7)					
§	A, A-S, AA, AA-S		0.5	H(WS)	A
1,2-Dichloropropane	GA	5		H(WS)	J
(78-87-5)					
§	A, A-S, AA, AA-S		5	H(WS)	I
Dichloropropanes	GA	5		H(WS)	J
(78-99-9; 142-28-9; 594-20-7)					
Remarks: Applies to each isomer (1,1-, 1,3-, and 2,2-) individually.					
§	A, A-S, AA, AA-S		5	H(WS)	I
Dichlorotoluenes	GA	5		H(WS)	J
(32768-54-0; 95-73-8; 19398-61-9; 118-69-4; 95-75-0; 25186-47-4)					
Remarks: Values listed apply to each isomer (2,3-, 2,4-, 2,5-, 2,6-, 3,4- and 3,5-) individually.					
§	A, A-S, AA, AA-S		0.0009	H(WS)	A
Dieldrin	GA	ND		H(WS)	F
(60-57-1)	A, A-S, AA, AA-S, B, C, D	*		H(B)	
	SA, SB, SC, SD	*		H(B)	
	I		*	H(B)	
Remarks: * Refer to entry for "Aldrin and Dieldrin."					

TABLE 1 (continued)

NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES

Date of Revision: November 1991

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	BASIS CODE
$	A, A-S, AA, AA-S		50	H(WS)	Z
Diethyl phthalate (84-66-2)	GA		50	H(WS)	Z
$	A, A-S, AA, AA-S		1.0	H(WS)	A,E
N,N-Dimethyl aniline (121-69-7)	GA	5		H(WS)	J
$	A, A-S, AA, AA-S		50	H(WS)	Z
Dimethylformamide (68-12-2)	GA		50	H(WS)	Z
$	A, A-S, AA, AA-S		50	H(WS)	Z
Dimethyl phthalate (131-11-3)	GA		50	H(WS)	Z
$	A, A-S, AA, AA-S		50	H(WS)	Z
Dimethyl tetrachloro-terephthalate (1861-32-1)	GA	50		H(WS)	J
$	A, A-S, AA, AA-S		0.07	H(WS)	A
2,6-Dinitrotoluene (606-20-2)	GA	5		H(WS)	J
$	A, A-S, AA, AA-S		50	H(WS)	Z
Di-n-octyl phthalate (117-84-0)	GA		50	H(WS)	Z
$	A, A-S, AA, AA-S	*		H(WS)	
Dinoseb (88-85-7)	GA	*		H(WS)	
Remarks: * Refer to entry for Phenolic compounds (total phenols).					
$	A, A-S, AA, AA-S		50	H(WS)	Z
Diphenamid (957-51-7)	GA	50		H(WS)	J
$	A, A-S, AA, AA-S		0.05*	H(WS)	A
Diphenylhydrazines (122-66-7; 530-50-7)	GA	ND		H(WS)	F
Remarks: Value listed applies to sum of these substances, except as noted below. * Value listed applies to (1,2-) isomer only.					

TABLE 1 (continued)

NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES

Date of Revision: November 1991

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	BASIS CODE
§	A, A-S, AA, AA-S		50	H(WS)	B
Dodecylguanidine acetate and Dodecylguanidine hydrochloride (2439-10-3; 13590-97-1)	GA		50	H(WS)	B
Remarks: Values listed apply to sum of these substances.					
§	A, A-S, AA, AA-S	50		H(WS)	B,E
Dyphylline (479-18-5)	GA		50	H(WS)	B,E
§	A, A-S, AA, AA-S, B, C	0.009		A	N
Endosulfan (115-29-7)	D	0.22		A	Q
	SA, SB, SC	0.001		A	N
	I		0.001	A	N
	SD	0.034		A	Q
§	A, A-S, AA, AA-S	0.2		H(WS)	G
Endrin (72-20-8)	GA	ND		H(WS)	F
	A, A-S, AA, AA-S, B, C, D	0.002		H(B)	K
	SA, SB, SC, SD	0.002		H(B)	K
	I		0.002	H(B)	K
§	A, A-S, AA, AA-S		5	H(WS)	I
Ethylbenzene (100-41-4)	GA	5		H(WS)	J
§	A, A-S, AA, AA-S		50	H(WS)	Z
Ethylene chlorohydrin (107-07-3)	GA		50	H(WS)	Z
§	A, A-S, AA, AA-S		50	H(WS)	Z
Ethylene glycol (107-21-1)	GA		50	H(WS)	Z
	A, A-S, AA, AA-S, B, C		500*	A	N
	D		1,000*	A	Q
Remarks: * Units are mg/L.					
§	A, A-S, AA, AA-S		0.05	H(WS)	A
Ethylene oxide (75-21-8)	GA		0.05	H(WS)	A
§ Ethylenethiourea (96-45-7)	GA	ND		H(WS)	F
§ Ferbam (14484-64-1)	GA	4.2		H(WS)	F

TABLE 1 (continued)

NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES

Date of Revision: November 1991

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	BASIS CODE
§ Fluometuron (2164-17-2)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA	50		H(WS)	J
§ Fluoranthene (206-44-0)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA		50	H(WS)	Z
§ Fluorene (86-73-7)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA		50	H(WS)	Z
Fluoride (Not Applicable)	A, A-S, AA, AA-S	1,500		H(WS)	H
	GA	1,500		H(WS)	F
	A, A-S, AA, AA-S, B, C	*		A	N
	D	**		A	N
Remarks: * (0.02) exp(0.907 [ln (ppm hardness)] + 7.394) ** (0.1) exp(0.907 [ln (ppm hardness)] + 7.394)					
Foaming agents (Not Applicable)	GA	500		H(WS)	F
Remarks: Determined as methylene blue active substances (MBAS) or by other tests as specified by the Commissioner.					
§ Folpet (133-07-3)	GA	50		H(WS)	J
Gross alpha radiation (Not Applicable)	A, A-S, AA, AA-S	*		H(WS)	G
	GA	*		H(WS)	G
Remarks: * 15 picocuries per liter, excluding radon and uranium.					
Gross beta radiation (Not Applicable)	A, AA	*		H(WS)	H
	A-S, AA-S		*	H(WS)	H
	GA	*		H(WS)	H
Remarks: * 1,000 picocuries per liter, excluding strontium-90 and alpha emitters.					
§ Guaifenesin (93-14-1)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA		50	H(WS)	Z
§ Heptachlor & Heptachlor epoxide (76-44-8; 1024-57-3)	A, A-S, AA, AA-S	0.009		H(WS)	A
	GA	ND		H(WS)	F
	A, A-S, AA, AA-S, B, C, D	0.001		A	S
	SA, SB, SC, SD	0.001		A	S
	I		0.001	A	S
Remarks: Values listed apply to the sum of these substances.					

TABLE 1 (continued)

NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES

Date of Revision: November 1991

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	BASIS CODE
§ Hexachlorobenzene (118-74-1)	A, A-S, AA, AA-S		0.02	H(WS)	A
	GA	0.35		H(WS)	F
§ Hexachlorobutadiene (87-68-3)	A, A-S, AA, AA-S	0.5		H(WS)	A
	GA	5		H(WS)	J
	A, A-S, AA, AA-S, B, C	1.0		A	N
	D	10		A	Q
	SA, SB, SC	0.3		A	N
	I		0.3	A	N
	SD	3.0		A	Q
§ Hexachlorocyclohexanes (58-89-9; 319-84-6; 319-85-7; 319-86-8; 608-73-1; 6108-10-7)	A, A-S, AA, AA-S		0.02	H(WS)	A
	GA	ND		H(WS)	F
	A, A-S, AA, AA-S, B, C	0.01		A	N
	D	2		A	Q
	SA, SB, SC	0.004		A	N
	I		0.004	A	N
	SD	0.16		A	Q

Remarks: Values listed apply to the sum of these substances.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	BASIS CODE
§ Hexachlorocyclopentadiene (77-47-4)	A, A-S, AA, AA-S	1.0		H(WS)	D
	GA	5		H(WS)	J
	A, A-S, AA, AA-S, B, C	0.45		A	N
	D	4.5		A	Q
	SA, SB, SC	0.07		A	N
	I		0.07	A	N
	SD	0.7		A	Q
§ 2-Hexanone (591-78-6)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA		50	H(WS)	Z
§ Hexazinone (51235-04-2)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA	50		H(WS)	J
§ Hydrazine (302-01-2)	A, A-S, AA, AA-S, B, C	*		A	N
	D	**		A	Q

Remarks: * 5 ug/L at less than 50 ppm hardness and 10 ug/L at greater than or equal to 50 ppm hardness.
** 50 ug/L at less than 50 ppm hardness and 100 ug/L at greater than or equal to 50 ppm hardness.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	BASIS CODE
Hydrogen sulfide (7783-06-4)	A, A-S, AA, AA-S		**	H(WS)	
	GA		**	H(WS)	
	A, A-S, AA, AA-S, B, C	2.0*		A	N
	SA, SB, SC	2.0*		A	N
	I		2.0*	A	N

Remarks: * Undissociated.
** Refer to entry for Sulfides.

TABLE 1 (continued)

NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES

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SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	 GUIDANCE VALUE	TYPE	BASIS CODE
§ Hydroquinone (123-31-9)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA		50	H(WS)	Z
	A, A-S, AA, AA-S, B, C	2.2		A	N
	D	4.4		A	Q
§ 1-Hydroxyethylidene-1,1-diphosphonic acid (2809-21-4)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA		50	H(WS)	Z
§ 2-(2-Hydroxy-3,5-di-tert-pentylphenyl)-benzotriazole (25973-55-1)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA		50	H(WS)	Z
§ Indeno (1,2,3-cd) pyrene (193-39-5)	A, A-S, AA, AA-S		0.002	H(WS)	A,E
	GA		0.002	H(WS)	A,E
Iron (Not Applicable)	A, A-S, AA, AA-S	300		H(WS)	G
	GA	300*		H(WS)	F
	A, A-S, AA, AA-S, B, C	300		A	N
	D	300		A	Q
Remarks: * Also see entry for "Iron and Manganese."					
Iron and Manganese (Not Applicable)	GA	500		H(WS)	F
Remarks: Value listed applies to the sum of these substances.					
§ Isodecyl diphenyl phosphate (29761-21-5)	A, A-S, AA, AA-S, B, C	1.7		A	N
	D	22		A	Q
§ Isophorone (78-59-1)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA		50	H(WS)	Z
§ Isothiazolones, total (Isothiazolinones) (Includes 5-chloro-2-methyl-4-isothiazolin-3-one & 2-methyl-4-isothiazolin-3-one) (Not Applicable)	A, A-S, AA, AA-S, B, C	1		A	N
	D	10		A	Q
Remarks: Values listed apply to the sum of these substances.					

TABLE 1 (continued)

NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES

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SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER		TYPE	BASIS CODE
		STANDARD	GUIDANCE VALUE		
§ Kepone (143-50-0)	GA	ND		H(WS)	F
Lead (Not Applicable)	A, A-S, AA, AA-S	50		H(WS)	G
	GA	25		H(WS)	F
	A, A-S, AA, AA-S, B, C	*		A	N
	D	**		A	Q
	SA, SB, SC	8.6		A	N
	I		8.6	A	N
	SD	220		A	Q
Remarks: * exp(1.266 [ln (ppm hardness)] - 4.661) ** exp(1.266 [ln(ppm hardness)] - 1.416) Aquatic standards and guidance value apply to acid-soluble form.					
§ Linear alkyl benzene sulfonates (LAS) (Not Applicable)	A, A-S, AA, AA-S, B, C	40*		A	N
Remarks: * LAS with side chains greater than 13 carbons only. Values listed applies to the sum of these substances.					
Magnesium (Not Applicable)	A, A-S, AA, AA-S	35,000		H(WS)	B
	GA		35,000	H(WS)	B
§ Malathion (121-75-5)	GA	7.0		H(WS)	F
	A, A-S, AA, AA-S, B, C	0.1		A	N
	SA, SB, SC	0.1		A	N
	I		0.1	A	N
§ Mancozeb (8018-01-7)	GA	1.8		H(WS)	F
§ Maneb (12427-38-2)	GA	1.8		H(WS)	F
Manganese (Not Applicable)	A, A-S, AA, AA-S	300		H(WS)	G
	GA	300*		H(WS)	F
Remarks: * Also see entry for "Iron and Manganese."					
§ Mercaptobenzothiazole (149-30-4)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA		50	H(WS)	Z
Mercury (Not Applicable)	A, A-S, AA, AA-S	2		H(WS)	G
	GA	2		H(WS)	F
	A, A-S, AA, AA-S, B, C, D		0.2	H(B)	K
	SA, SB, SC, I, SD		0.1	H(B)	K

TABLE 1 (continued)

NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES

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SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	BASIS CODE
§ Methacrylic acid (79-41-4)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA		50	H(WS)	Z
§ Methoxychlor (72-43-5)	A, A-S, AA, AA-S	35		H(WS)	H
	GA	35		H(WS)	F
	A, A-S, AA, AA-S, B, C	0.03		A	N
	SA, SB, SC	0.03		A	N
	I		0.03	A	N
§ Methoxyethylbenzenes (4013-34-7; 3558-60-9)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA		50	H(WS)	Z

Remarks: Values listed apply to each isomer [(2-Methoxyethyl)benzene and (1-Methoxyethyl)benzene] individually.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	BASIS CODE
§ Methylbenz(a)-anthracenes (Not Applicable)	A, A-S, AA, AA-S		0.002	H(WS)	A,E
	GA		0.002	H(WS)	A,E

Remarks: Values listed apply to the sum of these substances.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	BASIS CODE
§ Methyl chloride (74-87-3)	A, A-S, AA, AA-S		5	H(WS)	I
	GA	5		H(WS)	J
§ 2-Methyl-4-chloro-phenoxyacetic acid (94-74-6)	GA	0.44		H(WS)	F
§ Methylene bisthiocyanate (6317-18-6)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA		50	H(WS)	Z
	A, A-S, AA, AA-S, B, C	1.0		A	N
§ Methylene chloride (75-09-2)	A, A-S, AA, AA-S		5	H(WS)	I
	GA	5		H(WS)	J
§ 4-(1-Methylethoxy)-1-butanol (31600-69-8)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA		50	H(WS)	Z
§ 2-Methylethyl-1,3-dioxolane (126-39-6)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA		50	H(WS)	Z
§ Methyl methacrylate (80-62-6)	GA	50		H(WS)	J

TABLE 1 (continued)

NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES

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		MICROGRAMS/LITER			
SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD	GUIDANCE VALUE	TYPE	BASIS CODE
§ Metribuzin (21087-64-9)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA	50		H(WS)	J
§ Mirex (2385-85-5)	A, A-S, AA, AA-S		0.04	H(WS)	A
	GA	5		H(WS)	J
	A, A-S, AA, AA-S, B, C	0.001		A	N
	D	0.001		A	Q
	SA, SB, SC	0.001		A	N
	I		0.001	A	N
	SD		0.001	A	Q
§ Nabam (142-59-6)	GA	1.8		H(WS)	F
§ Naphthalene (91-20-3)	A, A-S, AA, AA-S	10		H(WS)	D
	GA		10	H(WS)	D
Niacinamide (98-92-0)	A, A-S, AA, AA-S	500		H(WS)	B
	GA		500	H(WS)	B
Nickel (Not Applicable)	A, A-S, AA, AA-S, B, C	*		A	N
	D	**		A	Q
	SA, SB, SC	7.1		A	N
	I		7.1	A	N
	SD	140		A	Q

Remarks: * exp (0.76 [ln (ppm hardness)] + 1.06)
** exp (0.76 [ln (ppm hardness)] + 4.02)
Aquatic standards and guidance value apply to acid-soluble form.

		MICROGRAMS/LITER			
SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD	GUIDANCE VALUE	TYPE	BASIS CODE
§ Nitralin (4726-14-1)	GA	35		H(WS)	F
Nitrate and Nitrite, total (expressed as N) (Not Applicable)	A, A-S, AA, AA-S	10,000*		H(WS)	G
	GA	10,000		H(WS)	H

Remarks: Value listed applies to the sum of these substances, except as noted below.
* Applies only to nitrate.

		MICROGRAMS/LITER			
SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD	GUIDANCE VALUE	TYPE	BASIS CODE
§ Nitrilotriacetic acid (Not Applicable)	A, A-S, AA, AA-S	3**		H(WS)	A
	GA	3**		H(WS)	A
	A, A-S, AA, AA-S, B, C	5,000*		A	N

Remarks: * Applies to Nitrilotriacetate.
** Includes related forms that convert to nitrilotriacetic acid upon acidification to a pH of 2.3 or less.

TABLE 1 (continued)

NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES

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SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	BASIS CODE
Nitrite (Not Applicable)	GA	*		H(WS)	
	A, A-S, AA, AA-S, B, C	**		A	

Remarks: * Refer to entry for "Nitrate and Nitrite."
** Value is 100 ug/L for warm water fishery waters and 20 ug/L for cold water fishery waters.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	BASIS CODE
§ Nitrobenzene (98-95-3)	A, A-S, AA, AA-S	30		H(WS)	D
	GA	5		H(WS)	J
§ N-Nitrosodiphenylamine (86-30-6)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA		50	H(WS)	Z
§ Oxamyl (23135-22-0)	GA	50		H(WS)	J
§ Paraquat (4685-14-7)	GA	3.0		H(WS)	F
§ Parathion & Methyl parathion (56-38-2; 298-00-0)	GA	1.5		H(WS)	F
	A, A-S, AA, AA-S, B, C	0.008		A	N,T

Remarks: Values listed apply to the sum of these substances.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	BASIS CODE
§ Pentachloronitrobenzene (82-68-8)	GA	ND		H(WS)	F
§ Pentachlorophenol (87-86-5)	A, A-S, AA, AA-S	*		H(WS)	
	GA	*		H(WS)	
	A, A-S, AA, AA-S, B, C	0.4		A	N
	D	**		A	

Remarks: * Refer to entry for Phenolic compounds (total phenols).
** Refer to entry for Phenols, total chlorinated.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	BASIS CODE
§ Phenanthrene (85-01-8)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA		50	H(WS)	Z
§ Phenol (108-95-2)	A, A-S, AA, AA-S	*		H(WS)	
	GA	*		H(WS)	
	A, A-S, AA, AA-S, B, C, D	**		A	

Remarks: * Refer to entry for Phenolic compounds (total phenols).
** Refer to entry for Phenols, total unchlorinated.

TABLE 1 (continued)

NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES

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		MICROGRAMS/LITER			
SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD	GUIDANCE VALUE	TYPE	BASIS CODE
§ Phenolic compounds (total phenols) (Not Applicable)	A, A-S, AA, AA-S	1		H(WS)	H
	GA	1		H(WS)	F
Remarks: Value listed applies to the sum of these substances.					
§ Phenols, total chlorinated (Not Applicable)	A, A-S, AA, AA-S	*		H(WS)	
	GA	*		H(WS)	
	A, A-S, AA, AA-S, B, C, D	1.0		A	R
Remarks: Value listed applies to the sum of these substances. * Refer to entry for Phenolic compounds (total phenols).					
§ Phenols, total unchlorinated (Not Applicable)	A, A-S, AA, AA-S, B, C, D	5.0		A	R
Remark: Value listed applies to sum of these substances.					
§ Phenyl ether (101-84-8)	A, A-S, AA, AA-S	10		H(WS)	D
	GA		10	H(WS)	D
§ Phenylpropanolamine (14838-15-4)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA		50	H(WS)	Z
§ Phorate & Disulfoton (298-02-2; 298-04-4)	GA	ND		H(WS)	F
Remark: Value listed apply to sum of these substances.					
§ Picloram (Not Applicable)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA	50		H(WS)	J
Remarks: Includes: related forms that convert to the organic acid upon acidification to a pH of 2 or less; and esters of the organic acid.					
§ Polychlorinated biphenyls (Not Applicable)	A, A-S, AA, AA-S	0.01		H(WS)	A
	GA	0.1		H(WS)	F
	A, A-S, AA, AA-S, B, C, D	0.001		A	S
	SA, SB, SC, SD	0.001		A	S
	I		0.001	A	S
	A, AS, AA, AA-S, B, C, D		0.0000006	H(B)	K
	SA, SB, SC, I, SD		0.0000006	H(B)	K
Remark: Values listed apply to sum of these substances.					

TABLE 1 (continued)

NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES

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SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	BASIS CODE
§ Principal organic contaminant (Not Applicable)	GA	5		H(WS)	J

Remarks: This standard applies to any and every individual substance that is in one of the principal organic contaminant classes as defined in 6 NYCRR 700.1 (see Table 4 of this TOGS), except any substance that has a standard for class GA waters listed elsewhere in this Table. Refer to the introduction of this TOGS for guidance on determining the applicability of the POC standard to individual substances.

A less stringent guidance value for an individual substance may be substituted for this standard if so determined by the Commissioner of the New York State Department of Health, pursuant to 10 NYCRR §5-1.51(g).

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	BASIS CODE
§ Prometon (1610-18-0)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA	50		H(WS)	J
§ Propachlor (1918-16-7)	GA	35		H(WS)	F
§ Propanil (709-98-8)	GA	7.0		H(WS)	F
§ Propazine (139-40-2)	GA	16		H(WS)	F
§ Propham (122-42-9)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA	50		H(WS)	J
§ Pyrene (129-00-0)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA		50	H(WS)	Z
§ Pyridine (110-86-1)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA		50	H(WS)	Z
§ Quaternary ammonium compounds (including dimethyl benzyl ammonium chloride & dimethyl ethyl benzyl ammonium chloride) (Not Applicable)	A, A-S, AA, AA-S, B, C	10		A	N

Remarks: Value listed applies to sum of these substances.

TABLE 1 (continued)

NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES

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SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	BASIS CODE
Radium 226	A, AA	*		H(WS)	H
(Not Applicable)	A-S, AA-S		*	H(WS)	H
	GA	*		H(WS)	H
Remarks: * 3 picocuries per liter.					
Radium 226 and	A, A-S, AA, AA-S	*		H(WS)	G
Radium 228	GA	*		H(WS)	G
(Not Applicable)					
Remarks: * 5 picocuries per liter. Values listed apply to sum of these substances.					
Selenium	A, A-S, AA, AA-S	10		H(WS)	G
(Not Applicable)	GA	10		H(WS)	G
	A, A-S, AA, AA-S, B, C	1.0*		A	N
Remarks: * Aquatic standard applies to acid-soluble form.					
Silver	A, A-S, AA, AA-S	50		H(WS)	G
(Not Applicable)	GA	50		H(WS)	F
	A, A-S, AA, AA-S, B, C	0.1*		A	N
	D	**		A	Q
	SD	2.3		A	Q
Remarks: * Ionic silver. ** exp (1.72 [ln (ppm hardness)] - 6.52) Standards for D and SD Classes apply to acid-soluble form.					
§ Simazine (122-34-9)	GA	50		H(WS)	J
Sodium (Not Applicable)	GA	20,000		H(WS)	H
Strontium 90 (Not Applicable)	A, A-S, AA, AA-S	*		H(WS)	G
Remarks: * 8 pCi/L If two or more radionuclides are present, the sum of their doses shall not exceed annual potential dose of 4 millirems per year.					
§ Styrene	A, A-S, AA, AA-S	50		H(WS)	D
(100-42-5)	GA	5		H(WS)	J
Sulfate	A, A-S, AA, AA-S	250,000		H(WS)	G
(Not Applicable)	GA	250,000		H(WS)	F

TABLE 1 (continued)

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SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	BASIS CODE
Sulfides, total (Not Applicable)	A, A-S, AA, AA-S		50*	H(WS)	D
	GA		50*	H(WS)	D
	A, A-S, AA, AA-S, B, C	**		A	
	SA, SB, SC	**		A	
	I		**	A	

Remarks: Values listed apply to sum of these substances.
* Expressed as hydrogen sulfide.
** Refer to entry for "Hydrogen Sulfide."

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	BASIS CODE
Sulfite (Not Applicable)	A, A-S, AA, AA-S, B, C	200		A	N
§ Tebuthiuron (34014-18-1)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA	50		H(WS)	J
§ Terbacil (5902-51-2)	GA	50		H(WS)	J
§ Terbufos (13071-79-9)	A, A-S, AA, AA-S		0.09	H(WS)	B
	GA		0.09	H(WS)	B
§ Tetrachlorobenzenes (634-66-2; 634-90-2; 95-94-3; 12408-10-5)	A, A-S, AA, AA-S	10		H(WS)	D
	GA	5*	10**	H(WS)	

Remarks: Values listed apply to sum of these substances, except as noted below.
** Basis Code is D.
* Applies to each isomer (1,2,3,4-, 1,2,3,5-, and 1,2,4,5-) individually; Basis Code is J.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	BASIS CODE
§ 1,1,2,2-Tetrachloroethane (79-34-5)	A, A-S, AA, AA-S		0.2	H(WS)	A
	GA	5		H(WS)	J
§ Tetrachloroethylene (127-18-4)	A, A-S, AA, AA-S		0.7	H(WS)	A
	GA	5		H(WS)	J
	A, A-S, AA, AA-S, B, C, D		1	H(B)	K
	SA, SB, SC, I, SD		1	H(B)	K
§ Tetrachloroterephthalic acid (2136-79-0)	GA	50		H(WS)	J
§ Tetrahydrofuran (109-99-9)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA		50	H(WS)	Z

TABLE 1 (continued)

NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES

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SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER		TYPE	BASIS CODE
		STANDARD	GUIDANCE VALUE		
Thallium (Not Applicable)	A, A-S, AA, AA-S		4	H(WS)	B
	GA		4	H(WS)	B
	A, A-S, AA, AA-S, B, C	8		A	N
	D	20		A	Q

Remarks: Aquatic standards apply to acid-soluble form.

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD	GUIDANCE VALUE	TYPE	BASIS CODE
§ Theophylline (58-55-9)	A, A-S, AA, AA-S	40		H(WS)	B
	GA		40	H(WS)	B
§ Thiram (137-26-8)	GA	1.8		H(WS)	F
§ Toluene (108-88-3)	A, A-S, AA, AA-S		5	H(WS)	I
	GA	5		H(WS)	J
§ o-Toluidine (95-53-4)	A, A-S, AA, AA-S		0.6	H(WS)	A
	GA	5		H(WS)	J
§ Tolyltriazole (29385-43-1)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA		50	H(WS)	Z
§ Toxaphene (8001-35-2)	A, A-S, AA, AA-S		0.01	H(WS)	A
	GA	ND		H(WS)	F
	A, A-S, AA, AA-S, B, C	0.005		A	N
	D	1.6		A	Q
	SA, SB, SC	0.005		A	N
	I		0.005	A	N
	SD		0.07	A	Q
§ Tributyltin oxide (56-35-9)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA		50	H(WS)	Z
§ Trichlorobenzenes (87-61-6; 120-82-1; 108-70-3; 12002-48-1)	A, A-S, AA, AA-S	10		H(WS)	D
	GA	5*	10**	H(WS)	
	A, A-S, AA, AA-S, B, C	5		A	N,T
	D	50		A	R
	SA, SB, SC	5		A	N,T
	I		5	A	N,T
	SD	50		A	R

Remarks: Values listed apply to the sum of substances, expect as noted below.
** Basis Code is D.
* Applies to each isomer (1,2,3-, 1,2,4-, and 1,3,5-) individually; Basis Code is J.

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD	GUIDANCE VALUE	TYPE	BASIS CODE
§ 1,1,1-Trichloroethane (71-55-6)	A, A-S, AA, AA-S		5	H(WS)	I
	GA	5		H(WS)	J

TABLE 1 (continued)

NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES

Date of Revision: November 1991

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	BASIS CODE
§ 1,1,2-Trichloroethane (79-00-5)	A, A-S, AA, AA-S	0.6		H(WS)	A
	GA	5		H(WS)	J
§ Trichloroethylene (79-01-6)	A, A-S, AA, AA-S		3	H(WS)	A
	GA	5		H(WS)	J
	A, A-S, AA, AA-S, B, C, D		11	H(B)	K
	SA, SB, SC, I, SD		11	H(B)	K
§ Trichlorofluoromethane (75-69-4)	A, A-S, AA, AA-S		5	H(WS)	I
	GA	5		H(WS)	J
§ 2,4,5-Trichlorophenoxy-acetic acid (93-76-5)	GA	35		H(WS)	F
§ 2,4,5-Trichloro-phenoxypropionic acid (93-72-1)	A, A-S, AA, AA-S	10		H(WS)	G
	GA	0.26		H(WS)	F
§ 2,3,6-Trichlorotoluene (2077-46-5)	A, AS, AA, AA-S		0.34	H(WS)	B
	GA	5		H(WS)	J
§ 2,4,5-Trichlorotoluene (6639-30-1)	A, AS, AA, AA-S		0.34	H(WS)	B,E
	GA	5		H(WS)	J
§ Trichlorotrifluoroethanes (354-58-5; 76-13-1; 26523-64-8)	A, A-S, AA, AA-S		5	H(WS)	I
	GA	5		H(WS)	J

Remarks: Values listed applies to each isomer (1,1,1-trichloro-2,2,2-trifluoroethane and 1,1,2-trichloro-1,2,2-trifluoroethane) individually.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	BASIS CODE
§ Trifluralin (1582-09-8)	GA	35		H(WS)	F
§ Trimethylbenzenes (526-73-8; 95-63-6; 108-67-8; 25551-13-7)	A, A-S, AA, AA-S		5	H(WS)	I
	GA	5		H(WS)	J

Remarks: Values listed applies to each isomer (1,2,3-, 1,2,4-, and 1,3,5-) individually.

NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES

Date of Revision: November 1991

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	BASIS CODE
§ Trimethylpyridines (1462-84-6; 108-75-8)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA		50	H(WS)	Z
Remarks: Values listed applies to each isomer (2,3,6- and 2,4,6-) individually.					
§ Triphenyl phosphate (115-86-6)	A, A-S, AA, AA-S		50	H(WS)	Z
	GA		50	H(WS)	Z
	A, A-S, AA, AA-S, B, C	4		A	N
	D	40		A	Q
Tritium (Not Applicable)	A, A-S, AA, AA-S	*		H(WS)	G
Remarks: * 20,000 picocuries per liter; if two or more radionuclides are present, the sum of their annual dose equivalent to the total body or any organ shall not exceed 4 millirems per year.					
Uranyl ion (Not Applicable)	GA	5,000		H(WS)	H
Vanadium (Not Applicable)	A, A-S, AA, AA-S, B, C	14		A	N
	D	190		A	Q
Remarks: Values listed apply to acid-soluble form.					
§ Vinyl chloride (75-01-4)	A, A-S, AA, AA-S		0.3	H(WS)	A
	GA	2		H(WS)	G
§ Xylenes (95-47-6; 108-38-3; 106-42-3; 1330-20-7)	A, A-S, AA, AA-S		5	H(WS)	I
	GA	5		H(WS)	J
Remarks: Values listed applies to each isomer (1,2-, 1,3-, and 1,4-) individually.					
Zinc (Not Applicable)	A, A-S, AA, AA-S	300		H(WS)	H
	GA	300		H(WS)	H
	A, A-S, AA, AA-S, B, C	30		A	N
	D	*		A	Q
	SA, SB, SC	58		A	N
	I		67	A	N
	SD	170		A	Q
Remarks: * exp (0.83 [ln (ppm hardness)] + 1.95) Aquatic standards and guidance value apply to acid-soluble form.					
§ Zineb (12122-67-7)	GA	1.8		H(WS)	F
§ Ziram (137-30-4)	GA	4.2		H(WS)	F

TABLE 2

PARTIAL LIST OF SUBSTANCES REGULATED BY THE PRINCIPAL ORGANIC CONTAMINANT (POC) GROUNDWATER STANDARD OF 5 ug/L

Remark: Refer to Section III of Introduction for explanation

Date of Revision: November, 1991

Substance [CAS Number]

Acrolein[107-02-8]
Acrylamide[79-06-1]
Allyl chloride[107-05-1]
4-Aminobiphenyl[92-67-1]
3-Aminotoluene[108-44-1]
4-Aminotoluene[106-49-0]
1,1'-Biphenyl[92-52-4]
Bis(2-chloroethoxy)methane[111-91-1]
Bis(chloromethyl)ether[542-88-1]
Bis(2-chloro-1-methylethyl)ether[108-60-1]
Bromobenzene[108-86-1]
Bromochloromethane[74-97-5]
Bromomethane[74-83-9]
cis-2-Butenal[15798-64-8]
trans-2-Butenal[123-73-9]
cis-2-Butenenitrile[1190-76-7]
trans-2-Butenenitrile[627-26-9]
n-Butylbenzene[104-51-8]
sec-Butylbenzene[135-98-8]
tert-Butylbenzene[98-06-6]
Chloranil[118-75-2]
2-Chloroaniline[95-51-2]
3-Chloroaniline[108-42-9]
4-Chloroaniline[106-47-8]
1-Chlorobutane[109-69-3]
Chloroethane[75-00-3]
Chloromethyl methyl ether[107-30-2]
2-Chloronitrobenzene[88-73-3]
3-Chloronitrobenzene[121-73-3]
4-Chloronitrobenzene[100-00-5]
Chloroprene[126-99-8]
Chlorothalonil[1897-45-6]
2-Chlorotoluene[95-49-8]
4-Chlorotoluene[106-43-4]
4-Chloro-o-toluidine[95-69-2]
3-Chloro-1,1,1-trifluoropropane[460-35-5]
Cyanogen bromide[506-68-3]
Cyanogen chloride[506-77-4]
1,4-Dibromobenzene[106-37-6]
1,2-Dibromo-3-chloropropane (DBCP)[96-12-8]
Dibromomethane[74-95-3]
3,3'-Dichlorobenzidine[91-94-1]
cis-1,4-Dichloro-2-butene[1476-11-5]
trans-1,4-Dichloro-2-butene[110-57-6]
Dichlorodifluoromethane[75-71-8]

TABLE 2 (Continued)

PARTIAL LIST OF SUBSTANCES REGULATED BY THE PRINCIPAL ORGANIC CONTAMINANT (POC) GROUNDWATER STANDARD OF 5 ug/L

Remark: Refer to Section III of Introduction for explanation

Date of Revision: November, 1991

Substance [CAS Number]

cis-1,2-Dichloroethene[156-59-2]
1,1-Dichloropropene[563-58-6]
cis-1,3-Dichloropropene[10061-01-5]
trans-1,3-Dichloropropene[10061-02-6]
1,2-Diisopropylbenzene[577-55-9]
1,3-Diisopropylbenzene[99-62-7]
1,4-Diisopropylbenzene[100-18-5]
2,4-Dimethylaniline[95-68-1]
3,3'-Dimethylbenzidine[119-93-7]
alpha, alpha-Dimethyl phenethylamine[122-09-8]
1,3-Dinitrobenzene[99-65-0]
2,3-Dinitrotoluene[602-01-7]
2,4-Dinitrotoluene[121-14-2]
2,5-Dinitrotoluene[619-15-8]
3,4-Dinitrotoluene[610-39-9]
3,5-Dinitrotoluene[618-85-9]
Diphenylamine[122-39-4]
Endrin aldehyde[7421-93-4]
Ethylene dibromide (EDB)[106-93-4]
Hexachloroethane[67-72-1]
Hexachlorophene[70-30-4]
Hexachloropropene[1888-71-7]
Isodrin[465-73-6]
Isopropalin[33820-53-0]
Isopropylbenzene[98-82-8]
2-Isopropyltoluene[527-84-4]
3-Isopropyltoluene[535-77-3]
4-Isopropyltoluene[99-87-6]
Methacrylonitrile[126-98-7]
N-Methylaniline[100-61-8]
4,4'-Methylene-bis-(2-chloroaniline)[101-14-4]
4,4'-Methylene-bis-(N,N'-dimethyl) aniline[1807-55-2]
Methyl iodide[74-88-4]
alpha-Methylstyrene[98-83-9]
2-Methylstyrene[611-15-4]
3-Methylstyrene[100-80-1]
4-Methylstyrene[622-97-9]
2-Nitroaniline[88-74-4]
3-Nitroaniline[99-09-2]
4-Nitroaniline[100-01-6]
2-Nitrotoluene[88-72-2]
3-Nitrotoluene[99-08-1]
4-Nitrotoluene[99-99-0]
5-Nitro-o-toluidine[99-55-8]
Pendimethalin[40487-42-1]

TABLE 2 (Continued)

PARTIAL LIST OF SUBSTANCES REGULATED BY THE PRINCIPAL ORGANIC CONTAMINANT (POC) GROUNDWATER STANDARD OF 5 ug/L

Remark: Refer to Section III of Introduction for explanation

Date of Revision: November, 1991

Substance [CAS Number]

Pentachlorobenzene[608-93-5]
Pentachloroethane[76-01-7]
1,2-Phenylenediamine[95-54-5]
1,3-Phenylenediamine[108-45-2]
1,4-Phenylenediamine[106-50-3]
Phenylhydrazine[100-63-0]
cis-1-Phenyl-1-propene[766-90-5]
trans-1-Phenyl-1-propene[873-66-5]
3-Phenyl-1-propene[637-50-3]
Polybrominated biphenyls (PBBs)[59536-65-1]*
n-Propylbenzene[103-65-1]
1,1,1,2-Tetrachloroethane[630-20-6]
alpha, alpha, alpha,4-Tetrachlorotoluene[5216-25-1]
Toluene-2,4-diamine[95-80-7]
Toluene-2,5-diamine[95-70-5]
Toluene-2,6-diamine[823-40-5]
1,2,4-Tribromobenzene[615-54-3]
2,4,6-Trichloroaniline[634-93-5]
1,1,2-Trichloropropane[598-77-6]
1,2,3-Trichloropropane[96-18-4]
cis-1,2,3-Trichloropropene[13116-57-9]
trans-1,2,3-Trichloropropene[13116-58-0]
alpha, alpha,2-Trichlorotoluene[88-66-4]
alpha, alpha,4-Trichlorotoluene[13940-94-8]
alpha, 2,4-Trichlorotoluene[94-99-5]
alpha,2,6-Trichlorotoluene[2014-83-7]
alpha,3,4-Trichlorotoluene[102-47-6]
sym-Trinitrobenzene[99-35-4]
2,3,4-Trinitrotoluene[602-29-9]
2,3,6-Trinitrotoluene[18292-97-2]
2,4,5-Trinitrotoluene[610-25-3]
2,4,6-Trinitrotoluene[118-96-7]
3,4,5-Trinitrotoluene[603-15-6]

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* POC standard applies to each congener individually.

EXPLANATION OF BASIS CODES
IN
TABLES 1 AND 2

Type[1]	Basis Code	NYCRR		Procedure
		Title	Reference	
H(WS) Human Health (water source)	A	6	702.4	Oncogenic
	B	6	702.5	Non-oncogenic, Chronic
	C	6	702.5	Non-oncogenic, Acute
	D	6	702.6	Aesthetic
	E	6	702.7	Chemical correlation
	F	6	----	Former groundwater regulations 703.5(a)(3)
	G	6	702.3(a)	Specific MCL
	H	10	Part 170	Former use of or reference to
	I	6	702.3(b)	Principal Organic Contaminant Classes
	J	10	Subpart 5-1	Former groundwater reference to general standards
	Z	6	702.15(a)(1)(ii)	General organic guidance value
H(B) Human Health (Fish Consumption)	K	6	702.8	Bioaccumulation (Health)
A aquatic life and wildlife	N	6	702.10	Propagation
	Q	6	702.11	Survival
	R	6	702.12	Tainting
	S	6	702.13	Bioaccumulation (Wildlife Protection)
	T	6	702.14	Chemical correlation

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[1] See page 3.

TABLE 3

PARTIAL LIST OF SUBSTANCES NOT REGULATED BY THE PRINCIPAL ORGANIC CONTAMINANT (POC) GROUNDWATER STANDARD

Note: Refer to Section III of Introduction for Explanation

(No standard or guidance value is available for these substances)

Date of Revision: November, 1991

Substance[CAS Number]

Acenaphthylene[208-96-8]
Acephate[30560-19-1]
Acetone[67-64-1]
Acetone cyanohydrin[75-86-5]
Acetonitrile[75-05-8]
Acetophenone[98-86-2]
2-Acetylaminofluorene[53-96-3]
Aldicarb sulfone[1646-88-4]
Aldicarb sulfoxide[1646-87-3]
Allyl alcohol[107-18-6]
Anisole[100-66-3]
Aramite[140-57-8]
Benzaldehyde[100-52-7]
Benzoic acid[65-85-0]
Benzo(g,h,i)perylene[191-24-2]
Benzo(e)pyrene[192-97-2]
Benzotrichloride[98-07-7]
Benzyl alcohol[100-51-6]
Benzyl chloride[100-44-7]
Bis(pentabromophenyl)ether[1163-19-5]
4-Bromophenylphenylether[101-55-3]
Bromophos[2104-96-3]
Bromoxynil[1689-84-5]
1-Butanol[71-36-3]
2-Butanone[78-93-3]
Cacodylic acid[75-60-5]
Caprolactam[105-60-1]
Captafol[2425-06-1]
Carbazole[86-74-8]
Carbon disulfide[75-15-0]
Chloral[75-87-6]
Chloroacetic acid[79-11-8]
Chlorobenzilate[510-15-6]
4-Chlorobenzoic acid[74-11-3]
4-(4-Chloro-2-methylphenoxy)butyric acid[94-81-5]
2-(4-Chloro-2-methylphenoxy)propionic acid[93-65-2]
4-Chlorophenyl phenyl ether[7005-72-3]
Chlorpyrifos[2921-88-2]
Cyanazine[21725-46-2]
Cyclohexane[110-82-7]
Cyclohexanol[108-93-0]
Cyclohexanone[108-94-1]
Cyclohexanone oxime[100-64-1]
Cyclohexene[110-83-8]
Cyclohexylamine[108-91-8]

TABLE 3 (Continued)

PARTIAL LIST OF SUBSTANCES NOT REGULATED BY THE PRINCIPAL ORGANIC CONTAMINANT (POC) GROUNDWATER STANDARD

Note: Refer to Section III of Introduction for Explanation

(No standard or guidance value is available for these substances)

Date of Revision: November, 1991

Substance[CAS Number]

Cyclotrimethylenetrinitramine[121-82-4]
2,4-DB[94-82-6]
Demeton[8065-48-3]
Diallate[2303-16-4]
Dibenz(a,h)anthracene[55-70-3]
Dibenzofuran[132-64-9]
Dibromoacetonitrile[3252-43-5]
Dibutyltin chloride[683-18-1]
Dibutyltin dilaurate[77-58-7]
2,3-Dichloro-1,4-napthoquinone[117-80-6]
alpha, alpha -Dichlorotoluene[98-87-3]
Dicyclopentadiene[77-73-6]
Diethylamine[109-89-7]
Diethylene glycol[111-46-6]
Diethylene glycol monoethyl ether[111-90-0]
Diethyl formamide[617-84-4]
Diethyl maleate[141-05-9]
Diethyl mercury[627-44-1]
O,O-Diethyl-O-2-pyrazinyl phosphorothioate[297-97-2]
Diethyltin dycaprylate[2641-56-7]
2,3-Dihydro-1,6-dimethyl-1H-indene[17059-48-2]
2,3-Dihydro-1-methyl-1H-indene[767-58-8]
Diisopropylamine[108-18-9]
Dimethoate[60-51-5]
3,3'-Dimethoxybenzidine[119-90-4]
Dimethylamine[124-40-3]
4-(Dimethylamino)azobenzene[60-11-7]
7,12-Dimethylbenz(a)anthracene[57-97-6]
Dimethylbenzylammonium chloride[1875-92-9]
Dimethyldioxane[25136-55-4]
Dimethyldithiocarbamate[79-45-8]
Dimethylethylbenzylammonium chloride[5197-80-8]
1,1-Dimethylhydrazine[57-14-7]
1,2-Dimethylhydrazine[540-73-8]
Dimethylphenylcarbinol[617-94-7]
Dimethylterephthalate[120-61-6]
Dioctyl adipate[103-23-1]
1,4-Dioxane[123-91-1]
Diquat dibromide[85-00-7]
Endosulfan[115-29-7]
Endosulfan I[959-98-8]
Endosulfan II[33213-65-9]
Endosulfan sulfate[1031-07-8]
Endothall[145-73-3]
Epichlorohydrin[106-89-8]

TABLE 3 (Continued)

PARTIAL LIST OF SUBSTANCES NOT REGULATED BY THE PRINCIPAL ORGANIC CONTAMINANT (POC) GROUNDWATER STANDARD

Note: Refer to Section III of Introduction for Explanation

(No standard or guidance value is available for these substances)

Date of Revision: November, 1991

Substance[CAS Number]

Ethion[563-12-2]
2-Ethoxyethanol[110-80-5]
2-Ethoxyethanol acetate[111-15-9]
Ethyl acetate[141-78-6]
Ethyl acrylate[140-88-5]
Ethyl di-n-propylthiocarbamate (EPTC)[759-96-4]
Ethylene cyanohydrin[109-78-4]
Ethyl ether[60-29-7]
Ethyl mercuric chloride[107-27-7]
Ethyl methacrylate[97-63-2]
Ethyl methane sulfonate[62-50-0]
Famphur[52-85-7]
Formaldehyde[50-00-0]
Formic acid[64-18-6]
Furan[110-00-9]
Furazolidone[67-45-8]
Furfural[98-01-1]
Furium[531-82-8]
Glycidaldehyde[765-34-4]
Glyphosate[1071-83-6]
1-Heptanol[111-70-6]
2-Heptanol[543-49-7]
3-Heptanol[589-82-2]
4-Heptanol[589-55-9]
Hexamethylene diamine[124-09-4]
Hexanate[25056-70-6]
Hydrazine[302-01-2]
Isobutyl alcohol[78-83-1]
Isodecyl diphenylphosphate[29761-21-5]
Isopropylamine[75-31-0]
Isopropylbenzene hydroperoxide[80-15-9]
Isosafrole[120-58-1]
Isothiazolones[---]
Linear alkylbenzenesulfonates[---]
Linuron[330-55-2]
2,5-Lutidine[589-93-5]
Maleic anhydride[108-31-6]
Maleic hydrazide[123-33-1]
Malononitrile[109-77-3]
Methacrylamide[79-39-0]
Methacrylic acid, ethyl ester[97-63-2]
Methanol[67-56-1]
Methapyrilene[91-80-5]
2-Methoxyethanol[109-86-4]
2-Methoxyethanol acetate[110-49-6]

TABLE 3 (Continued)

PARTIAL LIST OF SUBSTANCES NOT REGULATED BY THE PRINCIPAL ORGANIC CONTAMINANT (POC) GROUNDWATER STANDARD

Note: Refer to Section III of Introduction for Explanation

(No standard or guidance value is available for these substances)

Date of Revision: November, 1991

Substance[CAS Number]

2-Methoxy-5-nitroaniline[99-59-2]
Methyl acetate[79-20-9]
Methylacrylate[96-33-3]
Methylamine[74-89-5]
2-Methylanthracene[613-12-7]
9-Methylanthracene[779-02-2]
3-Methylcholanthrene[56-49-5]
Methyl mercury[22967-92-6]
Methylmethanesulfonate[66-27-3]
2-Methylnaphthalene[91-57-6]
Methylolmethacrylamide[923-02-4]
4-Methyl-2-pentanone[108-10-1]
Molinate[2212-67-1]
1,4-Naphthoquinone[130-15-4]
1-Napthylamine[134-32-7]
2-Napthylamine[91-59-8]
Nitrocyclohexane[1122-60-7]
Nitrofurantoin[67-20-9]
Nitrofurazone[59-87-0]
2-Nitropropane[79-46-9]
4-Nitroquinoline-1-oxide[56-57-5]
N-Nitrosodi-N-butylamine[924-16-3]
N-Nitrosodiethylamine[55-18-5]
N-Nitrosodimethylamine[62-75-9]
N-Nitrosodipropylamine[621-64-7]
N-Nitrosomethylethylamine[10595-95-6]
N-Nitroso-N-methyl urea[684-93-5]
N-Nitrosomorpholine[59-89-2]
N-Nitrosopiperidine[100-75-4]
N-Nitrosopyrrolidine[930-55-2]
Nonanal[124-19-6]
1-Nonanol[143-08-8]
Octamethylpyrophosphoramine[152-16-9]
Pebulate[1114-71-2]
Pentanate[136-25-4]
Phenacitin[62-44-2]
Phenylmercuric acetate[62-38-4]
Phthalic anhydride[85-44-9]
alpha-Picoline[109-06-8]
Profluralin[26399-36-0]
Pronamide[23950-58-5]
Propionitrile[107-12-0]
Propylene glycol[58-55-6]
Propylene glycol monoethyl ether[19089-47-5]
Propylene glycol monomethyl ether[1589-49-7]

TABLE 3 (Continued)

PARTIAL LIST OF SUBSTANCES NOT REGULATED BY THE PRINCIPAL ORGANIC CONTAMINANT (POC) GROUNDWATER STANDARD

Note: Refer to Section III of Introduction for Explanation

(No standard or guidance value is available for these substances)

Date of Revision: November, 1991

Substance[CAS Number]

Propylene oxide[75-56-9]
Quaternary ammonium compounds[---]
Quinoline[91-22-5]
1,4-Quinone dioxide[105-11-3]
RDX (Cyclonite)[121-82-4]
Reserpine[50-55-5]
Rhodamine WT[37299-86-8]
Ronnel[299-84-3]
Rotenone[83-79-4]
Safrole[94-59-7]
Sodium adipate, disodium salt[7486-38-6]
Sodium diethyldithiocarbamate[148-18-5]
Strychnine[57-24-9]
Tetraethyl dithiopyrophosphate[3689-24-5]
Tetraethyl lead[78-00-2]
Tetraethyl tin[597-64-8]
2-(Thiocyanomethylthio) benzothiazole[21564-17-0]
Thiofanox[39196-18-4]
Thiourea[62-56-6]
Toluene diisocyanate[584-84-9]
Triallate[2303-17-5]
alpha, alpha, alpha-Trichlorotoluene[98-07-7]
Triethylamine[121-44-8]
O,O,O-Triethylphosphorothioate[126-68-1]
Trimethyl phosphate[512-56-1]
Vernolate[1929-77-7]
Vinyl acetate[108-05-4]
Warfarin[81-81-2]

TABLE 4

DEFINITION FOR PRINCIPAL ORGANIC CONTAMINANT CLASSES*
(excerpted from 6NYCRR Section 700.1)

Principal organic contaminant classes means the following classes of organic chemicals.

(1) Halogenated alkane: Compound containing carbon (C), hydrogen (H) and halogen (X) where X = fluorine (F), chlorine (Cl), bromine (Br) and/or iodine (I), having the general formula $C_nH_yX_z$, where $y + z = 2n + 2$; n, y and z are integer variables; n and z are equal to or greater than one and y is equal to or greater than zero. Specifically excluded from this class are chloroform, bromoform, bromodichloromethane and dibromochloromethane.

(2) Halogenated ether: Compound containing carbon (C), hydrogen (H), oxygen (O) and halogen (X) (where X = F, Cl, Br and/or I) having the general formula $C_nH_yX_zO$, where $y + z = 2n + 2$; the oxygen is bonded to two carbons; n, y and z are integer variables; n is equal to or greater than two, y is equal to or greater than zero and z is equal to or greater than one.

(3) Halobenzenes and substituted halobenzenes: Derivatives of benzene which have at least one halogen atom attached to the ring and which may or may not have straight or branched chain hydrocarbon, nitrogen or oxygen substituents.

(4) Benzene and alkyl- or nitrogen-substituted benzenes: Benzene or a derivative of benzene which has either an alkyl- and/or a nitrogen-substituent.

(5) Substituted, unsaturated hydrocarbons: A straight or branched chain unsaturated hydrocarbon compound containing one of the following: halogen, aldehyde, nitrile, amide.

(6) Halogenated non-aromatic cyclic hydrocarbons: A non-aromatic cyclic compound containing a halogen.

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*Note: Determining the applicability of the POC groundwater standard to a specific substance can be a complex process that should not be undertaken using these definitions alone. Refer to the introduction of this TOGS for guidance (page 7).

INDEX OF TABLE 1 AND TABLE 2 ENTRIES BY CHEMICAL ABSTRACTS SERVICE (CAS) REGISTRY NUMBER

Notes: 1. Where an entry includes multiple substances, underlining identifies the specific substance that corresponds to the CAS number listed. Entries having no CAS numbers are indicated by "NA" (not applicable).

2. CAS numbers for groups of substances, including pairs of cis- and trans- isomers, may not be included in this index. The reader may need to determine individual substances and CAS numbers within a group CAS number.

INDEX OF TABLE 1 AND TABLE 2
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INDEX OF TABLE 1 AND TABLE 2
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* This non-individual CAS number also refers to one or more individual substances that are not specifically listed in Tables 1 and 2. These individual substances, however, may be encompassed by a group entry in Table 1 (for example, Principal Organic Contaminant or Phenolic Compounds). Refer to IB of the Introduction for an explanation of group entries.

WATER QUALITY REGULATIONS

FOR

SURFACE WATERS AND GROUNDWATERS

6NYCRR
PARTS 700-705

Effective September 1, 1991

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF WATER
Albany, New York

FOREWORD

This document provides the New York State Water Quality Regulations, Parts 700-705 for surface waters and groundwaters. Parts 700-703 are presented here by the Express Terms submitted to the Secretary of State for the complete revision of those Parts effective September 1, 1991. Parts 704 and 705 are presented here by a copy of those Parts prior to their revision along with the Express Terms showing the revisions to those Parts.

TABLE OF CONTENTS

Existing Part 700 is REPEALED and a new Part 700 is ADOPTED as follows:

PART 700

DEFINITIONS, SAMPLES AND TESTS

(Statutory authority: Environmental Conservation Law, §§ 3-0301 [2][m], 15-0313, 17-0301, 17-0303, 17-0809)

Section 700.1. Definitions. (a) The terms, words, or phrases used in Parts 700-705 of this Title shall have the meanings described below.

(1) "Acute toxic effect" means an effect that usually occurs shortly after the administration of either a single dose or multiple doses of a chemical.

(2) "Administrator" means the Administrator of the United States Environmental Protection Agency.

(3) "Approved treatment" as applied to water supplies means treatment accepted as satisfactory by the authorities responsible for exercising supervision over the quality of water supplies.

(4) "Best usages" as specified for each class of water means those uses as determined by the commissioner in accordance with the considerations prescribed by the Environmental Conservation Law.

(5) "Chronic toxic effect" means an effect that is irreversible or progressive or occurs because the rate of injury is greater than the rate of repair during prolonged exposure to a chemical.

(6) "Coastal waters" mean those marine waters within the territorial limits of the state other than estuaries and enclosed bays. Long Island Sound is designated as coastal waters for the purposes of thermal discharges.

(7) "Commissioner" means the Commissioner of the Department of Environmental Conservation.

(8) "Consolidated rock or bedrock" means the compact or solid hard rock beneath or exposed at the surface of the earth or overlain by surface waters.

(9) "Department" means the New York State Department of Environmental Conservation.

(10) "Disposal system" means a system for disposing of sewage, industrial waste or other wastes, including sewer systems and treatment works.

(11) "Effluent limitations" mean any restriction on quantities, qualities, rates and concentrations of chemical, physical, biological, and other constituents of effluents that are discharged into or allowed to run from an outlet or point source or any other discharge within the meaning of section 17-0501 of the Environmental Conservation Law into surface waters, groundwater or unsaturated zones.

(12) "Enclosed bays" mean those marine waters within the territorial limits of New York State, other than coastal waters or estuaries, in which exchange of sea water is severely limited by barrier beaches. For the purpose of thermal discharges, the following are designated as enclosed bays: Jamaica Bay, Hempstead Bay, Great South Bay, Moriches Bay, Shinnecock Bay and Mecox Bay.

(13) "Estuary" means the tidal portion of a river or stream.

(14) "Fresh groundwaters" mean those groundwaters having a chloride concentration equal to or less than 250 mg/L or a total dissolved solids concentration equal to or less than 1,000 mg/L.

(15) "Groundwaters" mean those waters in saturated zones.

(16) "Groundwater effluent standards" mean effluent limitations that have been adopted and are included in section 703.6 of this Title for protection of groundwater and unsaturated zones.

(17) "Guidance value" means such measure of purity or quality for any waters in relation to their reasonable and necessary use as may be established by the department pursuant to section 702.1 of this Title.

(18) "Heat of artificial origin" means all heat from other than natural sources, including but not limited to cumulative effects of multiple and proximate thermal discharges.

(19) "Industrial waste" means any liquid, gaseous, solid or waste substance, or a combination thereof, resulting from any process of industry, manufacturing, trade, or business or from the development or recovery of any natural resources, that may cause or might reasonably be expected to cause pollution of the waters of the state in contravention of the standards adopted pursuant to the Environmental Conservation Law, Article 17.

(20) "Land application techniques" include the following three basic methods of waste discharge application: irrigation, infiltration-percolation, and overland flow.

(21) "Land utilization practices" entail the use of plants, the soil surface, and soil matrix for removal of certain wastewater constituents.

(22) "Micrograms per liter (ug/L)" means the weight in micrograms of any specific substance or substances contained in one liter of liquid.

(23) "Milligrams per liter (mg/L)" means the weight in milligrams of any specific substance or substances contained in one liter of liquid.

(24) "Oncogenic effect" means the induction of tumors that has been demonstrated in:

(i) humans;
(ii) two mammalian species;
(iii) one mammalian species, independently reproduced;
(iv) one mammalian species, to an unusual degree with respect to incidence, latency period, site, tumor type or age at onset; or
(v) one mammalian species, supported by positive results in short-term tests that are indicative of potential oncogenic activity.

(25) "Other wastes" means garbage, refuse, decayed wood, sawdust, shavings, bark, sand, lime, cinders, ashes, offal, oil, tar, dyestuffs, acids, chemicals, leachate, sludge, salt and all other discarded matter not sewage or industrial waste that may cause or might reasonably be expected to cause pollution of the waters of the state in contravention of the standards adopted pursuant to the Environmental Conservation Law, Article 17.

(26) "Outlet" means the terminus of a sewer system, or the point of emergence of any water-borne sewage, industrial waste or other wastes or the effluent therefrom, into the waters of the state.

(27) "Pathogenic organism" means any disease-producing organism.

(28) "Person or persons" means any individual, public or private corporation, political subdivision, government agency, municipality, industry, co-partnership, association, firm, trust, estate or any other legal entity whatsoever.

(29) "Point source" means any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation or vessel or other floating craft from which pollutants are or may be discharged.

(30) "Pollutant" means dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, and industrial, municipal, and agricultural waste discharged into water.

(31) "Pollution" means the presence in the environment of conditions and/or contaminants in quantities of characteristics that are or may be injurious to human, plant or animal life or to property or that unreasonably interfere with the comfortable enjoyment of life and property throughout such areas of the state as shall be affected thereby.

(32) "Potable waters" mean those fresh waters usable for drinking, culinary or food processing purposes.

(33) "Primary contact recreation" means recreational activities where the human body may come in direct contact with raw water to the point of complete body submergence. Primary contact recreation includes, but is not limited to, swimming, diving, water skiing, skin diving and surfing.

(34) "Principal organic contaminant classes" means the classes of organic chemicals listed below.

(i) Halogenated alkane: compound containing carbon (C), hydrogen (H) and halogen (X) where X = fluorine (F), chlorine (Cl), bromine (Br) and/or iodine (I), having the general formula $C_nH_yX_z$, where $y + z = 2n + 2$; n, y and z are integer variables; n and z are equal to or greater than one and y is equal to or greater than zero. Specifically excluded from this class are chloroform, bromoform, bromodichloromethane and dibromochloromethane.

(ii) Halogenated ether: compound containing carbon (C), hydrogen (H), oxygen (O) and halogen (X) (where X = F, Cl, Br and/or I) having the general formula $C_nH_yX_zO$, where $y + z = 2n + 2$; the oxygen is bonded to two carbons; n, y and z are integer variables; n is equal to or greater than two, y is equal to or greater than zero and z is equal to or greater than one.

(iii) Halobenzenes and substituted halobenzenes: derivatives of benzene which have at least one halogen atom attached to the ring and which may or may not have straight or branched chain hydrocarbon, nitrogen or oxygen subtitutents.

(iv) Benzene and alkyl- or nitrogen-substituted benzenes: benzene or a derivative of benzene which has either an alkyl- and/or a nitrogen-substitutent.

(v) Substituted, unsaturated hydrocarbons: a straight or branched chain unsaturated hydrocarbon compound containing one of the following: halogen, aldehyde, nitrile, amide.

(vi) Halogenated non-aromatic cyclic hydrocarbons: a non-aromatic cyclic compound containing a halogen.

(35) "Saline groundwater" means groundwater having a chloride concentration of more than 250 mg/L or a total dissolved solids concentration of more than 1,000 mg/L.

(36) "Saline surface waters" mean all waters that are so designated by the commissioner.

(37) "Saturated zones" mean any extensive portion of the earth's crust that contains sufficient water to fill all interconnected voids or pore spaces.

(38) "Secondary contact recreation" means recreational activities where contact with the water is minimal and where ingestion of the water is not probable. Secondary contact recreation includes, but is not limited to, fishing and boating.

(39) "Sewage" means the water-carried human or animal wastes from residences, buildings, industrial establishments or other places, together with such groundwater infiltration and surface water as may be present.

(40) "Source of water supply for drinking, culinary or food processing purposes" means any water source, either public or private, that is used for domestic consumption or used in connection with the processing of milk, beverages or food.

(41) "Specific MCL" means a maximum contaminant level (MCL) included in 10 NYCRR 5-1.51, 5-1.52 or 5-1.55 for either an individual substance or group of substances. A Specific MCL does not include the 10 NYCRR Part 5 MCLs for principal organic contaminants or unspecified organic contaminants.

(42) "Standards" mean such measures of purity or quality for any waters in relation to their reasonable and necessary use as may be established by the department pursuant to section 17-0301 of the Environmental Conservation Law.

(43) "Subsurface sewage disposal system" means a disposal system that discharges sewage beneath the surface of the ground.

(44) "Thermal discharge" means a discharge that results or would result in a temperature change of the receiving water.

(45) "Toxic pollutant" means those pollutants, or combination of pollutants, including disease-causing agents, that after discharge and upon exposure, ingestion, inhalation or assimilation into any organism, either directly from the environment or indirectly through food chains, will, on the basis of information available to the department, cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions, including malfunctions in reproduction, or physical deformations, in such organisms or their offspring.

(46) "Treatment works" means any plant, disposal field, lagoon, pumping station, constructed drainage ditch or surface water intercepting ditch, incinerator, area devoted to sanitary landfills or other works not specifically mentioned here, installed for the purpose of treating, neutralizing, stabilizing or disposing of sewage, industrial waste or other wastes.

(47) "Unconsolidated deposits" means all non- or poorly indurated soil materials above the bedrock.

(48) "Waste management system" includes the management of mechanical equipment, crops, irrigation ~~and monitors~~ as an operational unit.

(49) "Water quality-based effluent limitations" mean effluent limitations for surface waters that are derived from water quality standards or guidance values.

700.2 Collection of samples. (a) The determination of compliance or non-compliance of sewage, industrial waste or other waste discharges with the requirements of Parts 700 through 705 of this Title shall be made through analytical methods or tests of groundwater, surface water or effluent samples collected in such manner as approved by the department.

(b) In selecting or approving the locations at which such samples are collected, the department shall consider all relevant factors, including but not limited to paragraphs (c), (d) and (e) of this section.

(c) For groundwater samples:

(1) the mobility of pollutants in unsaturated zones, which, among other things, is affected by the rate of movement of percolating water; and

(2) attenuation of pollutants that may occur in passage through unsaturated and saturated zones.

(d) For surface water samples:

(1) there must be prompt mixing of the discharge with the receiving waters;

(2) mixing shall not interfere with biological communities to a degree that is damaging to the ecosystem;

(3) the zone of mixing shall not include intakes for potable water supplies; and

(4) mixing shall not diminish other beneficial uses disproportionately.

(e) The location at which effluent samples are collected shall be at a point where the effluent emerges from a treatment works, disposal system, outlet or point source, and prior to being discharged to surface water or the ground, unless specified otherwise by a State Pollutant Discharge Elimination System (SPDES) permit issued pursuant to Parts 750-758 of this Title.

700.3 Tests or analytical methods. (a) Tests or analytical methods for measurement of surface water or groundwater to determine compliance with standards or guidance values shall be made in accordance with the following requirements:

(1) 40 CFR Part 136, as of July 1, 1988 (see section 705.1 of this Title); or

(2) other tests or analytical methods approved by the department.

(b) Tests or analytical methods to determine compliance with effluent limitations shall be made in accordance with subdivision (a), unless a different test or analytical method is specified in a State Pollutant Discharge Elimination System permit.

700.4 Severability. If any provision of this Part or its application to any person or circumstance is held to be invalid, the remainder of this Part and the application of that provision to other persons or circumstances will not be affected.

Existing Part 701 and Appendix 31 are REPEALED and a new Part 701 is ADOPTED as follows:

PART 701

CLASSIFICATIONS

SURFACE WATERS AND GROUNDWATERS

(Statutory authority: Environmental Conservation Law, §§ 3-0301 [2][m], 15-0313, 17-0301, 17-0303, 17-0809)

Section 701.1 General conditions applying to all water classifications. The discharge of sewage, industrial waste or other wastes shall not cause impairment of the best usages of the receiving water as specified by the water classifications at the location of discharge and at other locations that may be affected by such discharge.

FRESH SURFACE WATERS

701.2 Class N fresh surface waters. (a) The best usages of Class N waters are the enjoyment of water in its natural condition and, where compatible, as a source of water for drinking or culinary purposes, bathing, fishing, fish propagation, and recreation.

(b) There shall be no discharge of sewage, industrial wastes, or other wastes, waste effluents or any sewage effluents not having had filtration resulting from at least 200 feet of lateral travel through unconsolidated earth. A greater distance may be required if inspection shows that, due to peculiar geologic conditions, this distance is inadequate to protect the water from pollution.

(c) These waters shall contain no deleterious substances, hydrocarbons or substances that would contribute to eutrophication, nor shall they receive surface runoff containing any such substance.

701.3 Class AA-Special (AA-S) fresh surface waters. (a) The best usages of Class AA-S waters are: a source of water supply for drinking, culinary or food processing purposes; primary and secondary contact recreation; and fishing. The waters shall be suitable for fish propagation and survival.

(b) These waters shall contain no floating solids, settleable solids, oil, sludge deposits, toxic wastes, deleterious substances, colored or other wastes or heated liquids attributable to sewage, industrial wastes or other wastes.

(c) There shall be no discharge or disposal of sewage, industrial wastes or other wastes into these waters.

(d) These waters shall contain no phosphorus and nitrogen in amounts that will result in growths of algae, weeds and slimes that will impair the waters for their best usages.

701.4 Class A-Special (A-S) fresh surface waters. (a) The best usages of Class A-S waters are: a source of water supply for drinking, culinary or food processing purposes; primary and secondary contact recreation; and fishing. The waters shall be suitable for fish propagation and survival.

(b) This classification may be given to those international boundary waters that, if subjected to approved treatment, equal to coagulation, sedimentation, filtration and disinfection with additional treatment, if necessary, to reduce naturally present impurities, meet or will meet New York State Department of Health drinking water standards and are or will be considered safe and satisfactory for drinking water purposes.

701.5 Class AA fresh surface waters. (a) The best usages of Class AA waters are: a source of water supply for drinking, culinary or food processing purposes; primary and secondary contact recreation; and fishing. The waters shall be suitable for fish propagation and survival.

(b) This classification may be given to those waters that, if subjected to approved disinfection treatment, with additional treatment if necessary to remove naturally present impurities, meet or will meet New York State Department of Health drinking water standards and are or will be considered safe and satisfactory for drinking water purposes.

701.6 Class A fresh surface waters. (a) The best usages of Class A waters are: a source of water supply for drinking, culinary or food processing purposes; primary and secondary contact recreation; and fishing. The waters shall be suitable for fish propagation and survival.

(b) This classification may be given to those waters that, if subjected to approved treatment equal to coagulation, sedimentation, filtration and disinfection, with additional treatment if necessary to reduce naturally present impurities, meet or will meet New York State Department of Health drinking water standards and are or will be considered safe and satisfactory for drinking water purposes.

701.7 Class B fresh surface waters. The best usages of Class B waters are primary and secondary contact recreation and fishing. These waters shall be suitable for fish propagation and survival.

701.8 Class C fresh surface waters. The best usage of Class C waters is fishing. These waters shall be suitable for fish propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.

701.9 Class D fresh surface waters. The best usage of Class D waters is fishing. Due to such natural conditions as intermittency of flow, water conditions not conducive to propagation of game fishery, or stream bed conditions, the waters will not support fish propagation. These waters shall be suitable for fish survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.

SALINE SURFACE WATERS

701.10 Class SA saline surface waters. The best usages of Class SA waters are shellfishing for market purposes, primary and secondary contact recreation and fishing. These waters shall be suitable for fish propagation and survival.

701.11 Class SB saline surface waters. The best usages of Class SB waters are primary and secondary contact recreation and fishing. These waters shall be suitable for fish propagation and survival.

701.12 Class SC saline surface waters. The best usage of Class SC waters is fishing. These waters shall be suitable for fish propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.

701.13 Class I saline surface waters. The best usages of Class I waters are secondary contact recreation and fishing. These waters shall be suitable for fish propagation and survival.

701.14 Class SD saline surface waters. The best usage of Class SD waters is fishing. These waters shall be suitable for fish survival. This classification may be given to those waters that, because of natural or man-made conditions, cannot meet the requirements for primary and secondary contact recreation and fish propagation.

GROUNDWATERS

701.15 Class GA fresh groundwaters. The best usage of Class GA waters is as a source of potable water supply. Class GA waters are fresh groundwaters.

701.16 Class GSA saline groundwaters. The best usages of Class GSA waters are as a source of potable mineral waters, for conversion to fresh potable waters, or as raw material for the manufacture of sodium chloride or its derivatives or similar products. Class GSA waters are saline groundwaters.

701.17 Class GSB saline groundwaters. The best usage of Class GSB waters is as a receiving water for disposal of wastes. Class GSB waters are saline groundwaters that have a chloride concentration in excess of 1,000 milligrams per liter or a total dissolved solids concentration in excess of 2,000 milligrams per liter.

701.18 Assignment of groundwater classifications. (a) The groundwater classifications defined in sections 701.15 through 701.16 are assigned to all the groundwaters of New York State.

(b) The Class GSB shall not be assigned to any groundwaters of the state, unless the commissioner finds that adjacent and tributary groundwaters and the best usages thereof will not be impaired by such classification.

701.19 Severability. If any provision of this Part or its application to any person or circumstance is held to be invalid, the remainder of this Part and the application of that provision to other persons or circumstances will not be affected.

Existing Part 702 is REPEALED and a new Part 702 is ADOPTED as follows:

PART 702

DERIVATION AND USE OF STANDARDS AND GUIDANCE VALUES

(Statutory authority: Environmental Conservation Law, §§ 3-0301 [2][m], 15-0313, 17-0301, 17-0303, 17-0809)

Section 702.1 Basis for derivation of water quality standards and guidance values. (a) The control of taste-, color- and odor-producing, toxic and other deleterious substances is implemented through the use of standards and guidance values. Standards and guidance values for such substances shall be derived according to the procedures set forth in this Part.

(b) The derivation of standards and guidance values will consider, to the extent possible, variations in natural or background conditions of waters, including but not limited to alkalinity, temperature, hardness and pH.

702.2 Standards and guidance values for protection of human health and sources of potable water supplies. (a) Standards and guidance values for protection of the best usage as a source of potable water supply shall protect human health and drinking water sources and are referred to as health (water source) values.

(b) The standard or guidance value shall be the most stringent of the values derived using the procedures found in sections 702.3 through 702.7 of this Part.

702.3 Procedures for deriving standards and guidance values based on Specific MCLs and principal organic contaminant classes. (a) The standard or guidance value shall be equal to the value of a Specific MCL.

(b) For a substance belonging to any of the principal organic contaminant classes and for which there is no Specific MCL, the standard or guidance value shall be 5 ug/L or a less stringent value as determined by the Commissioner of the New York State Department of Health.

702.4 Procedures for deriving standards and guidance values based on oncogenic effects. (a) Values based on oncogenic effects shall be calculated using dose-response data from scientifically valid animal or human studies and a linearized multi-stage low-dose extrapolation model, unless the scientific evidence is determined to be sufficient to support the use of an alternative extrapolation model.

(b) Considering factors, including but not limited to route and duration of exposure, tumor type, species and statistical significance, the dose-response data deemed to be the most appropriate shall be used as a basis for the value.

(c) Other relevant toxicological information, including but not limited to mutagenicity, pharmacokinetics and protein-binding ability shall be considered in the selection of dose-response data and procedures used to derive the value.

(d) The 95 percent lower confidence limit on the dose corresponding to an excess lifetime cancer risk of one-in-one million shall be the basis of the value.

(e) Unless the scientific evidence is determined to be sufficient to support the use of an alternative trans-species conversion method, the human dose, in milligrams of substance per kilogram of body weight per day, shall be calculated by multiplying the animal-to-human body weight ratio to the 0.33 power by the animal dose in milligrams of substance per kilogram of body weight per day.

(f) The value shall be based on an average 70 kilogram adult, consuming 2 liters of water per day for 70 years.

(g) The associated biological and mathematical uncertainties shall be considered in the establishment of the value.

702.5 Procedures for deriving standards and guidance values based on non-oncogenic effects. (a) Values shall be based on a dose that does not produce an observed effect (no-observed- effect level) derived from the results of scientifically valid human or animal studies determined most appropriate, considering factors, including but not limited to route and duration of exposure, effects, species and statistical significance. If a valid no-observed-effect level has not been determined, a minimal effect level may be used.

(b) The no-observed-effect level (NOEL) or the minimal effect level, expressed as a dose in milligrams of substance per kilogram of body weight, shall be divided by an uncertainty factor to obtain an acceptable daily intake (ADI). The magnitude of this factor will generally range from 10 to 1,000 and shall reflect the quantity and quality of the toxicologic data, the degree of confidence in the data and the nature of the effects of concern. Generally, the magnitude of the uncertainty factor shall be:

(1) 10 - where valid experimental results from prolonged exposure studies of humans and one or more animal species are available.

(2) 100 - where experimental results from prolonged exposures of humans are inconclusive or not available, and valid results of long-term studies on experimental animals exist.

(3) 1,000 - where experimental results of studies on human exposure are unavailable or inconclusive, and valid results from long-term ingestion studies on experimental animals are not available.

(c) Values shall allow no more than 20 percent of the acceptable daily intake to come from drinking water.

(d) Values based on acute toxic effects shall be derived based on an average 10-kilogram child, consuming one liter of water per day.

(e) Values based on chronic toxic effects shall be derived based on an average 70-kilogram adult, consuming two liters of water per day.

702.6 Procedure for deriving standards and guidance values based on aesthetic considerations. Values based on aesthetic considerations, including but not limited to taste, odor and discoloration, shall be based on an evaluation of the reported levels of the substance that affect the aesthetic quality of water.

702.7 Procedure for deriving standards and guidance values based on chemical correlation. Where the available data are deemed insufficient for deriving a value on the basis of any of sections 702.4 through 702.6 of this Part, a value may be based on correlation to a chemical for which a standard or guidance value has been established pursuant to that section. Values based on chemical correlation may be established where similar toxic effects or aesthetic considerations are anticipated because of similarity of functional groups or metabolic or toxicologic pathways.

702.8 Procedures for deriving standards and guidance values for protection of human health from consumption of fish. Standards and guidance values for the protection of the best usage of fishing shall protect the health of human consumers of finfish and, for Class SA waters, human consumers of shellfish from chemicals that may bioaccumulate and are referred to as health (bioaccumulation) values.

(a) Standards and guidance values based on bioaccumulation and human consumption of fish shall be equal to the acceptable daily intake from fish consumption divided by a fish consumption rate of 0.033 kilograms per day and by a bioaccumulation factor.

(b) The acceptable daily intake, in micrograms per day, from fish consumption shall be the more stringent of:

(1) 20 percent of the ADI (for non-oncogenic effects) as determined from sections 702.5 or 702.7, or

(2) the human dose (for oncogenic effects) as determined from sections 702.4 or 702.7.

(c) The bioaccumulation factor is the ratio of the concentration of a substance in fish flesh, in micrograms per kilogram, to the concentration in water, in micrograms per liter. Bioaccumulation factors will generally be based on measured values which may be supported by bioaccumulation factors derived from octanol/water partition coefficients.

702.9 Standards and guidance values for protection of aquatic life. (a) Standards and guidance values for the protection of the best usage of fishing shall also prevent tainting of aquatic food and shall be protective of the health of wildlife consumers of aquatic life from substances that may bioaccumulate and are referred to as aquatic values.

(b) Where the waters are to be suitable for both fish propagation and survival, standards and guidance values shall be the most stringent of the values derived using the procedures found in sections 702.10 through 702.14 of this Part.

(c) Where the waters are to be suitable for only fish survival, the standards and guidance values shall be the most stringent of the values derived using the procedures found in sections 702.11 through 702.14 of this Part.

702.10 Procedures for deriving standards and guidance values for fish propagation and survival. (a) A standard or guidance value to allow fish propagation and survival shall be derived from a determination of the threshold for chronic toxic effects important to propagation of the test species, including but not limited to embryo-larval productivity, teratogenesis or other reproductive effects, growth, long-term mortality or oncogenesis.

(b) The threshold for chronic toxic effects shall be determined in accordance with either paragraphs (1) or (2) below.

(1) The procedures concerning chronic toxic effects, described in "Guidelines for Deriving Numerical Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses," as interpreted and applied by the department (see section 705.2 of this Title).

(2) The threshold from a toxicity test of a full or partial-life cycle or an early-life stage using available scientific data. Where multiple chronic test results are available from an important sensitive species, representative of New York State waters, a geometric mean of the chronic values shall be used to derive a standard or guidance value.

(c) Where chronic test data are not sufficient to establish a value by subdivision (b) of this section, a standard or guidance value may be derived from the results of an acute toxicity test on a sensitive species multiplied by a chronic to acute ratio, empirically developed from other species.

(d) Where test results are not sufficient to establish a standard or guidance value by subdivisions (b) or (c), a guidance value may be established by either of paragraphs (1) or (2) of this subdivision.

(1) Where a chronic test does not provide a determination of the threshold for toxic effects, a guidance value shall be established below the concentration associated with a valid lowest-observed-adverse-effect. The selection of the guidance value shall be based on, but not limited to, an evaluation of the test type and duration, species tested and the significance and severity of the observed effect.

(2) The guidance value shall be the concentration at which 50 percent of the specimens in an acute 48- or 96-hour toxicity test or similar short-term test survive (LC50) or maintain equilibrium and mobility (EC50), multiplied by an application factor. For metals or persistent chemicals, or for chemicals of unknown persistence with an EC50 or LC50 less than or equal to 1.0 milligram per liter (mg/L), an application factor of 0.01 shall be used. For all other chemicals, an application factor of 0.05 shall be used where the test results are for sensitive species, and an application factor of 0.03 shall be used where the test results are for a species that is generally of lower sensitivity.

702.11 Procedures for deriving standards and guidance values for fish survival. (a) A standard or guidance value for fish survival shall be based on one or more valid long-term survival tests for appropriate species.

(b) In the absence of valid long-term survival tests for appropriate species, a standard or guidance value shall be determined in accordance with the guidelines for the Criterion Maximum Concentration described in "Guidelines for Deriving Numerical Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses," as interpreted and applied by the department (see section 705.2 of this Title).

(c) Where a standard or guidance value cannot be developed using subdivisions (a)or (b), a guidance value may be developed from an EC50 or LC50 from a 48- or 96-hour toxicity test or similar short-term test, multiplied by an application factor of 0.1.

702.12 Procedures for deriving standards and guidance values based on tainting of aquatic food. Values based on aesthetic considerations, including but not limited to taste, odor and discoloration, shall be based on an evaluation of the reported levels of the substance that affect the aesthetic quality of the fish flesh, aquatic life, wildlife or livestock that are consumed by humans and that acquire such flavor, odor or color because of habitation in, passage through, or ingestion of waters.

702.13 Procedures for deriving standards and guidance values to protect wildlife consumers of fish. Standards and guidance values to protect wildlife shall be determined using levels of chemicals in aquatic organism flesh known to be toxic to wildlife consumers of fish, in conjunction with a bioaccumulation factor.

702.14 Procedure for deriving standards and guidance values based on chemical correlations. Where the available data are deemed insufficient for deriving a value on the basis of any of sections 702.10 through 702.13 of this Part, a value may be based on correlation to a chemical for which a standard or guidance value has been established pursuant to that section. Values based on chemical correlation may be established where similar toxic effects or aesthetic considerations are anticipated because of similarity of functional groups or metabolic or toxicologic pathways.

702.15 Derivation of guidance values. (a) For those substances that do not have an applicable health (water source) standard in section 703.5 of this Title and that the department determines may pose a threat to human health if discharged into the waters of the state:

(1) a guidance value may be derived and shall be the more stringent of the following:

(i) the values derived by applying the procedures from sections 702.3 through 702.7; or

(ii) a "general organic guidance value" of 50 ug/L for an individual organic substance. This subparagraph does not apply if adequate and sufficient data are available to justify values greater than 50 ug/L using procedures from both sections 702.4 and 702.5.

(2) a water quality-based effluent limitation or groundwater effluent limitation shall then be derived as described in section 702.16 of this Part. The department will initiate rule making to adopt a standard or effluent standard for any substance for which a guidance value or groundwater effluent limitation has been derived in this manner if based on sections 702.3 or 702.4, paragraphs 702.5(b)(1) or (2), or sections 702.6 or 702.7 of this Part.

(b) For those substances that do not have an applicable health (bioaccumulation) standard in section 703.5 of this Title and that the department determines may pose a threat to human health if discharged into waters of the state, a guidance value may be derived by applying the procedures from section 702.8 of this Part. A water quality-based effluent limitation shall then be derived as described in section 702.16 of this Part. The department will initiate rule making to adopt a standard for any substance for which a guidance value has been derived in this manner, unless the ADI has been derived by paragraph 702.5(b)(3) of this Part.

(c) For those substances that do not have an applicable aquatic standard in section 703.5 of this Title and that the department determines may pose a threat to aquatic life or the environment if discharged to the waters of the state, a guidance value may be derived by applying the appropriate procedure from sections 702.9 through 702.14 of this Part. A water quality-based effluent limitation shall then be derived as described in section 702.16 of this Part. The department will initiate rule making to adopt a standard for any substance for which a guidance value has been derived in this manner if based on subdivisions 702.10(b) or (c), 702.11(a) or (b), or sections 702.12 through 702.14 of this Part.

702.16 Derivation and implementation of effluent limitations. (a) Standards, guidance values and groundwater effluent standards shall be used to control taste-, color- and odor-producing, toxic and deleterious substances, as specified in the narrative standards for fresh and saline surface waters and groundwaters and shall be the basis of water quality-based effluent limitations and groundwater effluent limitations for use in SPDES permits issued pursuant to Parts 750-758 of this Title.

(b) Surface water effluent limitations.

(1) When deriving a water quality-based effluent limitation from a surface water standard or guidance value, the department may take into account factors, including but not limited to analytical detectability, treatability, natural background levels and the waste assimilative capacity of the receiving waters.

(2) Where these factors indicate that achieving a water quality-based effluent limitation would be clearly unreasonable, the department may substitute a modified effluent

limitation. Where the effluent limitation had been derived from an aquatic standard or guidance value, the department shall also require biological monitoring.

(3) A surface water effluent limitation for the total of organic substances that have a health (water source) standard for surface water in Table 1 of Part 703 or a guidance value for surface water derived pursuant to subdivision 702.15(a) of this Part shall be established based upon an ambient value of 100 ug/L. Where such standards or guidance values are 100 ug/L or greater, they shall not be included in the total.

(c) Groundwater effluent limitations.

(1) Groundwater effluent standards are provided in Table 3 of section 703.6 of this Title. For those substances not included in Table 3 of section 703.6 and for which a guidance value has been derived as provided in subdivision 702.15(a) of this Part, the groundwater effluent limitation shall be equal to the guidance value.

(2) When implementing a groundwater effluent standard or limitation, the department may take into account factors, including but not limited to analytical detectability and treatability.

(3) Where these factors indicate that achieving a groundwater effluent limitation would be clearly unreasonable, the department may substitute a modified effluent limitation.

(4) A groundwater effluent limitation for the total of organic substances that have a groundwater standard in Table 1 of Part 703 or a groundwater guidance value derived pursuant to subdivision 702.15(a) of this Part shall be established at 100 ug/L. However, substances that have a groundwater standard or guidance value or effluent standard of 100 ug/L or greater shall not be included in this total.

702.17 Variances for effluent limitations based on aquatic standards or guidance values. (a) The department may, upon written application from the applicant for a SPDES permit or from a SPDES permittee, grant a variance from one or more effluent limitations based on standards or guidance values for the protection of aquatic life. No variance may be granted that would result in an effluent limitation that would be less stringent than:

(1) an effluent limitation derived from a standard or guidance value for the protection of human health; or

(2) the applicable technology-based effluent limitation or other applicable effluent limitation required pursuant to section 754.1 of this Title.

(b) An application for a variance must:

(1) identify the specific effluent limitation or limitations in the SPDES permit for which a variance is sought; and

(2) demonstrate that due to conditions unique and peculiar to the applicant's situation, compliance with the proposed effluent limitation would result in substantial and widespread economic and social impacts.

(c) In granting such variances, the department may impose specific conditions, including but not limited to additional monitoring and biological studies, extending through the life of the permit, as necessary.

(d) Article 70 of the Environmental Conservation Law and the rules and regulations promulgated thereunder shall govern applications for variances.

702.18 More stringent groundwater effluent standards or limitations. (a) The department, after consultation with the New York State Department of Health, may establish, on a case-by-case basis, more stringent effluent standards or limitations than those set forth in section 703.6 of this Title or established by paragraph 702.16(c)(1) of this Part, where necessary, to prevent pollution and protect the groundwaters for their best usages. The department shall consider rules and regulations promulgated by the administrator or the New York State Department of Health in establishing such standards or limitations. Additionally, the department shall consider action levels for compounds determined to exhibit toxic effects which are established by the Commissioner of the New York State Department of Health.

(b) Circumstances under which the department may consider more stringent effluent standards and limitations include but are not limited to the following:

(1) a discharge to an aquifer that is the sole or principal source of potable water supply;

(2) an existing or proposed discharge that is directly on or into consolidated rock or bedrock;

(3) a discharge containing one or more substances that in combination with precipitation and/or natural soil constituents is likely to produce a toxic pollutant; or

(4) where adverse cumulative or synergistic effects can be established for constituents in a discharge.

702.19 Modifications of groundwater effluent standards or limitations. (a) (1) An applicant for a SPDES permit or a SPDES permittee may make written application for a modification of an effluent standard or groundwater effluent limitation established pursuant to paragraph 702.16(c)(1) of this Part.

(2) Such applicant shall have the burden of establishing to the satisfaction of the commissioner, that one or more of the effluent standards or limitations are unnecessarily restrictive as to a particular discharge in that such modification would, notwithstanding noncompliance with such standards or limitations, prevent pollution and protect the groundwaters for their best usages.

(b) Article 70 of the Environmental Conservation Law and the rules and regulations promulgated thereunder shall govern applications for modifications.

702.20 Studies and monitoring for discharges to groundwater. (a) The department may require the submission of information by any person responsible for a discharge in order that the department may evaluate the short- and long-term effect the discharge may have on groundwaters of the state or for the purpose of determining additional (subdivision 702.15(a)) or more stringent (section 702.18) effluent standards or limitations or modifications (section 702.19) thereto. Such information may include but is not limited to the following:

(1) a statement of the property to be affected by a discharge and the extent to which such property is under the control of the person responsible for such discharge;

(2) a geohydrologic analysis of the aquifers that may be affected;

(3) a determination of the direction and rate of movement of the discharge and the natural groundwater;

(4) an evaluation of adverse effects a discharge may have on any aquifer, source of potable water supply, or other surface waters or groundwaters of the state; and

(5) an evaluation of the ability of unconsolidated deposits, consolidated rock or bedrock and the groundwaters to attenuate potential pollutants such that the best usage of the groundwaters is maintained.

(b) The department may require the installation and operation of monitoring facilities in order to assure compliance with effluent standards or limitations or to evaluate the effect of the discharge on the quality of the groundwater. Specific monitoring requirements shall be established by the department on a case-by-case basis and as may be required by Part 756 of this Title.

702.21 Exceptions to groundwater effluent limitations. (a) Activities and conditions. The effluent standards set forth in section 703.6 of this Title or effluent limitations established pursuant to paragraph 702.16(c)(1) of this Part for discharges to class GA waters are not applicable to the following activities:

(1) the discharge of sewage without the admixture of industrial waste or other wastes where:

(i) a disposal system, point source or outlet consists of a subsurface sewage disposal system designed, constructed and maintained in accordance with guidelines and standards satisfactory to the department;

(ii) monitoring facilities are utilized in accordance with requirements as may be specified by the department; and

(iii) the disposal system is designed to discharge, and discharges, less than 30,000 gallons per day;

(2) normally accepted agricultural practice of utilizing chemicals and fertilizers for growing of crops for human and animal consumption; and

(3) waste management systems that employ land application techniques and have renovative capabilities provided it has been demonstrated to the satisfaction of the commissioner that:

(i) there will be no actual or potential public health hazard;

(ii) applicable water quality standards will be met in saturated zones; and

(iii) applicable water quality standards will not be contravened in any adjacent waters of the state.

(b) Nothing contained in this section shall be construed to allow any discharge that would preclude the best usage of class GA waters specified in section 701.15 of this Title.

702.22 Severability. If any provision of this Part or its application to any person or circumstance is held to be invalid, the remainder of this Part and the application of that provision to other persons or circumstances will not be affected.

Existing Part 703 is REPEALED and a new Part 703 is ADOPTED as follows:

PART 703

SURFACE WATER AND GROUNDWATER QUALITY STANDARDS AND GROUNDWATER EFFLUENT STANDARDS

(Statutory authority: Environmental Conservation Law, §§ 3-0301 [2][m], 15-0313, 17-0301, 17-0303, 17-0809)

Section 703.1 Substance form. A water quality standard, guidance value or groundwater effluent standard includes all (total) forms of the substance, unless indicated otherwise. Where a standard or guidance value is for a specific form of the substance, water quality-based effluent limitations for SPDES permits may include other forms of the substance to account for changes in the substance that occur in the receiving water.

Section 703.2 Narrative water quality standards. Narrative standards for specific water classes are provided in this section. Narrative standards for Classes N and AA-Special are provided in Part 701 of this Title.

PARAMETER	CLASSES	STANDARD
Taste-, color-, and odor-producing, toxic and other deleterious substances	AA, A, B, C, D, SA, SB, SC, I, SD, A-Special, GA, GSA, GSB	None in amounts that will adversely affect the taste, color or odor thereof, or impair the waters for their best usages.
Turbidity	AA, A, B, C, D, SA, SB, SC, I, SD	No increase that will cause a substantial visible contrast to natural conditions.
Suspended, colloidal and settleable solids	AA, A, B, C, D, SA, SB, SC, I, SD, A-Special	None from sewage, industrial wastes or other wastes that will cause deposition or impair the waters for their best usages.

PARAMETER	CLASSES	STANDARD
Oil and floating substances	AA, A, B, C, D, SA, SB, SC, I, SD, A-Special	No residue attributable to sewage, industrial wastes or other wastes, nor visible oil film nor globules of grease.
Garbage, cinders, ashes, oils, sludge and other refuse	SA, SB, SC, I, SD	None in any amounts.
Phosphorus and nitrogen	AA, A, B, C, D, SA, SB, SC, I, SD, A-Special	None in amounts that will result in growths of algae, weeds and slimes that will impair the waters for their best usages.
Radioactivity	A-Special	Should be kept at the lowest practicable levels, and in any event should be controlled to the extent necessary to prevent harmful effects on health.
Thermal discharges	GA, GSA, GSB	None in amounts that will impair the waters for their best usages.
Thermal discharges	AA, A, B, C, D, SA, SB, SC, I, SD, A-Special	See Part 704 of this Title.

703.3 Water quality standards for pH, dissolved oxygen, dissolved solids, odor, color and turbidity. Standards for specific classes are provided below.

PARAMETER	CLASSES	STANDARD
pH	AA, A, B, C, AA-Special, A-Special, GA	Shall not be less than 6.5 nor more than 8.5.
	D	Shall not be less than 6.0 nor more than 9.5.
	SA, SB, SC, I, SD	The normal range shall not be extended by more than one-tenth (0.1) of a pH unit.
Dissolved oxygen (DO)	A-Special	In rivers and upper waters of lakes, not less than 6.0 mg/L at any time. In hypolimnetic waters, it should not be less than necessary for the support of fishlife, particularly cold water species.
	AA, A, B, C, AA-Special	For cold waters suitable for trout spawning, the DO concentration shall not be less than 7.0 mg/L from other than natural conditions. For trout waters, the minimum daily average shall not be less than 6.0 mg/L, and at no time shall the concentration be less than 5.0 mg/L. For non-trout waters, the minimum daily average shall not be less than 5.0 mg/L, and at no time shall the DO concentration be less than 4.0 mg/L.
	D, SD	Shall not be less than 3.0 mg/L at any time.
	SA, SB, SC	Shall not be less than 5.0 mg/L at any time.
	I	Shall not be less than 4.0 mg/L at any time.

PARAMETER	CLASSES	STANDARD
Dissolved solids	A-Special	Shall not exceed 200 mg/L.
	AA, A, B, C, AA-Special, GA	Shall be kept as low as practicable to maintain the best usage of waters but in no case shall it exceed 500 mg/L.
Odor	GA	Shall not exceed a threshold odor number of 3.
Color	GA	Shall not exceed 15 color units (platinum-cobalt method).
Turbidity	GA	Shall not exceed 5 nephelometric units.

703.4 Water quality standards for coliforms. Total and fecal coliform standards for specific classes are provided below.

(a) Total coliforms (number per 100 ml).

CLASSES	STANDARD
AA	The monthly median value and more than 20 percent of the samples, from a minimum of five examinations, shall not exceed 50 and 240, respectively.
A	The monthly median value and more than 20 percent of the samples, from a minimum of five examinations, shall not exceed 5,000 and 20,000, respectively.

CLASSES	STANDARD
B, C, D, SB, SC	The monthly median value and more than 20 percent of the samples, from a minimum of five examinations, shall not exceed 2,400 and 5,000, respectively.
SA	The median most probable number (MPN) value in any series of representative samples shall not be in excess of 70.
I	The monthly geometric mean, from a minimum of five examinations, shall not exceed 10,000.
A-Special	The geometric mean, of not less than five samples, taken over not more than a 30-day period shall not exceed 1,000.
GA	The maximum allowable limit is 50.

(b) Fecal coliforms (number per 100 ml).

CLASSES	STANDARD
A, B, C, D, SB, SC	The monthly geometric mean, from a minimum of five examinations, shall not exceed 200.
I	The monthly geometric mean, from a minimum of five examinations, shall not exceed 2,000.
A-Special	The geometric mean, of not less than five samples, taken over not more than a 30-day period shall not exceed 200.

(c) The total and fecal coliform standards for classes B, C, D, SB, SC and I shall be met during all periods when disinfection is practiced.

703.5 Water quality standards for taste-, color- and odor-producing, toxic and other deleterious substances. (a) Water quality standards for specific substances or groups of substances are listed in Table 1 of this section for the applicable water classes. The substance name is listed with the associated Chemical Abstract Service Registry Number (CAS No.) where applicable. For entries in Table 1 that refer to chemical groups, congeners or other expressions of multiple substances, the standard applies to the sum of the substances, unless otherwise indicated.

(b) Standards are health (water source), health (bioaccumulation) or aquatic based and are respectively designated as H(WS), H(B), or A in the column headed "Type." Where more than one type of standard is listed for a water class, the most stringent applies.

(c) The "Basis Code" in Table 1 refers to the procedure that was the most stringent basis for establishment of the standard. The explanation of the basis code is found in Table 2.

(d) The standard is the maximum allowable concentration in micrograms per liter (ug/L), unless otherwise noted. A standard defined by the symbol "ND" means not detectable by the analytical tests specified or approved pursuant to Part 700 of this Title.

(e) Special interpretive remarks are provided as necessary.

703.6 Groundwater effluent standards and limitations for discharges to class GA waters. (a) The groundwater effluent standards in Table 3 of this section and effluent limitations as established by paragraph 702.16(c)(1) of this Title apply to a discharge from a point source or outlet or any other discharge within the meaning of the Environmental Conservation Law, section 17-0501 that will or may enter unsaturated or saturated zones. The groundwater effluent standard is the maximum allowable concentration in micrograms per liter (ug/L), unless otherwise noted.

(b) In addition to the chemical characteristics provided in subdivision (a) above, coliform or pathogenic organisms shall not be discharged in amounts sufficient to render fresh groundwaters detrimental to public health, safety or welfare.

(c) The department may establish additional groundwater effluent standards and limitations as set forth in Part 702 of this Title.

(d) The groundwater effluent standards or limitations shall be incorporated in SPDES permits (under Part 750 et seq. of this Title) for discharges to groundwaters, where applicable.

703.7 Severability. If any provision of this Part or its application to any person or circumstance is held to be invalid, the remainder of this Part and the application of that provision to other persons or circumstances will not be affected.

Table 1
(cf. section 703.5)

WATER QUALITY STANDARDS
SURFACE WATERS AND GROUNDWATER

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD (ug/L)	TYPE	BASIS CODE
Acenaphthene (83-32-9)	A, A-S, AA, AA-S	20	H(WS)	D
Alachlor (15972-60-8)	GA	35	H(WS)	F
Aldicarb (116-06-3)	A, A-S, AA, AA-S	7	H(WS)	B
Aldicarb and Methomyl (116-06-3; 16752-77-5)	GA	0.35	H(WS)	F
Aldrin (309-00-2)	GA	ND	H(WS)	F
	A, A-S, AA, AA-S, B, C	*	H(B)	
	D	*	H(B)	
	SA, SB, SC	*	H(B)	
	SD	*	H(B)	
Remarks:	* Refer to standards for "Aldrin and Dieldrin."			
Aldrin and Dieldrin (309-00-2; 60-57-11)	A, A-S, AA, AA-S, B, C	0.001	H(B)	K
	D	0.001	H(B)	K
	SA, SB, SC	0.001	H(B)	K
	SD	0.001	H(B)	K
Alkyl dimethyl benzyl ammonium chloride (68391-01-5)	A, A-S, AA, AA-S, B, C	*	A	
Remarks:	* Refer to standards for "Quaternary ammonium compounds."			

Table 1
(cf. section 703.5)
(Continued)

WATER QUALITY STANDARDS
SURFACE WATERS AND GROUNDWATER

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD (ug/L)	TYPE	BASIS CODE
Aluminum, ionic (Not Applicable)	A, A-S, AA, AA-S, B, C	100	A	N
Ametryn (834-12-8)	GA	50	H(WS)	J
Aminocresols (95-84-1;	A, A-S, AA, AA-S	*	H(WS)	
2835-95-2;	GA	*	H(WS)	
2835-99-6)	A, A-S, AA, AA-S, B, C	**	A	
	D	**	A	

Remarks: * Refer to standards for "Phenolic compounds."
** Refer to standards for "Phenols, total unchlorinated."

Table 1
(cf. section 703.5)
(Continued)

WATER QUALITY STANDARDS
SURFACE WATERS AND GROUNDWATER

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD (ug/L)	TYPE	BASIS CODE
Ammonia and Ammonium	A, A-S, AA, AA-S	2,000*	H(WS)	H
(7664-41-7;	GA	2,000*	H(WS)	H
Not Applicable)	A, A-S, AA, AA-S, B, C	**	A	N
	D	**	A	Q

Remarks: * $NH_3 + NH_4^+$ as N.

** Un-ionized ammonia as NH_3; tables below provide the standard in ug/L at varying pH and temperature for different classes and specifications. Linear interpolation between the listed pH values and temperatures is applicable.

Classes A,A-S, AA, AA-S, B, C with the (T) or (TS) Specification

pH	0°C	5°C	10°C	15°-30°C
6.50	0.7	0.9	1.3	1.9
6.75	1.2	1.7	2.3	3.3
7.00	2.1	2.9	4.2	5.9
7.25	3.7	5.2	7.4	11
7.50	6.6	9.3	13	19
7.75	11	15	22	31
8.0-9.0	13	18	25	35

Classes A, A-S, AA, AA-S, B, C without the (T) or (TS) Specification

pH	0°C	5°C	10°C	15°C	20°-30°C
6.50	0.7	0.9	1.3	1.9	2.6
6.75	1.2	1.7	2.3	3.3	4.7
7.00	2.1	2.9	4.2	5.9	8.3
7.25	3.7	5.2	7.4	11	15
7.50	6.6	9.3	13	19	26
7.75	11	15	22	31	43
8.0-9.0	13	18	25	35	50

Class D

pH	0°C	5°C	10°C	15°C	20°C	25°-30°C
6.50	9.1	13	18	26	36	51
6.75	15	21	30	42	59	84
7.00	23	33	46	66	93	131
7.25	34	48	68	95	140	190
7.50	45	64	91	130	180	260
7.75	56	80	110	160	220	320
8.0-9.0	65	92	130	180	260	370

Table 1
(cf. section 703.5)
(Continued)

WATER QUALITY STANDARDS
SURFACE WATERS AND GROUNDWATER

SUBSTANCE (CAS NO.)	**WATER CLASSES**	**STANDARD (ug/L)**	**TYPE**	**BASIS CODE**
Arsenic (Not Applicable)	A, A-S, AA, AA-S	50	H(WS)	G
	GA	25	H(WS)	F
	A, A-S, AA, AA-S, B, C	190	A	N
	D	360	A	Q
	SA, SB, SC	63	A	N
	SD	120	A	Q
Remarks:	Aquatic standards apply to dissolved form.			
Atrazine (1912-24-9)	GA	7.5	H(WS)	F
Azinphosmethyl (86-50-0)	GA	4.4	H(WS)	F
	A, A-S, AA, AA-S, B, C	0.005	A	N
	SA, SB, SC	0.01	A	N
Barium (Not Applicable)	A, A-S, AA, AA-S	1,000	H(WS)	G
	GA	1,000	H(WS)	F
Benefin (1861-40-1)	GA	35	H(WS)	F
Benzene (71-43-2)	A, A-S, AA, AA-S	0.7	H(WS)	A
	GA	0.7	H(WS)	A
Benzidine (92-87-5)	A, A-S, AA, AA-S, B, C	0.1	A	N
	D	0.1	A	Q
Benzo(a)pyrene (50-32-8)	GA	ND	H(WS)	F
Beryllium (Not Applicable)	A, A-S, AA, AA-S, B, C	*	A	N
Remarks:	* 11 ug/L when hardness is less than or equal to 75 ppm. 1100 ug/L when hardness is greater than 75 ppm. Standards apply to acid-soluble form.			
Bis (2-chloro-ethyl) ether (111-44-4)	GA	1.0	H(WS)	F

Table 1
(cf. section 703.5)
(Continued)

WATER QUALITY STANDARDS
SURFACE WATERS AND GROUNDWATER

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD (ug/L)	TYPE	BASIS CODE
Bis (2-ethylhexyl) phthalate (117-81-7)	GA	50	H(WS)	J
	A, A-S, AA, AA-S, B, C	0.6	A	N
Boron (Not Applicable)	GA	1,000	H(WS)	H
	A, A-S, AA, AA-S, B, C	10,000	A	N
	SA, SB, SC	1,000	A	N
Remarks:	Aquatic standards apply to acid-soluble form.			
Bromacil (314-40-9)	GA	4.4	H(WS)	F
Butachlor (23184-66-9)	GA	3.5	H(WS)	F
Butylate (2008-41-5)	GA	50	H(WS)	J
Cadmium (Not Applicable)	A, A-S, AA, AA-S	10	H(WS)	G
	GA	10	H(WS)	F
	A, A-S, AA, AA-S, B, C	*	A	N
	D	**	A	Q
	SA, SB, SC, I	7.7	A	N
	SD	21	A	Q
Remarks:	* exp (0.7852 [ln (ppm hardness)] - 3.490) ** exp (1.128 [ln (ppm hardness)] - 3.828) Aquatic standards apply to acid-soluble form.			
Captan (133-06-2)	GA	18	H(WS)	F
Carbaryl (63-25-2)	GA	29	H(WS)	F
Carbofuran (1563-66-2)	A, A-S, AA, AA-S	15	H(WS)	B
	A, A-S, AA, AA-S, B, C	1.0	A	N
	D	10	A	Q
Carbon tetrachloride (56-23-5)	GA	5	H(WS)	F
Carboxin (5234-68-4)	GA	50	H(WS)	J

Table 1
(cf. section 703.5)
(Continued)

WATER QUALITY STANDARDS
SURFACE WATERS AND GROUNDWATER

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD (ug/L)	TYPE	BASIS CODE
Chloramben (Not Applicable)	GA	50*	H(WS)	J

Remarks: * Includes: related forms that convert to the organic acid upon acidification to a pH of 2 or less; and esters of the organic acid.

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD (ug/L)	TYPE	BASIS CODE
Chlordane (57-74-9)	GA	0.1	H(WS)	F
Chloride (Not Applicable)	A, A-S, AA, AA-S	250,000	H(WS)	H
	GA	250,000	H(WS)	H
Chlorine, Total Residual (7782-50-5)	A, A-S, AA, AA-S, B, C	5	A	N
	D	19	A	Q
	SA, SB, SC, I	7.5	A	N
	SD	13	A	Q
Chlorobenzene (108-90-7)	A, A-S, AA, AA-S	20	H(WS)	D
	A, A-S, AA, AA-S, B, C	5	A	N
	D	50	A	R
Chloroform (67-66-3)	A, A-S, AA, AA-S	7	H(WS)	A
	GA	7	H(WS)	A
2-Chloronaphthalene (91-58-7)	A, A-S, AA, AA-S	10	H(WS)	E
Chromium (Not Applicable)	A, A-S, AA, AA-S	50	H(WS)	G
	GA	50	H(WS)	G
	A, A-S, AA, AA-S, B, C	*	A	N
	D	**	A	Q

Remarks: * exp (0.819 [ln (ppm hardness)] + 1.561)
** exp (0.819 [ln (ppm hardness)] + 3.688)
Aquatic standards apply to acid-soluble form.

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD (ug/L)	TYPE	BASIS CODE
Chromium (hexavalent) (Not Applicable)	GA	50	H(WS)	F
	A, A-S, AA, AA-S, B, C	11	A	N
	D	16	A	Q
	SA, SB, SC	54	A	N
	SD	1,200	A	Q

Remarks: Aquatic standards apply to acid-soluble form.

Table 1
(cf. section 703.5)
(Continued)

WATER QUALITY STANDARDS
SURFACE WATERS AND GROUNDWATER

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD (ug/L)	TYPE	BASIS CODE
Cobalt (Not Applicable)	A, A-S, AA, AA-S, B, C	5	A	N
Remarks:	Standards apply to acid-soluble form.			
Copper (Not Applicable)	A, A-S, AA, AA-S	200	H(WS)	H
	GA	200	H(WS)	H
	A, A-S, AA, AA-S, B, C	*	A	N
	D	**	A	Q
	SA, SB, SC, I	2.9	A	N
	SD	2.9	A	Q
Remarks:	* exp (0.8545 [ln (ppm hardness)] - 1.465) ** exp (0.9422 [ln (ppm hardness)] - 1.464) Aquatic standards apply to dissolved form.			
Cyanide (Not Applicable)	A, A-S, AA, AA-S	100	H(WS)	H
	GA	100	H(WS)	H
	A, A-S, AA, AA-S, B, C	5.2	A	N
	D	22	A	Q
	SA, SB, SC	1.0	A	N
	SD	1.0	A	Q
Remarks:	Aquatic standards are as free cyanide (HCN + CN^-) expressed as CN.			
Dalapon (Not Applicable)	GA	50*	H(WS)	J
Remarks:	* Includes: related forms that convert to the organic acid upon acidification to a pH of 2 or less; and esters of the organic acid.			
DDT, DDD and DDE (50-29-3; 72-54-8; 72-55-9)	A, A-S, AA, AA-S	0.01	H(WS)	A
	GA	ND	H(WS)	F
	A, A-S, AA, AA-S, B, C	0.001	A	S
	D	0.001	A	S
	SA, SB, SC	0.001	A	S
	SD	0.001	A	S
Demeton (8065-48-3; 298-03-3; 126-75-0)	A, A-S, AA, AA-S, B, C	0.1	A	N
	SA, SB, SC	0.1	A	N

Table 1
(cf. section 703.5)
(Continued)

WATER QUALITY STANDARDS
SURFACE WATERS AND GROUNDWATER

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD (ug/L)	TYPE	BASIS CODE
Diazinon (333-41-5)	GA	0.7	H(WS)	F
	A, A-S, AA, AA-S, B, C	0.08	A	N
Di-n-butyl-phthalate (84-74-2)	GA	50	H(WS)	J
Dicamba (1918-00-9)	GA	0.44	H(WS)	F
Dichlorobenzenes (95-50-1; 106-46-7; 541-73-1)	A, A-S, AA, AA-S	20*/30**	H(WS)	D
	GA	4.7***	H(WS)	F
	A, A-S, AA, AA-S, B, C	5	A	N,T
	D	50	A	R
Remarks: *	Applies to meta (1,3-) isomer only.			
**	Applies to para (1,4-) isomer only.			
***	Applies to sum of para (1,4-) and ortho (1,2-) isomers only.			
1,2-Dichloroethane (107-06-2)	A, A-S, AA, AA-S	0.8	H(WS)	A
2,4-Dichlorophenol (120-83-2)	A, A-S, AA, AA-S	0.3	H(WS)	D
	A, A-S, AA, AA-S, B, C	*	A	
	D	*	A	
Remarks: *	Refer to standards for "Phenols, total chlorinated."			
2,4-Dichloro-phenoxyacetic acid (94-75-7)	A, A-S, AA, AA-S	100	H(WS)	G
	GA	4.4	H(WS)	F
Dieldrin (60-57-1)	GA	ND	H(WS)	F
	A, A-S, AA, AA-S, B, C	*	H(B)	
	D	*	H(B)	
	SA, SB, SC	*	H(B)	
	SD	*	H(B)	
Remarks: *	Refer to standards for "Aldrin and Dieldrin."			

Table 1
(cf. section 703.5)
(Continued)

WATER QUALITY STANDARDS
SURFACE WATERS AND GROUNDWATER

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD (ug/L)	TYPE	BASIS CODE
Dimethyl tetrachloro-terephthalate (1861-32-1)	GA	50	H(WS)	J
Diphenamid (957-51-7)	GA	50	H(WS)	J
Diphenyl-hydrazines (122-66-7; 530-50-7)	GA	ND	H(WS)	F
Dyphylline (479-18-5)	A, A-S, AA, AA-S	50	H(WS)	E
Endosulfan (115-29-7)	A, A-S, AA, AA-S, B, C	0.009	A	N
	D	0.22	A	Q
	SA, SB, SC	0.001	A	N
	SD	0.034	A	Q
Endrin (72-20-8)	A, A-S, AA, AA-S	0.2	H(WS)	G
	GA	ND	H(WS)	F
	A, A-S, AA, AA-S, B, C	0.002	H(B)	K
	D	0.002	H(B)	K
	SA, SB, SC	0.002	H(B)	K
	SD	0.002	H(B)	K
Ethylenethiourea (96-45-7)	GA	ND	H(WS)	F
Ferbam (14484-64-1)	GA	4.2	H(WS)	F
Fluometuron (2164-17-2)	GA	50	H(WS)	J
Fluoride (Not Applicable)	A, A-S, AA, AA-S	1,500	H(WS)	H
	GA	1,500	H(WS)	F
	A, A-S, AA, AA-S, B, C	*	A	N
	D	**	A	N

Remarks: * (0.02) exp(0.907 [ln (ppm hardness)] + 7.394)
** (0.1) exp(0.907 [ln (ppm hardness)] + 7.394)

Table 1
(cf. section 703.5)
(Continued)

WATER QUALITY STANDARDS
SURFACE WATERS AND GROUNDWATER

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD (ug/L)	TYPE	BASIS CODE
Foaming Agents (Not Applicable)	GA	500	H(WS)	F
Remarks:	Determined as methylene blue active substances (MBAS) or by other tests as specified by the commissioner.			
Folpet (133-07-3)	GA	50	H(WS)	J
Gross Alpha Radiation (Not Applicable)	A, A-S, AA, AA-S	*	H(WS)	G
	GA	*	H(WS)	G
Remarks: *	15 picocuries per liter, excluding radon and uranium.			
Gross Beta Radiation (Not Applicable)	A, AA	*	H(WS)	H
	GA	*	H(WS)	H
Remarks: *	1,000 picocuries per liter, excluding strontium-90 and alpha emitters.			
Heptachlor and Heptachlor epoxide (76-44-8; 1024-57-3)	A, A-S, AA, AA-S	0.009	H(WS)	A
	GA	ND	H(WS)	F
	A, A-S, AA, AA-S, B, C	0.001	A	S
	D	0.001	A	S
	SA, SB, SC	0.001	A	S
	SD	0.001	A	S
Hexachlorobenzene (118-74-1)	GA	0.35	H(WS)	F
Hexachlorobutadiene (87-68-3)	A, A-S, AA, AA-S	0.5	H(WS)	A
	A, A-S, AA, AA-S, B, C	1.0	A	N
	D	10	A	Q
	SA, SB, SC	0.3	A	N
	SD	3.0	A	Q
Hexachlorocyclohexanes (58-89-9; 319-84-6; 319-85-7; 319-86-8; 6108-10-7; 608-73-1)	GA	ND	H(WS)	F
	A, A-S, AA, AA-S, B, C	0.01	A	N
	D	2	A	Q
	SA, SB, SC	0.004	A	N
	SD	0.16	A	Q

Table 1
(cf. section 703.5)
(Continued)

WATER QUALITY STANDARDS
SURFACE WATERS AND GROUNDWATER

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD (ug/L)	TYPE	BASIS CODE
Hexachlorocyclopentadiene (77-47-4)	A, A-S, AA, AA-S	1.0	H(WS)	D
	A, A-S, AA, AA-S, B, C	0.45	A	N
	D	4.5	A	Q
	SA, SB, SC	0.07	A	N
	SD	0.7	A	Q
Hexazinone (51235-04-2)	GA	50	H(WS)	J
Hydrazine (302-01-2)	A, A-S, AA, AA-S, B, C	*	A	N
	D	**	A	Q
Remarks: *	5 ug/L at less than 50 ppm hardness and 10 ug/L at greater than or equal to 50 ppm hardness.			
**	50 ug/L at less than 50 ppm hardness and 100 ug/L at greater than or equal to 50 ppm hardness.			
Hydrogen sulfide (7783-06-4)	A, A-S, AA, AA-S, B, C	2.0*	A	N
	SA, SB, SC	2.0*	A	N
Remarks: *	Undissociated form.			
Hydroquinone (123-31-9)	A, A-S, AA, AA-S, B, C	2.2	A	N
	D	4.4	A	Q
Iron (Not Applicable)	A, A-S, AA, AA-S	300	H(WS)	G
	GA	300*	H(WS)	F
	A, A-S, AA, AA-S, B, C	300	A	N
	D	300	A	Q
Remarks: *	Also see standard for "Iron and Manganese."			
Iron and Manganese (Not Applicable)	GA	500	H(WS)	F
Isodecyl diphenyl phosphate (29761-21-5)	A, A-S, AA, AA-S, B, C	1.7	A	N
	D	22	A	Q

Table 1
(cf. section 703.5)
(Continued)

WATER QUALITY STANDARDS
SURFACE WATERS AND GROUNDWATER

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD (ug/L)	TYPE	BASIS CODE
Isothiazolones, total (isothiazolinones) (includes 5-chloro-2- methyl-4 isothiazolin-3-one and 2-methyl-4 isothiazolin-3-one) (Not Applicable)	A, A-S, AA, AA-S, B, C	1	A	N
	D	10	A	Q
Kepone (143-50-0)	GA	ND	H(WS)	F
Lead (Not Applicable)	A, A-S, AA, AA-S	50	H(WS)	G
	GA	25	H(WS)	F
	A, A-S, AA, AA-S, B, C	*	A	N
	D	**	A	Q
	SA, SB, SC	8.6	A	N
	SD	220	A	Q
Remarks: *	exp (1.266 [ln (ppm hardness)] - 4.661)			
**	exp (1.266 [ln (ppm hardness)] - 1.416)			
	Aquatic standards apply to acid-soluble form.			
Linear alkyl benzene sulfonates (LAS) (Not Applicable)	A, A-S, AA, AA-S, B, C	40*	A	N
Remarks: *	LAS with side chains greater than 13 carbons only.			
Magnesium (Not Applicable)	A, A-S, AA, AA-S	35,000	H(WS)	B
Malathion (121-75-5)	GA	7.0	H(WS)	F
	A, A-S, AA, AA-S, B, C	0.1	A	N
	SA, SB, SC	0.1	A	N
Mancozeb (8018-01-7)	GA	1.8	H(WS)	F
Maneb (12427-38-2)	GA	1.8	H(WS)	F

Table 1
(cf. section 703.5)
(Continued)

WATER QUALITY STANDARDS
SURFACE WATERS AND GROUNDWATER

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD (ug/L)	TYPE	BASIS CODE
Manganese (Not Applicable)	A, A-S, AA, AA-S	300	H(WS)	G
	GA	300*	H(WS)	F

Remarks: * Also see standard for "Iron and Manganese."

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD (ug/L)	TYPE	BASIS CODE
Mercury (Not Applicable)	A, A-S, AA, AA-S	2	H(WS)	G
	GA	2	H(WS)	F
Methoxychlor (72-43-5)	A, A-S, AA, AA-S	35	H(WS)	H
	GA	35	H(WS)	F
	A, A-S, AA, AA-S, B, C	0.03	A	N
	SA, SB, SC	0.03	A	N
2-Methyl-4-chloro-phenoxyacetic acid (94-74-6)	GA	0.44	H(WS)	F
Methylene bisthiocyanate (6317-18-6)	A, A-S, AA, AA-S, B, C	1.0	A	N
Methyl methacrylate (80-62-6)	GA	50	H(WS)	J
Metribuzin (21087-64-9)	GA	50	H(WS)	J
Mirex (2385-85-5)	A, A-S, AA, AA-S, B, C	0.001	A	N
	D	0.001	A	Q
	SA, SB, SC	0.001	A	N
Nabam (142-59-6)	GA	1.8	H(WS)	F
Naphthalene (91-20-3)	A, A-S, AA, AA-S	10	H(WS)	D
Niacinamide (98-92-0)	A, A-S, AA, AA-S	500	H(WS)	B
Nickel (Not Applicable)	A, A-S, AA, AA-S, B, C	*	A	N
	D	**	A	Q
	SA, SB, SC	7.1	A	N
	SD	140	A	Q

Remarks: * exp (0.76 [ln (ppm hardness)] + 1.06)
** exp (0.76 [ln (ppm hardness)] + 4.02)
Standards apply to acid-soluble form.

WATER QUALITY STANDARDS
SURFACE WATERS AND GROUNDWATER

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD (ug/L)	TYPE	BASIS CODE
Nitralin (4726-14-1)	GA	35	H(WS)	F
Nitrate and Nitrite (expressed as N) (Not Applicable)	A, A-S, AA, AA-S	10,000*	H(WS)	G
	GA	10,000	H(WS)	H
Remarks: *	Applies only to nitrate.			
Nitrilotri-acetic acid (Not Applicable)	A, A-S, AA, AA-S	3**	H(WS)	A
	GA	3**	H(WS)	A
	A, A-S, AA, AA-S, B, C	5,000*	A	N
Remarks: *	Applies to Nitrilotriacetate.			
**	Includes related forms that convert to nitrilotriacetic acid upon acidification to a pH of 2.3 or less.			
Nitrite (Not Applicable)	GA	***	H(WS)	
	A, A-S, AA, AA-S, B, C	100*/20**	A	N
Remarks: *	Warm water fishery waters.			
**	Cold water fishery waters.			
***	Refer to standard for "Nitrate and Nitrite."			
Nitrobenzene (98-95-3)	A, A-S, AA, AA-S	30	H(WS)	D
Oxamyl (23135-22-0)	GA	50	H(WS)	J
Paraquat (4685-14-7)	GA	3.0	H(WS)	F
Parathion and Methyl parathion (56-38-2; 298-00-0)	GA	1.5	H(WS)	F
	A, A-S, AA, AA-S, B, C	0.008	A	N,T
Pentachloro-nitrobenzene (82-68-8)	GA	ND	H(WS)	F

Table 1
(cf. section 703.5)
(Continued)

WATER QUALITY STANDARDS
SURFACE WATERS AND GROUNDWATER

SUBSTANCE (CAS NO.)		WATER CLASSES	STANDARD (ug/L)	TYPE	BASIS CODE
Pentachloro-phenol (87-86-5)		A, A-S, AA, AA-S	*	H(WS)	
		GA	*	H(WS)	
		A, A-S, AA, AA-S, B, C	0.4	A	N
		D	**	A	
Remarks:	*	Refer to standards for "Phenolic compounds (total phenols)."			
	**	Refer to standards for "Phenols, total chlorinated."			
Phenol (108-95-2)		A, A-S, AA, AA-S	*	H(WS)	
		GA	*	H(WS)	
		A, A-S, AA, AA-S, B, C	**	A	
		D	**	A	
Remarks:	*	Refer to standards for "Phenolic compounds (total phenols)."			
	**	Refer to standards for "Phenols, total unchlorinated."			
Phenolic compounds (total phenols) (Not Applicable)		A, A-S, AA, AA-S	1	H(WS)	H
		GA	1	H(WS)	F
Phenols, total chlorinated (Not Applicable)		A, A-S, AA, AA-S	*	H(WS)	
		GA	*	H(WS)	
		A, A-S, AA, AA-S, B, C	1.0	A	R
		D	1.0	A	R
Remarks:	*	Refer to standards for "Phenolic compounds (total phenols)."			
Phenols, total unchlorinated (Not Applicable)		A, A-S, AA, AA-S, B, C	5.0	A	R
		D	5.0	A	R
Phenyl ether (101-84-8)		A, A-S, AA, AA-S	10	H(WS)	D
Phorate and Disulfoton (298-02-2; 298-04-4)		GA	ND	H(WS)	F

Table 1
(cf. section 703.5)
(Continued)

WATER QUALITY STANDARDS
SURFACE WATERS AND GROUNDWATER

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD (ug/L)	TYPE	BASIS CODE
Picloram (Not Applicable)	GA	50*	H(WS)	J
Remarks: *	Includes: related forms that convert to the organic acid upon acidification to a pH of 2 or less; and esters of the organic acid.			
Polychlorinated biphenyls (Not Applicable)	A, A-S, AA, AA-S	0.01	H(WS)	A
	GA	0.1	H(WS)	F
	A, A-S, AA, AA-S, B, C	0.001	A	S
	D	0.001	A	S
	SA, SB, SC	0.001	A	S
	SD	0.001	A	S
Principal organic contaminant (Not Applicable)	GA	5*	H(WS)	J
Remarks: *	This standard applies to any and every individual substance that is in the principal organic contaminant classes, except any substance that has a standard for class GA waters listed elsewhere in this Table. A less stringent guidance value for an individual substance may be substituted for this standard if so determined by the Commissioner of the New York State Department of Health, pursuant to 10 NYCRR section 5-1.51(g).			
Prometon (1610-18-0)	GA	50	H(WS)	J
Propachlor (1918-16-7)	GA	35	H(WS)	F
Propanil (709-98-8)	GA	7.0	H(WS)	F
Propazine (139-40-2)	GA	16	H(WS)	F
Propham (122-42-9)	GA	50	H(WS)	J

Table 1
(cf. section 703.5)
(Continued)

WATER QUALITY STANDARDS
SURFACE WATERS AND GROUNDWATER

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD (ug/L)	TYPE	BASIS CODE
Quaternary ammonium compounds (including dimethyl benzyl ammonium chloride and dimethyl ethyl benzyl ammonium chloride) (Not Applicable)	A, A-S, AA, AA-S, B, C	10	A	N
Radium 226 (Not Applicable)	A, AA	*	H(WS)	H
	GA	*	H(WS)	H
Remarks:	* 3 picocuries per liter.			
Radium 226 and Radium 228 (Not Applicable)	A, A-S, AA, AA-S	*	H(WS)	G
	GA	*	H(WS)	G
Remarks:	* 5 picocuries per liter.			
Selenium (Not Applicable)	A, A-S, AA, AA-S	10	H(WS)	G
	GA	10	H(WS)	G
	A, A-S, AA, AA-S, B, C	1.0*	A	N
Remarks:	* Aquatic standard applies to acid-soluble form.			
Silver (Not Applicable)	A, A-S, AA, AA-S	50	H(WS)	G
	GA	50	H(WS)	F
	A, A-S, AA, AA-S, B, C	0.1*	A	N
	D	**	A	Q
	SD	2.3	A	Q
Remarks:	* Applies to ionic silver. ** exp(1.72 [ln (ppm hardness)] - 6.52) Acid-soluble form applies to D and SD Classes.			
Simazine (122-34-9)	GA	50	H(WS)	J
Sodium (Not Applicable)	GA	20,000	H(WS)	H

Table 1
(cf. section 703.5)
(Continued)

WATER QUALITY STANDARDS
SURFACE WATERS AND GROUNDWATER

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD (ug/L)	TYPE	BASIS CODE
Strontium 90 (Not Applicable)	A, A-S, AA, AA-S	8 pCi/L*	H(WS)	G
Remarks:	* If two or more radionuclides are present, the sum of their doses shall not exceed an annual potential dose of 4 millirems per year.			
Styrene (100-42-5)	A, A-S, AA, AA-S	50	H(WS)	D
	GA	*	H(WS)	
Remarks:	* Refer to standard for Principal organic contaminant.			
Sulfate (Not Applicable)	A, A-S, AA, AA-S	250,000	H(WS)	G
	GA	250,000	H(WS)	F
Sulfite (Not Applicable)	A, A-S, AA, AA-S, B, C	200	A	N
Tebuthiuron (34014-18-1)	GA	50	H(WS)	J
Terbacil (5902-51-2)	GA	50	H(WS)	J
Tetrachlorobenzenes (95-94-3; 634-66-2; 634-90-2)	A, A-S, AA, AA-S	10	H(WS)	D
2,3,7,8-Tetrachlorodibenzo-p-dioxin (1746-01-6)	GA	0.000035	H(WS)	F
	A, A-S, AA, AA-S, B, C	0.000001	H(B)	K
	D	0.000001	H(B)	K
Tetrachloroterephthalic acid (2136-79-0)	GA	50	H(WS)	J
Thallium (Not Applicable)	A, A-S, AA, AA-S, B, C	8	A	N
	D	20	A	Q
Remarks:	Standards apply to acid-soluble form.			

Table I
(cf. section 703.5)
(Continued)

WATER QUALITY STANDARDS
SURFACE WATERS AND GROUNDWATER

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD (ug/L)	TYPE	BASIS CODE
Theophylline (58-55-9)	A, A-S, AA, AA-S	40	H(WS)	B
Thiram (137-26-8)	GA	1.8	H(WS)	F
Toxaphene (8001-35-2)	GA	ND	H(WS)	F
	A, A-S, AA, AA-S, B, C	0.005	A	N
	D	1.6	A	Q
	SA, SB, SC	0.005	A	N
Trichlorobenzenes (87-61-6; 108-70-3; 120-82-1; 12002-48-1)	A, A-S, AA, AA-S	10	H(WS)	D
	A, A-S, AA, AA-S, B, C	5	A	N,T
	D	50	A	R
	SA, SB, SC	5	A	N,T
	SD	50	A	R
1,1,2-Trichloroethane (79-00-5)	A, A-S, AA, AA-S	0.6	H(WS)	A
2,4,5-Trichlorophenoxyacetic acid (93-76-5)	GA	35	H(WS)	F
2,4,5-Trichlorophenoxypropionic acid (93-72-1)	A, A-S, AA, AA-S	10	H(WS)	G
	GA	0.26	H(WS)	F
Trifluralin (1582-09-8)	GA	35	H(WS)	F
Triphenylphosphate (115-86-6)	A, A-S, AA, AA-S, B, C	4	A	N
	D	40	A	Q
Tritium (Not Applicable)	A, A-S, AA, AA-S	*	H(WS)	G

Remarks: * 20,000 picocuries per liter; if two or more radionuclides are present, the sum of their annual dose equivalent to the total body or any organ shall not exceed 4 millirems per year.

Table 1
(cf. section 703.5)
(Continued)

WATER QUALITY STANDARDS
SURFACE WATERS AND GROUNDWATER

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD (ug/L)	TYPE	BASIS CODE
Uranyl ion (Not Applicable)	GA	5,000	H(WS)	H
Vanadium (Not Applicable)	A, A-S, AA, AA-S, B, C	14	A	N
	D	190	A	Q
Remarks:	Standards apply to acid-soluble form.			
Vinyl chloride (75-01-4)	GA	2	H(WS)	G
Zinc (Not Applicable)	A, A-S, AA, AA-S	300	H(WS)	H
	GA	300	H(WS)	H
	A, A-S, AA, AA-S, B, C	30	A	N
	D	*	A	Q
	SA, SB, SC	58	A	N
	SD	170	A	Q
Remarks:	* exp (0.83 [ln (ppm hardness)] + 1.95) Aquatic standards apply to acid-soluble form.			
Zineb (12122-67-7)	GA	1.8	H(WS)	F
Ziram (137-30-4)	GA	4.2	H(WS)	F

Table 2
(cf. section 703.5)

BASIS FOR ESTABLISHMENT OF STANDARDS

BASIS CODE	**BASIS (REGULATION REFERENCE)**	**TYPE**
A	Oncogenic (702.4)	Health (Water Source)
B	Non-oncogenic, Chronic (702.5)	Health (Water Source)
C	Non-oncogenic, Acute (702.5)	Health (Water Source)
D	Aesthetic (702.6)	Health (Water Source)
E	Chemical Correlation (702.7)	Health (Water Source)
F	Former Groundwater Regulations (6 NYCRR § 703.5(a) (3))	Health (Water Source)
G	Specific MCL (702.3(a))	Health (Water Source)
H	Former Use of or Reference to 10 NYCRR Part 170	Health (Water Source)
I	Principal Organic Contaminant Classes (702.3(b))	Health (Water Source)
J	Former Groundwater Reference to 10 NYCRR Subpart 5-1 General Standards	Health (Water Source)
K	Bioaccumulation (702.8)	Health (Bioaccumulation)
N	Propagation (702.10)	Aquatic
Q	Survival (702.11)	Aquatic
R	Tainting (702.12)	Aquatic
S	Bioaccumulation (702.13) (Wildlife Protection)	Aquatic
T	Chemical Correlation (702.14)	Aquatic

Table 3
(cf. section 703.6)

GROUNDWATER EFFLUENT STANDARDS
CLASS GA

SUBSTANCE	CAS NO.	MAXIMUM ALLOWABLE CONCENTRATION (ug/L)
Alachlor	15972-60-8	35
Aldicarb and Methomyl	116-06-3; 16752-77-5	0.35
Aldrin	309-00-2	Not Detectable
Aluminum	Not Applicable	2,000
Arsenic	Not Applicable	50
Atrazine	1912-24-9	7.5
Azinphosmethyl	86-50-0	4.4
Barium	Not Applicable	2,000
Benefin	1861-40-1	35
Benzene	71-43-2	0.7
Benzo(a)pyrene	50-32-8	Not Detectable
Bis(2-chloroethyl)ether	111-44-4	1.0
Bis(2-ethylhexyl)phthalate	117-81-7	4,200
Bromacil	314-40-9	4.4
Butachlor	23184-66-9	3.5
Cadmium	Not Applicable	20
Captan	133-06-2	18
Carbaryl	63-25-2	29
Carbon tetrachloride	56-23-5	5

Table 3
(cf. section 703.6)
(Continued)

GROUNDWATER EFFLUENT STANDARDS
CLASS GA

SUBSTANCE	**CAS NO.**	**MAXIMUM ALLOWABLE CONCENTRATION (ug/L)**
Chloramben[1]	Not Applicable	88
Chlordane	57-74-9	0.1
Chloride	Not Applicable	500,000
Chloroform	67-66-3	7
Chromium (Hexavalent)	Not Applicable	100
Copper	Not Applicable	1,000
Cyanide	Not Applicable	400
DDT, DDD and DDE	50-29-3; 72-54-8; 72-55-9	Not Detectable
Diazinon	333-41-5	0.7
Di-n-butylphthalate	84-74-2	770
Dicamba	1918-00-9	0.44
(1,4-) and (1,2-) Dichlorobenzenes	95-50-1; 106-46-7	4.7
2,4-Dichlorophenoxy-acetic acid	94-75-7	4.4
Dieldrin	60-57-1	Not Detectable
Diphenylhydrazine	122-66-7	Not Detectable
Endrin	72-20-8	Not Detectable
Ethylenethiourea	96-45-7	Not Detectable
Ferbam	14484-64-1	4.2
Fluoride	Not Applicable	3,000
Foaming agents[2]	Not Applicable	1,000

Table 3
(cf. section 703.6)
(Continued)

GROUNDWATER EFFLUENT STANDARDS
CLASS GA

SUBSTANCE	**CAS NO.**	**MAXIMUM ALLOWABLE CONCENTRATION (ug/L)**
Folpet	133-07-3	56
Heptachlor and Heptachlorepoxide	76-44-8; 1024-57-3	Not Detectable
Hexachlorobenzene	118-74-1	0.35
Hexachlorocyclohexanes	58-89-9; 319-84-6; 319-85-7; 319-86-8; 6108-10-7, 608-73-1	Not Detectable
Hexachlorophene	70-30-4	7
Iron[3]	Not Applicable	600
Kepone	143-50-0	Not Detectable
Lead	Not Applicable	50
Malathion	121-75-5	7.0
Mancozeb	8018-01-7	1.8
Maneb	12427-38-2	1.8
Manganese[3]	Not Applicable	600
Mercury	Not Applicable	4
Methoxychlor	72-43-5	35
2-Methyl-4-chlorophenoxyacetic acid	94-74-6	0.44
Methyl methacrylate	80-62-6	700
Nabam	142-59-6	1.8
Nickel	Not Applicable	2,000
Nitralin	4726-14-1	35

Table 3
(cf. section 703.6)
(Continued)

GROUNDWATER EFFLUENT STANDARDS
CLASS GA

SUBSTANCE	**CAS NO.**	**MAXIMUM ALLOWABLE CONCENTRATION (ug/L)**
Nitrate (Expressed as N)	Not Applicable	20,000
Nitrilotriacetic acid[4]	Not Applicable	3
Oil and Grease	Not Applicable	15,000
Paraquat	4685-14-7	3.0
Parathion and Methyl parathion	56-38-2; 298-00-0	1.5
Pentachloronitrobenzene	82-68-8	Not Detectable
pH	Not Applicble	See Note 5
Phenolic compounds (total phenols)	Not Applicable	2
Phorate and Disulfoton	298-02-2; 298-04-4	Not Detectable
Polychlorinated biphenyls	Not Applicable	0.1
Propachlor	1918-16-7	35
Propanil	709-98-8	7.0
Propazine	139-40-2	16
Selenium	Not Applicable	40
Silver	Not Applicable	100
Simazine	122-34-9	75
Styrene	100-42-5	930
Sulfate	Not Applicable	500,000
Sulfide	Not Applicable	1,000
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746-01-6	0.000035

Table 3
(cf. section 703.6)
(Continued)

GROUNDWATER EFFLUENT STANDARDS
CLASS GA

SUBSTANCE	**CAS NO.**	**MAXIMUM ALLOWABLE CONCENTRATION (ug/L)**
Thiram	137-26-8	1.8
Toxaphene	8001-35-2	Not Detectable
Trichloroethylene	79-01-6	10
2,4,5-Trichlorophenoxy-acetic acid	93-76-5	35
2,4,5-Trichlorophenoxy-propionic acid	93-72-1	0.26
Trifluralin	1582-09-8	35
Vinyl chloride	75-01-4	5.0
Zinc	Not Applicable	5,000
Zineb	12122-67-7	1.8
Ziram	137-30-4	4.2

NOTES.

1. Includes: related forms that convert to the organic acid upon acidification to a pH of 2 or less; and esters of the organic acid.
2. Foaming agents determined as methylene blue active substances (MBAS) or other tests as specified by the commissioner.
3. Combined concentration of iron and manganese shall not exceed 1000 ug/L.
4. Includes related forms that convert to nitrilotriacetic acid upon acidification to a pH of 2.3 or less.
5. pH shall not be lower than 6.5 or the pH of the natural groundwater, whichever is lower, nor shall be greater than 8.5 or the pH of the natural groundwater, whichever is greater.

In addition to the effluent standards above, the following also apply in the counties of Nassau and Suffolk:

SUBSTANCE	**MAXIMUM ALLOWABLE CONCENTRATION IN mg/L**
(1) Dissolved solids, total	1,000
(2) Nitrogen, total (as N)	10

Existing subparagraph 704.2(b)(3)(iii) is AMENDED to read as follows:

(iii) In lakes subject to stratification as defined in Part 652 of this Title, thermal discharges [which] that will lower the temperature of the receiving waters shall be discharged to the hypolimnion[,] and shall meet the water quality standards contained in [Parts 701 and 702] Part 703 of this Title in all respects.

New section 704.7 is ADOPTED as follows:

704.7 Severability. If any provision of this Part or its application to any person or circumstance is held to be invalid, the remainder of this Part and the application of that provision to other persons or circumstances will not be affected.

Existing section 705.1 is AMENDED to read as follows:

Section 705.1 Federal statutes or regulations. The following Federal statutes or regulations have been referenced in Parts 700-704 of this Title:

(a) "40 CFR Part 136" means Part 136 of title 40 of the "Code of Federal Regulations", as of July 1, 1988 (Protection of the Environment).

[(b) The Safe Drinking water Act, 42 USC 300f "et seq"., effective July 1, 1978.]

[(c)](b) The Federal Water Pollution Control Act of 1972, 33 USC 466 "et seq"., effective October 18, 1972.

[(d)](c) All United States publications referenced above are available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

Existing section 705.2 is REPEALED and a new section 705.2 is ADOPTED as follows:

705.2 Publications. (a) The following publication has been referenced in Parts 700-704 of this Title:

(1) "Guidelines for Deriving Numerical Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses," January 1985, U.S. Environmental Protection Agency, Washington, D.C.

New section 705.4 is ADOPTED as follows:

705.4 Severability. If any provision of this Part or its application to any person or circumstance is held to be invalid, the remainder of this Part and the application of that provision to other persons or circumstances will not be affected.

PART 704

CRITERIA GOVERNING THERMAL DISCHARGES

(Statutory authority: Environmental Conservation Law, §§ 15-0313, 17-0301)

Historical Note

Part (§§ 704.1—704.4) added, filed Aug. 12, 1969; repealed, new filed: Apr. 28, 1972; Sept. 20, 1974 eff. 30 days after filing with the Secretary of State, provided, however, if the application, pursuant to Parts 800 to 941 inclusive of Title 6, of any provision of Part 704 shall be found to be invalid, the corresponding provision of Part 704 in effect immediately prior to such effective date shall be deemed not to have been repealed and shall remain in effect until such time as the provision, the application of which was found to be invalid, can lawfully be made applicable.

Section 704.1 Water quality standard for thermal discharges. (a) All thermal discharges to the waters of the State shall assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the body of water.

(b) The criteria contained in this Part shall apply to all thermal discharges and shall be complied with, except as provided in this Part.

Historical Note

Sec. added, filed Aug. 12, 1969; repealed, new filed: Apr. 28, 1972; Sept. 20, 1974 eff. 30 days after filing with the Secretary of State, provided, however, if the application, pursuant to Parts 800 to 941 inclusive of Title 6, of any provision of Part 704 shall be found to be invalid, the corresponding provision of Part 704 in effect immediately prior to such effective date shall be deemed not to have been repealed and shall remain in effect until such time as the provision, the application of which was found to be invalid, can lawfully be made applicable.

704.2 Criteria governing thermal discharges. (a) *General criteria.* The following criteria shall apply to all waters of the State receiving thermal discharges, except as provided in section 704.6 of this Part:

(1) The natural seasonal cycle shall be retained.

(2) Annual spring and fall temperature changes shall be gradual.

(3) Large day-to-day temperature fluctuations due to heat of artificial origin shall be avoided.

(4) Development or growth of nuisance organisms shall not cccur in contravention of water quality standards.

(5) Discharges which would lower receiving water temperature shall not cause a violation of water quality standards and section 704.3 of this Part.

(6) For the protection of the aquatic biota from severe temperature changes, routine shut down of an entire thermal discharge at any site shall not be scheduled during the period from December through March.

(b) *Special criteria.* The following criteria shall apply to all waters of the State receiving thermal discharges, except as provided in section 704.6 of this Part:

(1) *Non-trout waters.* (i) The water temperature at the surface of a stream shall not be raised to more than 90 degrees Fahrenheit at any point.

(ii) At least 50 percent of the cross sectional area and/or volume of flow of the stream including a minimum of one-third of the surface as measured from shore to shore shall not be raised to more than five Fahrenheit degrees over the temperature that existed before the addition of heat of artificial origin or to a maximum of 86 degrees Fahrenheit whichever is less.

(iii) At least 50 percent of the cross sectional area and/or volume of flow of the stream including a minimum of one-third of the surface as measured from shore to shore shall not be lowered more than five Fahrenheit degrees from the temperature that existed immediately prior to such lowering.

(2) *Trout waters.* (i) No discharge at a temperature over 70 degrees Fahrenheit shall be permitted at any time to streams classified for trout.

(ii) From June through September no discharge shall be permitted that will raise the temperature of the stream more than two Fahrenheit degrees over that which existed before the addition of heat of artificial origin.

(iii) From October through May, no discharge shall be permitted that will raise the temperature of the stream more than five Fahrenheit degrees over that which existed before the addition of heat of artificial origin or to a maximum of 50 degrees Fahrenheit whichever is less.

(iv) From June through September no discharge shall be permitted that will lower the temperature of the stream more than two Fahrenheit degrees from that which existed immediatly prior to such lowering.

(3) *Lakes.* (i) The water temperature at the surface of a lake shall not be raised more than three Fahrenheit degrees over the temperature that existed before the addition of heat of artificial origin.

(ii) In lakes subject to stratification as defined in Part 652 of this Title, thermal discharges that will raise the temperature of the receiving waters shall be confined to the epilimnion.

(iii) In lakes subject to stratification as defined in Part 652 of this Title, thermal discharges which will lower the temperature of the receiving waters shall be discharged to the hypolimnion, and shall meet the water quality standards contained in Parts 701 and 702 of this Title in all respects.

(4) *Coastal waters.* (i) The water temperature at the surface of coastal waters shall not be raised more than four Fahrenheit degrees from October through June nor more than 1.5 Fahrenheit degrees from July through September over that which existed before the addition of heat of artificial origin.

(ii) The water temperature at the surface of coastal waters shall not be lowered more than four Fahrenheit degrees from October through June nor more than 1.5 Fahrenheit degrees from July through September from that which existed immediately prior to such lowering.

(5) *Estuaries or portions of estuaries.* (i) The water temperature at the surface of an estuary shall not be raised to more than 90 degrees Fahrenheit at any point.

(ii) At least 50 percent of the cross sectional area and/or volume of the flow of the estuary including a minimum of one-third of the surface as measured from water edge to water edge at any stage of tide, shall not be raised to more than four Fahrenheit degrees over the temperature that existed before the addition of heat of artificial origin or a maximum of 83 degrees Fahrenheit whichever is less.

(iii) From July through September, if the water temperature at the surface of an estuary before the addition of heat of artificial origin is more than 83 degrees Fahrenheit an increase in temperature not to exceed 1.5 Fahrenheit degrees at any point of the estuarine passageway as delineated above, may be permitted.

(iv) At least 50 percent of the cross sectional area and/or volume of the flow of the estuary including a minimum of one-third of the surface as measured from water edge to water edge at any stage of tide, shall not be lowered more than four Fahrenheit degrees from the temperature that existed immediately prior to such lowering.

(6) *Enclosed bays.* No additional temperature change except that which occurs naturally shall be permitted in enclosed bays.

Historical Note

Sec. added, filed Aug. 12, 1969; repealed, new filed: Apr. 28, 1972; Sept. 20, 1974 eff. 30 days after filing with the Secretary of State, provided, however, if the application, pursuant to Parts 800 to 941 inclusive of Title 6, of any provision of Part 704 shall be found to be invalid, the corresponding provision of Part 704 in effect immediately prior to such effective date shall be deemed not to have been repealed and shall remain in effect until such time as the provision, the application of which was found to be invalid, can lawfully be made applicable.

704.3 Mixing zone criteria. The following criteria shall apply to all waters of the State receiving thermal discharges, except as provided in section 704.6 of this Part.

(a) The department shall specify definable, numerical limits for all mixing zones (e.g., linear distances from the point of discharge, surface area involvement, or volume of receiving water entrained in the thermal plume).

(b) Conditions in the mixing zone shall not be lethal in contravention of water quality standards to aquatic biota which may enter the zone.

(c) The location of mixing zones for thermal discharges shall not interfere with spawning areas, nursery areas and fish migration routes.

Historical Note

Sec. added, filed Aug. 12, 1969; repealed, new filed: Apr. 28, 1972; Sept. 20, 1974 eff. 30 days after filing with the Secretary of State, provided, however, if the application, pursuant to Parts 800 to 941 inclusive of Title 6, of any provision of Part 704 shall be found to be invalid, the corresponding provision of Part 704 in effect immediately prior to such effective date shall be deemed not to have been repealed and shall remain in effect until such time as the provision, the application of which was found to be invalid, can lawfully be made applicable.

704.4 Additional limitations or modifications. (a) An applicant may apply for a modification of the criteria set forth in sections 704.2 and 704.3 of this Part.

(b) Upon receipt of such application, the commissioner shall confer with the U.S. Environmental Protection Agency and shall transmit to that agency information to enable the administrator to fulfill responsibilities under Federal Law.

(c) The applicant shall have the burden of establishing to the satisfaction of the commissioner that one or more of the criteria are unnecessarily restrictive as to a particular project in that a modification of such criterion, or criteria, as the case may be, would assure the protection and propagation of a balanced indigenous population of shellfish, fish, and wildlife in and on the body of water into which the discharge is to be made.

(d) The applicant shall consult with the Department of Environmental Conservation to determine appropriate studies which shall be conducted by the applicant. Prior approval shall be obtained by the applicant for a program of studies that will determine the impact of any proposed modification. Such studies shall include, but shall not be limited to:

(1) A comparative analysis of environmental effects of the thermal discharge on the receiving waters when subject to the stated criteria of this Part, and when subject to the applicant's proposed modification.

(2) An analysis of the different discharge modes (e.g., surface or subsurface) and the advantages and disadvantages of each mode with regard to effects on aquatic life.

(e) A public hearing shall be held upon the application.

(f) The commissioner may authorize a modification of the stated criteria, which modifications shall be conditioned upon post-operational experience. The commissioner may require additional treatment of, or change in, a thermal discharge in the event that post-operational experience shows a trend toward impairment by the discharge of the quality of the receiving waters for the protection and propagation of a balanced indigenous population of shellfish, fish and wildlife in and on the body of water.

Historical Note

Sec. filed Aug. 12, 1969; repealed, new filed: April 28, 1972; Sept. 20, 1974 eff. 30 days after filing.

704.5 Intake structures. The location, design, construction and capacity of cooling water intake structures, in connection with point source thermal discharges, shall reflect the best technology available for minimizing adverse environmental impact.

Historical Note

Sec. filed Sept. 20, 1974 eff. 30 days after filing.

704.6 Applicability of criteria. (a) In determining that a discharge existing prior to July 25, 1969 has violated the standard for thermal discharges, as provided in subdivision (a) of section 704.1 of this Part, the violation of any of the criteria contained in this Part shall not constitute evidence of a violation of such standard unless it is also shown that the violation of such criteria has contributed to the violation of the standard.

(b) The provisions of subdivision (a), subparagraphs (1)(iii), (2)(iv), (3)(iii), (4)(ii), (5)(iv), and paragraph (b)(6) of section 704.2 of this Part, and section 704.3, shall apply only to thermal discharges which have been brought into existence subsequent to July 31, 1973, or to which the criteria contained in this Part were intended to apply pursuant to any certification issued by the commissioner pursuant to section 401(d) of the Federal Water Pollution Control Act amendments of 1972.

(c) Whenever the commissioner has reason to believe that a thermal discharge, existing prior to the adoption of this Part, does not conform to subdivision (a) of section 704.1 of this Part, he may impose appropriate criteria contained in this Part upon such thermal discharge, unless, after public hearing, the owner or operator of any such thermal discharge establishes to the satisfaction of the commissioner that either such thermal discharge does conform to such subdivision (a) or that any such criteria are more stringent than necessary to assure conformance with such subdivision (a).

Historical Note

Sec. filed Sept. 20, 1974 eff. 30 days after filing.

PART 705

REFERENCES

(Statutory authority: Environmental Conservation Law, § 3-0301[2][m])

Historical Note

Part (§§ 705.1-705.3) filed Nov. 5, 1984 eff. Nov. 5, 1984.

Section 705.1 Federal statutes or regulations. The following Federal statutes or regulations have been referenced in Parts 700-704 of this Title:

(a) *40 CFR* means title 40 of the *Code of Federal Regulations* (Protection of the Environment).

(b) The Safe Drinking Water Act, 42 USC 300f *et seq.*, effective July 1, 1978.

(c) The Federal Water Pollution Control Act of 1972, 33 USC 466 *et seq.*, effective October 18, 1972.

(d) All United States publications referenced above are available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

Historical Note

Sec. filed Nov. 5, 1984 eff. Nov. 5, 1984.

705.2 Books. The following books have been referenced in Parts 700-704 of this Title:

(a) *Standard Methods for the Examination of Water and Wastewater*, 12th edition, 1965, American Public Health Association (APHA), American Water Works Association (AWWA), and Water Pollution Control Federation (WPCF); 2626 Pennsylvania Avenue NW, Washington, DC 20037.

(b) *Methods for Chemical Analysis of Water and Wastes*, 1974, Environmental Protection Agency (EPA); Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

(c) *Water Standards of the American Society for Testing and Materials* means 1968 Book of ASTM Standards, Part 23, Water; Atmospheric Analysis; published in October 1968 by the American Society for Testing and Materials (ASTM), 1916 Race Street, Philadelphia, PA 19103.

Historical Note

Sec. filed Nov. 5, 1984 eff. Nov. 5, 1984.

705.3 Availability. All material referenced in Parts 700-704 of this Title is available for copying and inspection at the Department of Environmental Conservation, Division of Water, 50 Wolf Road, Albany, NY 12233.

Historical Note

Sec. filed Nov. 5, 1984 eff. Nov. 5, 1984.

CHAPTER I STATE SANITARY CODE

PART 5
DRINKING WATER SUPPLIES
(Statutory Authority: Public Health Law §225)

SUBPART 5-1

PUBLIC WATER SUPPLIES

SUBPART 5-1

PUBLIC WATER SUPPLIES

TABLES

GENERAL PROVISIONS

Section 5-1.1 Definitions. As used in this Subpart the following words and terms shall have the indicated meaning, except as otherwise specifically provided:

(a) Auxiliary source means a source of water supply which is not normally used but which has been approved for use by the department and other State agencies having jurisdiction, and has been developed for use when the normal source or sources fail to meet the water supply requirements.

(b) Commissioner means the Commissioner of Health of the State of New York.

(c) Community water system (CWS) means a public water system which serves at least five service connections used by year-round residents or regularly serves at least 25 year-round residents.

(d) Consumer notification means notification of all persons served by the system in a manner acceptable to the commissioner as follows:

(1) Community water systems. Notification must be made within three months after the failure to comply or the issuance of a variance or exemption. Such notice shall be repeated at least once every three months so long as such failure to comply continues or such variance or exemption remains in effect.

(2) Noncommunity water systems. Notification must be made by posting a notice in a conspicuous location immediately after the failure to comply or the issuance of a variance or exemption.

(3) The supplier of water shall furnish the State with a copy of the notice.

(e) Contaminant means any physical, chemical, microbiological or radiological substance or matter in water.

(f) Designated representative means the health commissioner or health officer of a city of 50,000 population or over, or the health commissioner or health officer of a county or part-county health district, the state regional director, or district director having jurisdiction; a public health director or public health engineer qualified as duly appointed pursuant to Part 11 of this Title; or a county health commissioner, or county health director having the powers and duties prescribed in section 352 of the Public Health Law, or any other individual so designated by the commissioner.

(g) Disinfection station means a facility consisting of one or more points where water is routinely treated with an oxidant for disinfection, odor control or other purposes, excluding treatment on a raw water transmission main.

(h) Distribution point means a sampling point representative of drinking water within the distribution system.

(i) Department means the New York State Department of Health.

(j) Dose equivalent means the product of the absorbed dose from ionizing radiation and such factors as account for differences in biological effectiveness due to the type of radiation and its distribution in the body as specified by the International Commission on Radiological Units and Measurements (ICRU).

(k) Dwelling unit means one or more rooms with provisions for living, sanitary and sleeping facilities arranged for the use of one family.

(l) Emergency source means a source of water supply which is not the regula source or auxiliary source and which is developed during an emergency fo temporary use.

(m) Entry point means a representative sampling location after the last poin of treatment but before the first consumer connection.

(n) EPA Methods 502.1, 503.1, 524.1, 524.2, 502.2 and 504 mean, respectively "Volatile Halogenated Organic Compounds in Water by Purge and Trap Ga Chromatography;" "Volatile Aromatic and Unsaturated Organic Compounds in Wate by Purge and Trap Gas Chromatography;" "Volatile Organic Compounds in Water b Purge and Trap Gas Chromatography/ Mass Spectrometry;" "Volatile Organi Compounds in Water by Purge and Trap Capillary Column Gas Chromatography/Mas Spectrometry," "Volatile Organic Compounds in Water by Purge and Trap Capillar Gas Chromatography with Photoionization and Electrolytic Conductivity Detector in Series;" and "Measurement of 1,2-Dibromoethane (EDB) an 1,2-Dibromo-3-chloropropane (DBCP) in Drinking Water by Microextraction and Ga Chromatography." These methods are contained in "Methods for Determination o Organic Compounds in Finished Drinking Water and Raw Source Water," Septembe 1986. Copies of this publication can be obtained from Environmental Monitorin and Support Laboratory, EPA, Cincinnati, Ohio 45268, and a copy is available fo inspection and copying at the offices of the records access officer of th Department of Health, Corning Tower, Empire State Plaza, Albany, NY 12237.

(o) EPA Methods 604, 605, 608, 609, 611, 612, and 625 mean respectivel "Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater Method 604 - Phenols; Method 605 - Benzidines; Method 608 - Organochlorin Pesticides and PCBs; Method 609 - Nitroaromatics and Isophorone; Method 611 Haloethers; Method 612 - Chlorinated Hydrocarbons; and Method 625 - Base/Neutral and Acids." These methods are contained in 40 CFR Part 136 as published in th Federal Register, Volume 49, page 43250, No. 209, Friday, October 26, 198 Copies of this publication are available from U.S. Environmental Protectio Agency, Public Information Reference Unit, 401 M Street, S.W., Washington, D.C 20460 and a copy is available for inspection and copying at the offices of th records access officer of the Department of Health, Corning Tower, Empire Stat Plaza, Albany, NY 12237.

(p) Gross alpha particle activity means the total radioactivity due to alph particle emission as inferred from measurements on a dry sample.

(q) Gross beta particle activity means the total radioactivity due to bet particle emission as inferred from measurements on a dry sample.

(r) Ground water source means a source of water supply taken from a groun water aquifer and developed in a manner which is acceptable to the commissione but shall not include an admixture of surface water or water exposed to the groun surface.

(s) Man made beta particle and photon emitters means all radionuclid emitting beta particles and/or photons, except the daughter products thorium-232, uranium-235 and uranium-238, listed in Maximum Permissible Bo Burdens and Maximum Permissible Concentration of Radionuclides in Air or Wat for Occupational Exposure, National Bureau of Standards, Handbook 69, as amend August 1963, U.S. Department of Commerce. Copies of this publication a available from N.C.R.P. Publications, 7910 Woodmont Avenue, Bethesda, MD, and copy is available for inspection and copying at the offices of the records acce officer of the Department of Health, Corning Tower, Empire State Plaza, Alban NY 12237.

(t) **Maximum contaminant level (MCL)** means the maximum permissible level of a contaminant in water which is delivered to the free-flowing outlet of the ultimate user of a public water system, except in the case of turbidity where the maximum permissible level is measured at the point of entry to the distribution system. Substances added to the water by the user, and confined to the premises of the user, are excluded from this definition.

(u) **Maximum total trihalomethane potential (MTP)** means the maximum concentration of total trihalomethane produced in a given water containing a free chlorine residual after seven days at a temperature of 25 C or above.

(v) **Noncommunity water system (NCWS)** means a public water system that is not a community water system.

(w) **Non transient noncommunity water system (NTNC)** means a public water system that is not a community water system and regularly serves at least 25 of the same persons, four hours or more per day, for four or more days per week, or 26 or more weeks per year.

(x) **Person** means an individual, corporation, company, association, partnership, State agency, municipality, including a county, or Federal agency.

(y) **Picocurie** means that quantity of radioactive material producing 2.22 nuclear transformations per minute.

(z) **Potable water** means a water which meets the drinking water quality requirements established by sections 5-1.50 and 5-1.51 of this Subpart.

(aa) **Point of use** means the free-flowing outlet of the ultimate user of a public water system.

(bb) **Principal organic contaminant (POC)** means any organic chemical compound belonging to the following classes, except for trichloromethane (chloroform), dibromochloromethane, bromodichloromethane, tribromomethane (bromoform) and any other organic contaminant with a specific MCL listed in Section 5.1-52, Table 3:

(1) Halogenated alkane: Compound containing carbon (C), hydrogen (H and halogen (X) where X = fluorine (F), chlorine (Cl), bromine (Br) and/or iodine (I), having the general formula $C_nH_yX_z$, where $y + z = 2n + 2$; n, y and z are integer variables; n and z are equal to or greater than one and y is equal to or greater than zero.

(2) Halogenated ether: Compound containing carbon (C), hydrogen (H), oxygen (O) and halogen X (where X = F, Cl, Br and/or I) having the general formula $C_nH_yX_zO$, where $y + z = 2n + 2$; the oxygen is bonded to two carbons; n, y and z are integer variables; n is equal to or greater than two, y is equal to or greater than zero and z is equal to or greater than one.

(3) Halobenzenes and substituted halobenzenes: Derivatives of benzene which have at least one halogen atom attached to the ring and which may or may not have straight or branched chain hydrocarbon, nitrogen or oxygen substituents.

(4) Benzene and alkyl- or nitrogen-substituted benzenes: Benzene or a derivative of benzene which has either an alkyl- and/or a nitrogen-substituent.

(5) Substituted, unsaturated hydrocarbons: A straight or branched chai unsaturated hydrocarbon compound containing one of the following: halogen aldehyde, nitrile, amide.

(6) Halogenated non-aromatic cyclic hydrocarbons: A non-aromatic cycli compound containing a halogen.

(cc) **Public health hazard** means an existing or imminent condition which ca be responsible for or cause illness, injury or death and for which immediat corrective or remedial action is required. Public health hazards include, bu are not limited to, the following:

(1) Confirmed microbiological, primary inorganic chemical, organi chemical, radiological, or nitrate MCL violations;

(2) use of an unapproved or contaminated water supply source;

(3) insufficient quantity of water to meet drinking or sanitary demands

(4) hazardous or toxic chemical contamination;

(5) disinfection which is inadequate to destroy harmful microorganism or to maintain a specified chlorine residual;

(6) disruption of water service of four hours or more;

(7) cross-connections of sufficient hazard to adversely affect wate consumers' health; and

(8) any other conditions determined to be a public health hazard by th commissioner.

(dd) **Public notification** means disseminating information in a manner an format commensurate with the degree of severity of the cause of said notificatio which can reasonably be expected to make the general public aware of the content of the notice. The notification must be made in the following manner:

(1) Publication for at least three consecutive issues in a newspape of general circulation in the area served by the water system within 14 days afte the supplier of water learns of a failure to comply or within 48 hours of th determination of a public health hazard.

(2) Furnishing a notice to the radio and television stations servi the area served by the water system within seven days after the supplier of wate learns of a failure to comply or within 48 hours of the determination of a publi health hazard.

(3) The supplier of water shall furnish the State with copies of t notification made to the newspaper and radio and television stations.

(4) The State may waive all or part of the requirements of th subdivision based upon prompt corrections of the violations or elimination the public health hazard.

(ee) **Public water system** means either a community or noncommunity syst which provides piped water to the public for human consumption, if such syst has at least five service connections or regularly serves an average of at lea 25 individuals daily at least 60 days out of the year. Such term includes:

(1) collection, treatment, storage and distribution facilities under control of the supplier of water of such system and used in connection with such system; and

(2) collection or pretreatment storage facilities not under such control which are used in connection with such system.

(ff) Regular source means a source of water supply which is normally used and is approved by the department and other State agencies having jurisdiction

(gg) Rem means the unit dose equivalent from ionizing radiation to the total body or any internal organ or organ system.

(hh) Millirem (mrem) means 0.001 of a rem.

(ii) Reporting period means a period of time designated by the State for the purpose of determining maximum contaminant level compliance.

(jj) Service connection means the pertinent pipes, valves and fittings that connect a distribution system to a consumer's facility.

(kk) Source of water supply means any ground water aquifer, surface water body or watercourse from which water is taken either periodically or continuously for drinking, culinary or food-processing purposes, or which has been designated for present or future use as a source of water supply for domestic or municipal purposes.

(ll) State means the State Commissioner of Health, or his designated representative.

(mm) State notification means notifying the State by telephone to a designated representative of the commissioner within 24 hours of the confirmed existence of a public health hazard, or within 48 hours after the supplier of water learns of a failure to comply, followed within 24 hours by a certified letter posted to the designated representative of the commissioner previously notified by telephone.

(nn) Supplier of water means any person who owns or operates a public water system.

(oo) Total trihalomethane (TTHM) means the sum of the concentration of trichloromethane (chloroform), dibromochloromethane, bromodichloromethane and tribromomethane (bromoform).

(pp) Unspecified organic contaminant (UOC) means any organic chemical compound not otherwise specified in this Subpart.

(qq) Violation means failure to comply with or conform to the provisions of this code, exceedance by a single sample of a maximum contaminant level, or failure to comply with or conform to monitoring, reporting or notification requirements.

(rr) Water supply emergency plan means a plan approved by the State and filed with the State at such location as specified by the commissioner. The plan shall address the actions to be taken by a water supplier to anticipate water supply emergencies and the steps to be taken to ensure the delivery of potable water during a water supply emergency.

(ss) Water supplier means any person who owns or operates a community water system with an annual gross operating revenues in excess of one hundred twenty-five thousand dollars.

(tt) Water treatment plant means any plant or equipment which, through the addition of chemicals or through aeration, ion exchange, demineralization, coagulation, sedimentation or filtration, or through any other means or combinations of treatment, shall change the physical, chemical, radiological or microbiological quality of water.

5-1.2 Effective date. Except as otherwise specifically provided, this Subpart shall become effective June 24, 1977.

SOURCES OF WATER SUPPLY

5-1.10 Statement. The rules contained in this Subpart, together with the watershed rules and regulations set forth in Parts 100 through 158 of this Title, have been promulgated to protect present or future sources of water supply.

5-1.11 Applicability. The provisions of sections 5-1.10 through 5-1.15 of this Subpart shall apply, throughout the entire State of New York, to all existing and proposed sources of water supply.

5-1.12 Water quality for existing sources of water supply. Whenever the supplier of water determines or is advised by the State that one or more of the MCLs set forth in this Subpart are or may be exceeded; or that effectiveness of treatment processes diminishes to the extent that a violation of the MCLs set forth in this Subpart may occur; or that any deleterious changes in raw water quality have occurred; or that a change in the character of the watershed or aquifer has been observed which may affect water quality; or that any combination of the preceding exists, the supplier of water shall immediately notify the State and do the following:

(a) undertake a study to determine the cause or causes of such conditions, independent of known or anticipated treatment technology;

(b) modify existing or install treatment to comply, to the extent practicable, with sections 5-1.50 and 5-1.51 of this Subpart;

(c) initiate water sampling as needed to delineate the extent and nature of the cause of concern;

(d) conduct an investigation of all or part of the watershed or aquifer to ascertain any existing or potential changes in the character of the sources of water supply; and

(e) submit a written report to the State within 30 days of the onset of the foregoing conditions summarizing the findings outlined in subdivisions (a), (b), (c) and (d) of this section.

5-1.13 Sampling and analytical requirements. The supplier of water shall collect and analyze raw water samples for contaminants at a frequency prescribed by the State.

5-1.14 Water quality for proposed sources of water supply. Prior to the approval of a source of water supply for public water system purposes, a report shall be submitted to the State. Such report shall include, but may not be limited to, all of the following:

(a) a summary of available raw water quality data for at least 10 years prior to the date of the report or as otherwise required by the State;

(b) a sanitary survey of the watershed or aquifer, with particular emphasis on water quality as affected by existing or potential spills, point and non point discharges, and natural seasonal occurrences; and

(c) a description of the proposed water treatment processes.

5-1.15 Limitation. If the information required is already available for the same source of water supply or if an emergency exists which requires the development of an emergency source, the requirements of section 5-1.14 of this Subpart shall not apply.

PLANNING, SITING, TREATMENT AND APPROVAL

5-1.20 Applicability. The provisions of sections 5-1.20 through 5-1.32 of this Subpart shall apply to all public water systems.

5-1.21 Siting requirements. Before a person shall enter into a financial commitment for or initiate construction of a public water system, such person shall notify the State and to the extent practicable, avoid locating part or all of the public water system at a site which:

(a) is subject to a significant risk from earthquake, floods, fires or other disasters; or

(b) except for intake structures, is within the floodplain of a 100-year flood or is lower than any recorded high tide.

5-1.22 Approval of plans and completed works. (a) No supplier of water shall make, install or construct, or allow to be made, installed or constructed, a public water system or any addition or deletion to or modification of a public water system until the plans and specifications have been submitted to and approved by the State.

(b) Bulletin 42, Recommended Standards for Water Works,[1] 1987 edition, published by Health Research Inc., 15 Brookview Avenue, Delmar, New York 12054 and Rural Water Supply,[2] 1966 edition, published by the Department of Health, both available for public inspection at the offices of the records access officer of the Department of Health, Empire State Plaza, Corning Tower, Albany, NY 12237, shall, in their entirety, be the basis upon which all plans and specifications for public water systems will be approved. The department may allow deviations from these standards in accordance with procedures and criteria established by the commissioner.

(c) The State may approve such plans or may require such modification which is deemed necessary to protect public health or safety. Application for plan approval shall be made on a form prescribed by the commissioner.

(d) A supplier of water shall receive the approval of the State before placing into service any public water system constructed under the requirement

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[1] See Appendix 5-A, infra.

[2] See Appendix 5-B, infra.

of this section. Application for placement into service shall be made on a form prescribed by the commissioner.

5-1.23 Reporting emergencies. (a) The supplier of water shall not take, use, or cause to be taken for use water from any emergency source or discontinue or alter disinfection or other treatment processes without first having notified by telephone or telegram, and received the approval of, the State. Upon receipt of such notification, the State shall advise the supplier of water and intereste local officials of the approved action or proposed action by the supplier of water to protect the public health during the emergency.

(b) The supplier of water must make State notification when he determine that the delivery of water is interrupted to a minimum of 25 individuals or fiv service connections, or to a minimum of one percent of the total number o individuals served or service connections, whichever is larger, for a period o four hours or more.

(c) A printed copy of this section shall be conspicuously posted in th office used by the supplier of water.

5-1.24 Approval of fluoridation of public water system. Fluorine compound shall not be added to a public water system until a written application has bee submitted to, and written approval is granted by, the State.

5-1.25 Disinfection of facilities. No spring basin, collecting basin, well infiltration gallery, water main, pumping station, standpipe or reservoir shal be placed in service following cleaning or repairs until it has been disinfecte in a manner approved by the commissioner.

5-1.26 Dewatering trenches. Repairs to the public water system shall be mad until the trench has been dewatered to a point below the mains, valves or othe structures. Every effort shall be made to prevent the entrance of foreig material and seepage into the public water system.

5-1.27 Adequacy of distribution system. The public water system shall b maintained and operated by the supplier of water to assure a minimum workin pressure of 20 pounds per square inch at ground level at all points in th distribution system. Measurement of pressure may be obtained from representativ points of use.

5-1.28 Blowoff facilties. All blowoff drains or discharge pipes connecte to the public water system should be terminated at points where these structure will not be subject to flooding or otherwise subject to contamination.

5-1.29 Pumping equipment. Pumping equipment of a public water system, fo water which is not subject to subsequent treatment, shall be so installed an operated as to prevent contamination of the public water system. Whenever primin is necessary, such pump shall be primed with water meeting the requirements o sections 5-1.50 and 5-1.51 of this Subpart.

5-1.30 Providing treatment for public water systems. (a) The supplier o water shall provide such treatment as necessary to deliver to the consumer a wate conforming to the requirements of this Subpart. Minimum treatment for a sourc of water supply shall be disinfection by chlorination or other disinfectio methods acceptable to the commissioner.

(b) Notwithstanding anything to the contrary contained in subdivision (a of this section, the commissioner is hereby authorized, upon the submission of written application therefore, to grant a waiver, renewable annually, to th disinfection rule established by this section for a ground water source provide that:

(1) the full-time public health officer or his designate representative having jurisdiction over the community water system of such ground water source recommends such waiver;

(2) the record of the bacteriological and physical characteristics fo the ground water source or sources demonstrates that they conformed to the MCLs of this Subpart, for the 12 months immediately preceding the date of applicatio for waiver; such record shall be established under procedures provided by th commissioner;

(3) a laboratory approved pursuant to Subpart 55-2 of Part 55 of thi Title, is used by the supplier of water to provide monitoring of drinking water quality and delivery of drinking water in conformity with this Subpart;

(4) an active cross-connection control program acceptable to th commissioner to prevent the backflow or entry of undesirable and toxic substances into the water distribution system is adopted and maintained by the supplier of water, and such cross-connection control program shall include the maintenanc of adequate distribution system pressures;

(5) appropriate watershed rules and regulations to protect such grou water source are adopted pursuant to the provisions of article 11 of the Public Health Law, updated as necessary, and administered by the supplier of water, or other watershed controls satisfactory to the commissioner are adopted, updat and administered;

(6) all water storage facilities are adequately protected pursuant to section 5-1.32 of this Subpart; and

(7) all sources of the water supply are properly located, constructed and effectively protected and maintained in a manner acceptable to t commissioner.

(c) Notwithstanding anything to the contrary contained in subdivision ([illegible]) of this section and based on compliance by the public water system with the requirements of subdivision (b) of this section, the State is hereby authorized upon submission of a written application to grant a waiver, renewable annually, to the disinfection rule established by this section for a ground water source which has been treated with or is presently treated with disinfection.

(d) Notwithstanding anything to the contrary contained in either subdivision (a) or subdivision (b) of this section, the State may waive the disinfection requirements of this section for a ground water source at a noncommunity water system or a community water system serving less than 50 dwelling units, based upon periodic evaluation of a sanitary survey and the geology of the area; the bacteriological, chemical and physical characteristics of the water; the location, construction and protection of the ground water source; and the method of water storage and distribution.

(e) When chlorine is used as the disinfectant, a free chlorine residual shall be maintained at representative points in the distribution system, unless otherwise approved by the commissioner. Representative chlorine residual analyses shall be performed and reported as required by the State.

5-1.31 Cross connection control. (a) The supplier of water shall protect the public water system, in accordance with procedures acceptable to the commissioner, by containing potential contamination within the premises of the user in the following manner:

(1) by requiring an acceptable air gap, reduced pressure zone device double check valve assembly or equivalent protective device acceptable to the commissioner consistent with the degree of hazard posed by any service connection

(2) by requiring the users of such connections to submit plans for the installation of protective devices to the supplier of water and the State fo approval; and

(3) by assuring that all protective devices be tested at least annually Records of such shall be made available to and maintained by the supplier o water. Such tests shall be conducted by certified backflow prevention devic testers pursuant to the following requirements.

(i) A "general tester" certification will be issued when the applican presents proof of satisfactory completion of a training course for testers o backflow prevention devices which has been approved by the department.

(ii) A "limited tester" certification will be issued when th applicant presents proof of employment by a manufacturer as its agent for th servicing, maintaining and testing of backflow prevention devices.

(iii) The department has the authority to require any person applyin for certification or renewal of certification as a certified tester of backflo prevention devices to take a written, oral or practical examination, if it deem such examinations to be reasonably necessary in determining the applicant' qualifications. The results of such examinations may be the sole basis fo approval or disapproval of an application for certification or renewal o certification.

(iv) At least three months prior to the expiration date of a curren certificate, both a general tester and a limited tester must submit proof tha they are still engaged in the activity represented by their current certification

(v) A certification will be suspended or revoked, upon due notice an an opportunity for a hearing thereon, for any of following reasons: submissio of false test reports for backflow prevention devices; proof that the person i no longer engaged in servicing, maintaining and testing backflow preventio devices; or failure to make application for recertification.

(b) The supplier of water should not allow a user to establish a separat source of water. However, if the user justifies the need for a separate sourc of water, the supplier of water shall protect the public water system from a use who has a separate source of water and does not pose a hazard as detailed subdivision (a) of this section in the following manner:

(1) by requiring the user to regularly examine the separate water sourc as to its quality;

(2) by approving the use of only those separate water sources which a properly developed, constructed, protected and found to meet the requirements sections 5-1.50 and 5-1.51 of this Subpart; and

(3) by filing such approvals with the State annually.

(c) All users of a public water system shall prevent cross-connections between

the potable water piping system and any other piping system within the premises.

5-1.32 Protection of equalizing and distribution reservoirs. Equalizing and distribution reservoirs which deliver water to the user without subsequent acceptable treatment shall be covered, or the water from an uncovered reservoir must be continuously disinfected in a manner acceptable to the State before being discharged to the distribution system.

5-1.33 Water supply emergency plans. (a) All water suppliers shall submit to the State a water supply emergency plan. The plan shall identify and outline the steps necessary to ensure that potable water is available during all phases of a water supply emergency.

(b) The water supply emergency plan shall include:

(1) The development of procedures for providing consumer notification during all phases of the water supply emergency.

(2) The development of criteria and procedures for determining and the subsequent reporting of critical water levels or safe yield of the source or sources of water.

(3) The identification of existing and future sources of water available during normal non emergency and water supply emergency conditions.

(4) The identification of all available water storage. Available water storage includes source, transmission and distribution system storage.

(5) The identification, capacity and location of existing inter-connections. Identification of additional inter-connections needed to provide potable water during a water supply emergency.

(6) The development of a specific action plan outlining all the step to be implemented, taken or followed during a water supply emergency, includi State notification, emergency notification rosters of key water supply personne with current telephone numbers both business and home, and follow-up corrective action to minimize the reoccurrence of an emergency.

(7) The identification and implementation of procedures for water conservation and water use restrictions to be put in place during a water suppl emergency.

(8) The identification of and the procedures for prioritization o potable water use during a water supply emergency.

(9) The identification and availability of emergency equipment neede during a water supply emergency.

(10) The development of criteria and procedures for determining an the subsequent reporting of the water supplier's capacity and ability to meet pea water demands and fire flow conditions concurrently.

(c) A vulnerability assessment shall be performed on the source or source of water supply, the public water system, disinfection stations and wate treatment plants to determine the vulnerability of these water supply component to a water supply emergency. The water supplier shall take whatever steps are necessary to ensure that potable water can be and is available during a water supply emergency.

(d) The water supplier, prior to the final submission of the water supply emergency plan to the State, shall publish a notice in a newspaper of general circulation in the area served by the community water system stating that the proposed water supply emergency plan is available for review and comment. The notice shall be printed at least once in each of two successive weeks. The water supplier shall accept public comment for at least fourteen days following the date of first publication. The water supplier shall submit all public comment with the water supply emergency plan to the State.

(e) The water supplier must submit the water supply emergency plan to the State by no later than December 31, 1990. The water supplier shall review, update and resubmit the water supply emergency plan every five years thereafter. The first revision is due no later than December 31, 1995.

(f) A community water system with an annual gross operating revenue of one hundred twenty-five thousand dollars or less, a non transient noncommunity water system and a noncommunity water system may be required to prepare, update and submit to the State an acceptable written water supply emergency plan for providing potable water during a water supply emergency.

PUBLIC WATER SYSTEMS; MAXIMUM CONTAMINANT LEVELS; MONITORING REQUIREMENTS; NOTIFICATIONS REQUIRED

5-1.50 Applicability and responsibility. The provisions of sections 5-1.50 and 5-1.51 of this Subpart shall apply to public water systems. The supplier of water of a public water system is responsible for completion of the sampling and analytical requirements set forth in such sections. At the discretion of the State, analyses performed by the State may be used for monitoring purposes.

5-1.51 Maximum contaminant levels. (a) The maximum contaminant level contained in Section 5-1.52, Tables 1 through 7, shall not be exceeded. In the case where a MCL is exceeded, notwithstanding anything to the contrary contained in section 5-1.12 of this Subpart, the supplier of water will take the necessary steps to comply with this section as deemed appropriate by the State to ensur the protection of the public health, including the undertaking of remedia feasibility studies and subsequent installation of a suitable treatment process Compliance with the MCLs shall be determined by the procedures contained in Table 1 through 7.

(b) The minimum monitoring requirements for each contaminant are indicate in Section 5-1.52, Tables 8 through 12.

(c) The notifications required whenever an MCL is violated or a monitorin requirement is not met, are indicated in Section 5-1.52, Table 13.

(d) Analyses to determine compliance with this section shall be made i accordance with the methods set forth in Standard Methods for the Examination o Water and Wastewater, current edition. Except for microbiological analysis, standard sample size shall be employed, with the standard sample used in th membrane filter procedure being 100 milliliters and in the multiple tub fermentation technique, being five times the standard portion of 10 milliliter and/or applicable procedures acceptable to the commissioner.

(e) Monitoring and reporting frequencies for specific contaminants may be established at State discretion whenever the State believes that a potential exists for an MCL violation or the contaminant may present a risk to public health.

(f) Notwithstanding anything to the contrary in subdivision (a) of this section the commissioner may recommend values lower than the MCLs if sufficient valid information based on commonly accepted scientific standards and principles demonstrates an increased public health concern. Within one year from the date of such recommendation, the State shall hold a public hearing regarding the justification for the lower value, and whether a new MCL is warranted.

(g) Notwithstanding anything to the contrary in section 5-1.52 the commissioner may in specific cases except specific organic chemicals from the MCLs for general organic chemicals if the supplier of water can demonstrate that sufficient valid scientific information exists to show that the organic chemical does not pose an unreasonable risk to human health, the organic chemical is present at a level and under circumstances not indicative of contamination, and the cost of compliance is unreasonable in light of the risk to human health.

(h) Notwithstanding anything to the contrary in Section 5-1.52, the commissioner may, based upon receipt and review of a justification submitted by the supplier of water, allow a higher MCL for a period of up to 60 days following application of a paint or lining to a potable water structure, if he determines that an unreasonable risk to human health does not exist.

5-1.52 Tables

TABLE 1-INORGANIC CHEMICALS AND PHYSICAL CHARACTERISTICS MAXIMUM CONTAMINANT LEVEL DETERMINATION

Contaminants	MCL (milligrams per liter)	Determination of MCL violation
Primary		
Arsenic	0.05	If the results of a monitoring sample analysis exceed the MCL, the supplier of water shall collect three more samples from the same sampling point within 30 days or as soon as practical. An MCL violation occurs when the average[1] of the four results exceeds the MCL.
Barium	1.00	
Cadmium	0.01	
Chromium	0.05	
Lead	0.05	
Mercury	0.002	
Selenium	0.01	
Silver	0.05	
Fluoride	2.2	
Secondary		
Chloride	250.0	
Copper	1.0	
Corrosivity	Noncorrosive[4]	
Iron	0.3[2]	
Manganese	0.3[2]	
Sodium	No designated limits[3]	
Sulfate	250.0	
Zinc	5.0	
Color	15 Units	
Odor	3 Units	

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[1] Rounded to the same number of significant figures as the MCL for the substance in question.

[2] If iron and manganese are present, the total concentration of both should not exceed 0.5 mg/l. Higher levels may be allowed when justified by the supplier of water.

[3] Water containing more than 20 mg/l of sodium should not be used for drinking by people on severely restricted sodium diets. Water containing more than 270 mg/l of sodium should not be used for drinking by people on moderately restricted sodium diets.

TABLE 1-INORGANIC CHEMICALS AND PHYSICAL CHARACTERISTICS MAXIMUM CONTAMINANT LEVEL DETERMINATION (Con't)

Corrosivity shall be determined by the calcium carbonate saturation method or other method acceptable to the commissioner. Corrosive water may be allowed by the State based on justification submitted by the supplier of water which shall include, but not be limited to:

a. data concerning increases in metal concentration of point of use water as compared to source water metal content;

b. distribution water quality characteristics such as calcium, hardness, alkalinity, total dissolved solids, and pH;

c. documentation of the lack of complaints of potential adverse effects; and

d. a report summarizing, for at least a period of one year, the above.

TABLE 2. ..TRATE
MAXIMUM CONTAMINANT LEVEL DETERMINATION

Contaminant	MCL	Determination of MCL violation
Nitrate (as N)	10.0 mg/l[1]	If the results of a monitoring sample analysis exceed the MCL, the supplier of water shall collect another sample from the same sampling point, within 24 hours of the receipt of results or as soon as practical. An MCL violation occurs when the average of the two results exceeds the MCL.

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[1] An MCL of 20 mg/l may be permitted at a noncommunity water system if the supplier of water demonstrates that:

a. the water will not be available to children under six months of age;

b. notice that nitrate levels exceed 10 mg/l and the potential health effects of exposure will be continuously posted in a conspicuous location;

c. local and State public health authorities will be notified annually of nitrate levels that exceed 10mg/l; and

d. no adverse health effects shall result.

TABLE 3-ORGANIC CHEMICALS
MAXIMUM CONTAMINANT LEVEL DETERMINATION

Contaminant	MCL	Type of water system	Determination of MCL violation
Pesticides/Herbicides[3]			
Endrin	0.0002 mg/l	Community and Noncommunity	If the results of a monitoring sample analysis exceed the MCL, the supplier of water shall collect three more samples from the same sampling point, as soon as practical, but within 30 days. An MCL violation occurs when the average of the four sample results exceeds the MCL.
Lindane	0.004 mg/l		
Methoxychlor	0.05 mg/l[4]		
Toxaphene	0.005 mg/l		
2,4-D	0.05 mg/l[4]		
2,4,5-TP Silvex	0.01 mg/l		
General Organic Chemicals			
Principal organic contaminant (POC)	0.005 mg/l[4]	Community and Noncommunity	If the results of a monitoring sample analysis exceed the MCL, the supplier of water shall collect one to three more samples from the same sampling point, as soon as practical, but within 30 days. An MCL violation occurs when at least one of the confirming samples is positive and the average of the initial sample and all confirming samples exceeds the MCL.
Unspecified organic contaminant (UOC)	0.05 mg/l[4]		
Total POCs and UOCs	0.1 mg/l[4]		
Vinyl chloride	0.002 mg/l[4]		
Trihalomethanes[2]			
Total trihalomethanes	0.10 mg/l[1]	Community	The results of all analyses per quarter must be arithmetically averaged and must be reported to the State within 30 days of the public water system's receipt of the analyses. A violation occurs if the average of the four most recent sets of quarterly samples (12-month running average) exceeds the MCL.
		Noncommunity	Not applicable.

TABLE 3-ORGANIC CHEMICALS
MAXIMUM CONTAMINANT LEVEL DETERMINATION (Con't)

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1. Effective one year after commencing sampling according to the minimum monitoring requirements.

2. The State may require a supplier of water to monitor for maximum total trihalomethane potential at a frequency specified by the State.

3. Pesticides/Herbicides:

   Endrin (1,2,3,4,10,hexachloro-6,7,-epoxy-1,4,4a,5,-6,7,8,8a octahydro-1,4-endo,endo-5,8-dimethano naphthalene).

   Lindane (1,2,3,4,5,6-hexachloro-cyclohexane, gamma isomer).

   Methoxychlor (1,1,1-Trichloro-2, 2-bis p-methoxyphenyl ethane).

   Toxaphene ($C_{10}H_{10}Cl_8$ -technical chlorinated camphene, 67-69 percent chlorine).

   2,4-D (2,4-dichlorophenoxyacetic acid).

   2,4,5-TP Silvex (2,4,5-trichlorophenoxypropionic acid).

4. The effective date of the MCL is January 9, 1989.

TABLE 4-ENTRY POINT TURBIDITY
MAXIMUM CONTAMINANT LEVEL DETERMINATION

Contaminant	MCL	Determination of MCL violation
Entry point turbidity (surface water only)	1 NTU [1] [2] [3] [4] (Monthly Average)	A violation occurs when the average of all daily entry point analyses for the month exceeds the MCL (rounded off to the nearest whole number).
	5 NTU [2] [3] [4] (Two-consecutive-day average)	A violation occurs when the average of two consecutive daily entry point analyses exceeds the MCL (rounded off to the nearest whole number).

1. The commissioner may establish a monthly average entry point turbidity MCL of 5 NTU based on justification submitted by the supplier of water. Such justification shall demonstrate that the higher turbidity does not:

   a. interfere with disinfection;

   b. prevent maintenance of a minimum of 0.2mg/l free chlorine residual at representative points within the distribution systems; or

   c. interfere with microbiological determinations, and substantiate why meeting a 1 NTU level is not feasible.

2. If the daily entry point analysis exceeds 1 NTU for a system with a monthly average MCL of 1 NTU or if a daily entry point analysis exceeds 5 NTU for a system with a monthly average MCL of 5 NTU, a repeat sample must be taken as soon as practicable and preferable within one hour. If the repeat sample exceeds 1 NTU for a system with a monthly average MCL of 1 NTU or 5 NTU the supplier of water must make State notification. The repeat sample must be used for the monthly average and the two consecutive day average.

3. NTU = Nephelometric Turbidity Units

4. If the two consecutive day average exceeds the MCL, the supplier of water shall analyze for microbiological contamination at a point downstream of the first consumer, but as close to the first consumer as is feasible. The additional microbiological sample should be taken within one hour as soon as feasible after determining the two consecutive day average. The supplier of water shall report the result of this microbiological analysis to the State within 48 hours of obtaining the result. The result of this analysis shall not be used for monitoring purposes.

SUBPART 5-5

WATER QUALITY TREATMENT DISTRICTS

CHAPTER I STATE SANITARY CODE

PART 5
DRINKING WATER SUPPLIES
(Statutory Authority: Public Health Law §225)

SUBPART 5-5
WATER QUALITY TREATMENT DISTRICTS

VARIANCES AND EXEMPTIONS

5.1-90 Variance from a maximum contaminant level. (a) The supplier of water may request, and the commissioner may grant, one or more variances from an MCL contained in sections 5-1.51 and 5-1.52 Tables 1 through 7 of this Subpart to any public water system based upon a finding that:

(1) because of characteristics of the raw water sources which are reasonably available to it, the public water system cannot meet the requirements respecting such MCL despite application of the best technology, treatment techniques or other means which are generally available, taking costs into consideration; and

(2) the granting of a variance will not result in an unreasonable risk to health.

(b) Within one year after the granting of the variance, the commissioner shall prescribe, and the supplier of water shall follow, a schedule for:

(1) compliance, including increments of progress, to meet each MCL covered by the variance; and

(2) implementation of such control measures as the commissioner may require.

5-1.91 Variance from required use of any specified treatment technique. (a) The supplier of water may request, and the commissioner may grant, one or more variances from the required use of any specified treatment technique contained in this Subpart upon a finding that such treatment technique is not necessary to protect the health of persons served by the public water system because of the nature of the raw water source or sources of such systems.

(b) As a condition to the grant of a variance under subdivision (a) of the section, the supplier of water shall perform monitoring and other requirements as prescribed by the commissioner.

(c) Notwithstanding subdivisions (a) and (b) of this section, section 5-1.30 of this Subpart shall govern the conditions under, and the manner in which a waiver of mandatory disinfection treatment for a ground water source may be granted.

5-1.92 Exemption from a maximum contaminant level or any treatment technique requirement. (a) The supplier of water may request, and the commissioner may grant, one or more exemptions from an MCL or any treatment technique requirement, or both, contained in this Subpart to any public water system based upon a finding that:

(1) due to compelling factors (which may include economic factors), the public water system is unable to comply with such MCL or treatment technique requirement;

(2) the public water system was in operation on the effective date of such MCL or treatment technique requirement; and

(3) the granting of an exemption will not result in an unreasonable risk to health.

5-1.75 Additional sampling requirements. (a) Additional water samples for any contaminant shall be collected and analyzed from any public water system by the supplier of water as may be required by the State, to assure adequate control of the quality of the public water system.

(b) The State may collect and analyze water samples from any public water system at any time, either by its own personnel or by contract with others.

5-1.76 Monitoring of consecutive public water systems. When a public water system supplies water to one or more other public water systems, the State may modify the monitoring requirements of this Subpart when the circumstances justify treating them as a single system for monitoring purposes. Any modified monitoring shall be conducted pursuant to a schedule acceptable to the State.

5-1.77 Public health hazard notification. (a) Notwithstanding anything to the contrary contained in sections 5-1.12, 5-1.23, 5-1.51 and 5-1.52 Table 13 of this Subpart, the supplier of water shall make State notification when a condition exists that may constitute a public health hazard.

(b) Notwithstanding anything to the contrary contained in sections 5-1.12, 5-1.23, 5-1.51and 5-1.52 Table 13 of this Subpart, the supplier of water shall make public notification when, upon the determination and at the direction of the commissioner, a condition exists which constitutes a public health hazard.

(c) Notwithstanding anything to the contrary contained herein, community water systems and non transient noncommunity water systems shall, prior to June 19, 1988, make public or consumer notification concerning the contaminant lead. The notification shall contain specific language and information prescribed in 40 CFR 141.34, as published in the Federal Register, Volume 52, page 41534, No. 208, Wednesday, October 28, 1987. A copy is available for inspection and copying at the offices of the record access officer of the Department of Health, Corning Tower, Empire State Plaza, Albany, NY 12237. Public or consumer notification concerning the contaminant lead after June 19, 1988 shall be at the discretion of the State.

5-1.78 Multiple distribution systems. A water supply system or facility with multiple distribution systems on separate sources of water supply shall be considered a single public water supply if all the following conditions are met:

(a) The separate sources are the same source type, with:

(1) the ground water sources located in the same aquifer area; or

(2) the surface water intakes located in the same water body and the intakes at the same approximate depth and location;

(b) The water supply system or facility is owned and operated by the same person(s);

(c) The water supply system or facility is operated for the same purposes and for the same time period; and

(d) The water supply system or facility serves 25 or more people or five or more service connections.

(e) If no timely request for hearing is submitted and the commissioner does not determine to hold a public hearing on his own motion, the proposed variance or schedule prescribed pursuant to the granting of a variance or exemption shall become effective 30 days after notice of opportunity for hearing is given pursuant to subdivision (c) of this section. If a public hearing is held, the commissioner shall take appropriate action with respect to such proposed variance or schedule within 30 days after termination of the public hearing.

5-1.96 Enforceability of final schedule prescribed pursuant to granting of variance or exemption. Once a schedule prescribed pursuant to the granting of a variance under section 5-1.90 or an exemption under section 5-1.92 of this Subpart has become final pursuant to subdivision (e) of section 5-1.94 of this Subpart, the conditions or requirements of any such schedule shall be enforceable, upon the application of the commissioner, by any court of competent jurisdiction in the same manner as an order of the commissioner under section 1107 of the Public Health Law.

5-1.100 Separability. If any provisions of this Part are held invalid, such invalidity shall not affect other provisions which can be given effect without the invalid provisions.

(b) Within one year after the granting of the exemption, the commissioner shall prescribe, and the supplier of water shall follow, a schedule for:

(1) compliance, including increments of progress, to meet the MCL or treatment technique requirement covered by the exemption; and

(2) implementation of such control measures as the commissioner may require.

(c) Such schedule prescribed by the commissioner pursuant to subdivision (b) of this section shall require compliance with each MCL or treatment technique requirement by no later than January 1, 1984, or seven years after the effective date of any revised MCL or treatment technique requirement mandated by the revised national primary drinking water regulations.

(d) Notwithstanding subdivision (c) of this section, if the public water system has entered into an enforceable agreement to become part of a regional public water system, such schedule prescribed by the commissioner pursuant to subdivision (b) of this section shall require compliance with each MCL or treatment technique requirement by no later than January 1, 1986, or nine years after the effective date of any revised MCL or treatment technique requirement mandated by revised national primary drinking water regulations.

5-1.93 Variance or exemption requests. All requests for a variance or an exemption shall be in a form prescribed by and submitted in writing to the commissioner. Suppliers of water may submit a joint request for variances or exemptions when they seek similar variances or exemptions under similar circumstances. The commissioner shall act on any request for a variance or an exemption submitted pursuant to section 5-1.90, 5-1.91 or 5-1.92 of this Subpart within 90 days of receipt of the request.

5-1.94 Notice and opportunity for public hearing. (a) Before a variance proposed to be granted by the commissioner under section 5-1.90 or 5-1.91 of this Subpart may take effect, the commissioner shall provide notice and opportunity for public hearing on the proposed variance. A notice given pursuant to the preceding sentence may cover the granting of more than one variance and a hearing held pursuant to such notice shall include each of the variances covered by the notice.

(b) Before a compliance or implementation schedule prescribed by the commissioner pursuant to the granting of a variance under section 5-1.90 or an exemption under section 5-1.92 of this Subpart may take effect, the commissioner shall provide notice and opportunity for public hearing on the proposed compliance or implementation schedule, or both. A notice given pursuant to the preceding sentence may cover the proposal of more than one such schedule and a hearing hel pursuant to such notice shall include each of the schedules covered by the notice

(c) Public notice of an opportunity for hearing pursuant to subdivision (a or (b) of this section shall be circulated in a manner designated to infor potentially interested persons of the proposed action. Requests for hearing mus be submitted to the commissioner within 15 days after issuance of such publi notice.

(d) Notice of public hearings to be held pursuant to request submitted b an interested person or on the commissioner's own motion shall be given not les than 15 days prior to the time scheduled for the hearing, in a form and manne to be prescribed by the commissioner. Notices of public hearing shall b circulated in a manner designed to inform interested persons of the hearing.

OPERATION AND QUALITY CONTROL

5-1.70 Applicability. Sections 5-1.70 through 5-1.78 of this Subpart shall be applicable to public water systems.

5-1.71 Protection and supervision of public water systems. (a) The supplier of water and the person or persons operating a public water system shall exercise due care and diligence in the maintenance and supervision of all sources of the public water systems so as to prevent, so far as possible, their pollution and depletion.

(b) The supplier of water and the person or persons operating a water treatment plant or distribution system shall exercise due care and diligence in the operation and maintenance of these facilities and their appurtenances to ensure continued compliance with the provisions of this Subpart. Facilities approved by the State shall be operated in general accordance with their design unless otherwise authorized under the provisions of section 5-1.22 or 5.1.23 or 5-1.24 of this Subpart.

5-1.72 Operation of a public water system. (a) The supplier of water and the person or persons in charge of the operation of a public water system shall operate and maintain the public water system in such a manner as to meet the requirements of this Subpart.

(b) The person or persons in charge of operation of a community water system shall be certified pursuant to Subpart 5-4 of this Part.

(c) Complete daily records shall be kept of the operation of a public water system on forms furnished or approved by the commissioner. A copy of such records shall be forwarded to the State by the 10th calendar day of the next reporting period. These records shall include the results of all tests, measurements or analysis required to be made by this Subpart or as requested by the State. Other operational records shall be available for inspection by the State.

(d) Any supplier of water of a public water system, subject to the provisions of this Subpart, shall retain at a convenient location the following records:

(1) Records of bacteriological analyses made pursuant to this Subpart shall be retained for at least five years and records of chemical analyses made pursuant to this Subpart shall be retained for at least 10 years. Actual laboratory reports may be kept, or data may be transferred to tabular summaries provided that the following information is included:

(i) the date, place and time of sampling, and the name of the person who collected the sample;

(ii) identification of the sample as to whether it was a routine distribution point sample, check sample, raw or process water sample or other special purpose sample;

(iii) date of analyses;

(iv) laboratory and person responsible for performing the analysis;

(v) the analytical technique or method used; and

(vi) the results of the analysis.

TABLE 13-REQUIRED NOTIFICATIONS (Con't)

1. The need and method of public and consumer notification are at the discretion of the State based on specific criteria developed by the commissioner.

2. When a supplier of water is either granted a variance or exemption, or fails to comply with the requirements of a variance or exemption compliance schedule, the supplier of water shall make consumer notification.

3. The State shall be notified if the sodium level exceeds 20 mg/l, and consumer notification performed if the sodium level exceeds 270 mg/l.

4. Each public water system shall notify its consumers of the availability of the initial sample result or results by including a notice in the first water bill issued by the system following receipt of the sample result or results or provide written notice to the consumers within three months whichever is sooner. The notice shall identify a contact person and telephone number to contact for information regarding the sample result or results.

(2) Records of action taken by the supplier of water to correc violations of the requirements of this Subpart shall be retained for at leas three years.

(3) Copies of any written reports, including summaries o communications relating to sanitary surveys of the public water system shall b retained for at least 10 years.

(4) Records concerning a variance or exemption granted to the publi water system shall be retained for at least five years following the expiratio of such variance or exemption.

(5) Copies of these records or appropriate data summaries shall b provided to any consumer of the public water system within 15 days upon writte request by a consumer. The supplier of water may require prepayment of a fee t cover the cost of handling and reproduction of the records and data summarie requested.

(e) Community water systems must report to the state annual gross operatin revenue figures. The figures are to be reported, to the State, by December 3 of each year.

(f) Each community water system with an annual gross operating revenue i excess of one hundred twenty-five thousand dollars and located in a county wit a population of one million two hundred fifty thousand or more which is not wholl contained within a city, shall prepare and provide an annual water suppl statement to the customers it serves. Such statement shall contain suc information as is required in this subdivision as well as any additiona information required by the commissioner. Additionally, the statement shal provide a section which explains, in plain language, the information required i the statement. The annual water supply statement shall include the followin items of information:

(1). A brief description on the source or sources of water supply and th general qualitative and quantitative condition of the water source or sources.

(2). The population served.

(3). An accounting of the total annual amount of water withdrawn, delivere and lost from the system.

(4). The analytical testing results for point of use samples for tho contaminants required to be tested for under this Subpart or as required by t State and for source or sources of water supply samples, except f microbiological results. The analytical results of samples collected from t source or sources of water supply may be placed in a supplement to the annual wat supply statement. The supplement need not be included in the copy of t statement provided to each customer. Where more than one analysis per year conducted on a specific contaminant, the water supplier shall list the highe and lowest results, the mean, and the number of samples taken during the reporti period. The applicable state guideline or MCL for each contaminant present sha be listed and any instance where a state guideline or MCL is violated shall noted. For microbiological analyses the water supplier shall indicate a instance where the water supply violated the MCL. The date or dates of violatic the location where the violation occurred,and the response of the community wat system shall be listed.

(5). A brief description of the types of treatment that the water received before entering the distribution system.

(6). A brief description of any water source restricted, removed from service, or otherwise limited in its use and any actions taken to secure new supplies or replace lost capacity.

(7). Information on water conservation measures customers can implement such as, but not limited to, retrofitting plumbing fixtures, altering irrigation timing, using irrigation sensors, leak detection, proper use of water-conserving appliances, daily conscientious use of water, and the estimated savings in water and energy or money from the use of such measures.

(8). Major modifications completed by the water system during the reporting period to include a brief description of each and its effect on the water system, and a discussion of capital improvements needed or planned.

(9). A statement on the annual average charge for water, either in terms of annual charge per average resident user or annual charge per one thousand (1,000) gallons of water delivered.

(g) The annual water statement shall either be mailed to each customer or published in at least one newspaper of general circulation in the area served by the community water system. If the statement is to be published in a newspaper, it shall be published in a notice at least one half page in size, and the water supplier shall provide ample notification by announcing the publication date and newspaper name either on the customers bill or in the newspaper in which the statement shall appear. If a supplement is prepared, the statement must contain a notice that the source or sources of water supply analytical testing results are contained in a supplement and that the supplement is available to the customer upon request. A limited number of additional copies of the statement and the supplement, if a supplement is prepared, in a quantity to be determined by the water supplier, shall be provided to customers upon request.

(h) One copy of each annual water supply statement and the supplement, if a supplement is prepared, shall be provided to the State and the commissioner of environmental conservation.

(i) The annual water supply statement and the supplement, if a supplement is prepared, shall be mailed or published on or before the thirty-first day of March of each year and shall apply to data received by the community water system during the preceding calendar year.

5-1.73 Water treatment plant laboratory. Every supplier of water shall provide or have available, laboratory facilities satisfactory to the commissioner. Tests for the control of the operation of such public water system shall be made daily or more frequently as required by the State. The results of such tests shall be recorded on forms pursuant to subdivision (d) of section 5-1.72 of this Subpart.

5-1.74 Approved laboratories. For the purpose of determining compliance with the Subpart, results of analyses may be considered only if they have been performed by a laboratory approved in accordance with Subpart 55-2 of Part 55 of the administrative rules and regulations of the department (10 NYCRR Part 55, Subpart 55-2). However, measurements for turbidity and chlorine residual may be performed by any person acceptable to the State.

TABLE 13-REQUIRED NOTIFICATIONS (Con't)

Contaminant	Type of water system	Single sample exceeds MCL	MCL violation[1]	Failure to meet monitoring requirements and/ or failure to use applicable testing procedure	Variance or exemption in effect[2]	Failure to meet requirements of a variance or exemption schedule
Coliform bacteria	Community	Not applicable	State Consumer Public	State Consumer	Not applicable	Not applicable
	Noncommunity	Not applicable Community	State Community	State	Not applicable	Not applicable
Entry point turbidity	Community	State	State Consumer Public	State Consumer	Not applicable	Not applicable
	Noncommunity	State	State Consumer	State Consumer	Not applicable	Not applicable
Distribution point turbidity	Community	Not applicable	State	State	Not applicable	Not applicable
	Noncommunity	Not applicable	State	State	Not applicable	Not applicable
Combined radium-226 and radium-228	Community	State	State Consumer Public	State Consumer	Consumer	Consumer
	Noncommunity	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Gross alpha particle activity	Community	State	Not applicable	State	Not applicable	Not applicable
	Noncommunity	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Beta particle and photon activity (manmade)	Community	State	State Consumer Public	State Consumer	Consumer	Consumer
	Noncommunity	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable

TABLE 13-REQUIRED NOTIFICATIONS (Con't)

Contaminant	Type of water system	Single sample exceeds MCL	MCL violation[1]	Failure to meet monitoring requirements and/ or failure to use applicable testing procedure	Variance or exemption in effect[2]	Failure to meet requirements of a variance or exemption schedule
Endrin Lindane Methoxychlor Toxaphene 2,4-D 2,4,5-TP Silvex	Community	State	State Consumer Public	State Consumer	Consumer	Consumer
	Noncommunity	State	State Consumer	State	Consumer	Consumer
Principal Organic Contaminant[4]	Community	State	State Consumer Public	State Consumer	Consumer	Consumer
Unspecified Organic Contaminant[4]	Noncommunity	State	State Consumer	State	Consumer	Consumer
Total POCs and UOCs[4]						
Vinyl chloride[4]						
Total trihalomethanes	Community	Not applicable	State Consumer Public	State Consumer	Consumer	Consumer
	Noncommunity	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable

TABLE 13-REQUIRED IFICATIONS

ontaminant	Type of water system	Single sample exceeds MCL	MCL violation[1]	Failure to meet monitoring requirements and/ or failure to use applicable testing procedure	Variance or exemption in effect[2]	Failure to meet requirements of a variance or exemption schedule
rsenic arium admium hromium ead ercury elenium ilver luoride	Community	State	State Consumer Public	State Consumer	Consumer	Consumer
	Noncommunity	State	State Consumer	State	Consumer	Consumer
itrate	Community	State	State Consumer Public	State Consumer	Consumer	Consumer
	Noncommunity	State	State Consumer	State	Consumer	Consumer
loride pper on nganese lfate nc lor rrosivity lor	Community	State	State	State	Consumer	Consumer
	Noncommunity	State	State	State	Consumer	Consumer
dium[3]	Community	State	State/ Consumer	State	Not applicable	Not applicable

TABLE 12-RADIOLOGICAL
MINIMUM MONITORING REQUIREMENTS (Con't)

If the concentration of radium-226 exceeds three picocuries per liter, the same or an equivalent sample shall be analyzed for radium-228.

2. The State may permit the substitution of the analysis of a single sample for quarterly sampling when the average annual concentration is less than one half of the MCL.

3. The State may require suppliers of water to conduct annual monitoring when the radium -226 concentration exceeds three picocuries.

4. If the average annual MCL for gross alpha particle activity or total radium is exceeded, monitoring at quarterly intervals shall be continued until the annual average concentration no longer exceeds the MCL, or until a monitoring schedule as a condition to a variance, exemption or enforcement action is effective.

5. Monitoring compliance may be assumed without further analysis if the average annual concentration of gross beta particle activity is less than 50 picocuries per liter and if the average annual concentration of tritium is less than 20,000 picocuries per liter and the average annual concentration of strontium-90 is less than 8 picocuries per liter provided that if both radionuclides are present, the sum of their annual dose equivalents to bone marrow shall not exceed four millirems per year.

6. If the gross bets particle activity exceeds 50 picocuries per liter, an analysis of the sample must be performed to identify the major radioactive constituents present and the appropriate organ and total body doses shall be calculated to determine compliance.

7. When the State determines that a community water system is using water contaminated by effluents from nuclear facilities, the supplier of water shall initiate quarterly monitoring for gross beta particle and iodine-131 radioactivity and annual monitoring for strontium-90 and tritium.

TABLE 12-RADIOLOGICAL
MINIMUM MONITORING REQUIREMENTS

Contaminant	Type of water system	Source type All
Combined radium-226 and radium-228 and gross alpha particle activity	Community	Once every four years, an annual composite of quarterly samples; or four quarterly samples must be obtained. [1] [2] [3] [4]
	Noncommunity	Not Applicable

		Source type	
		Ground water only	Surface only or Surface and ground water
Beta particle and photon radioactivity from manmade radionuclides	Community serving over 100,000 people	State discretion[7]	Once every four years, an annual composite of quarterly samples; or four quarterly samples must be obtained.[5] [6]
	Community serving 100,000 or fewer people	State discretion[7]	State discretion[7]
	Noncommunity	Not Applicable	Not Applicable

Gross alpha particle activity measurement may be substituted for the required radium-226 and radium -228 analysis, provided that the measured gross alpha particle activity does not exceed five picocuries per liter at a confidence level of 95 percent (1.65 sigma where sigma is the standard deviation of the net counting rate of the sample). When the gross alpha particle activity exceeds five picocuries per liter, the same or an equivalent sample shall be analyzed for radium-226.

TABLE 11-MICROBIOLOGICAL
MINIMUM MONITORING REQUIREMENTS (Con't)

Contaminant	Type of Water system	Number of samples based on population[2]			
		Population served:	Minimum number of samples per month	Population served:	Minimum number of samples per month
		37,001 to 41,000	45	2,060,001 to 2,270,000	410
		41,001 to 46,000	50	2,270,001 to 2,510,000	420
		46,001 to 50,000	55	2,510,001 to 2,750,000	430
		50,001 to 54,000	60	2,750,001 to 3,020,000	440
		54,001 to 59,000	65	3,020,001 to 3,320,000	450
		59,001 to 64,000	70	3,320,001 to 3,620,000	460
		64,001 to 70,000	75	3,620,001 to 3,960,000	470
		70,001 to 76,000	80	3,960,001 to 4,310,000	480
		76,001 to 83,000	85	4,310,001 to 4,690,000	490
		83,001 to 90,000	90	4,690,001 or more	500
	Noncommunity	Collect and analyze one sample quarterly. Monitoring may be increased at State discretion.[3]			

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1. If chlorine is used as the disinfectant, a free chlorine residual determination shall be made at the same time and location as the microbiological sample.

2. The State may permit a community water system, serving 1,000 or fewer people, to reduce the sampling frequency to not less than one sample per quarter based on justification submitted by the supplier of water.

3. State discretion shall mean requiring monitoring when the State has reason to believe the MCL has been violated, the potential exist for an MCL violation or the contaminant may present a risk to public health.

TABLE 11-MICROBIOLOGICAL
MINIMUM MONITORING REQUIREMENTS

		Number of samples based on population[2]			
Contaminant	Type of Water system	Population served:	Minimum number of samples per month	Population served:	Minimum number of samples per month
Microbiological[1]	Community	Up to 1000	1	90,001 to 96,000	95
		1,001 to 2,500	2	96,001 to 111,000	100
		2,501 to 3,300	3	111,001 to 130,000	110
		3,301 to 4,100	4	130,001 to 160,000	120
		4,101 to 4,900	5	160,001 to 190,000	130
		4,901 to 5,800	6	190,001 to 220,000	140
		5,801 to 6,700	7	220,001 to 250,000	150
		6,701 to 7,600	8	250,001 to 290,000	160
		7,601 to 8,500	9	290,001 to 320,000	170
		8,501 to 9,400	10	320,001 to 360,000	180
		9,401 to 10,300	11	360,001 to 410,000	190
		10,301 to 11,100	12	410,001 to 450,000	200
		11,101 to 12,000	13	450,001 to 500,000	210
		12,001 to 12,900	14	500,001 to 550,000	220
		12,901 to 13,700	15	550,001 to 600,000	230
		13,701 to 14,600	16	600,001 to 660,000	240
		14,601 to 15,500	17	660,001 to 720,000	250
		15,501 to 16,300	18	720,001 to 780,000	260
		16,301 to 17,200	19	780,001 to 840,000	270
		17,201 to 18,100	20	840,001 to 910,000	280
		18,101 to 18,900	21	910,001 to 970,000	290
		18,901 to 19,800	22	970,001 to 1,050,000	300
		19,801 to 20,700	23	1,050,001 to 1,140,000	310
		20,701 to 21,500	24	1,140,001 to 1,230,000	320
		21,501 to 22,300	25	1,230,001 to 1,320,000	330
		22,301 to 23,200	26	1,320,001 to 1,420,000	340
		23,201 to 24,000	27	1,420,001 to 1,520,000	350
		24,001 to 24,900	28	1,520,001 to 1,630,000	360
		24,901 to 25,000	29	1,630,001 to 1,730,000	370
		25,001 to 28,000	30	1,730,001 to 1,850,000	380
		28,001 to 33,000	35	1,850,001 to 1,970,000	390
		33,001 to 37,000	40	1,970,001 to 2,060,000	400

TABLE 10-TURBIDITY
MINIMUM MONITORING REQUIREMENTS

Contaminant	Type of water system	Source type	
		Groundwater only	Surface only or Surface and groundwater
Entry point turbidity	Community	State discretion[1]	Collect and analyze one sample per day from each entry point. All results must be recorded to two significant figures.
	Noncommunity	State discretion[1]	Collect and analyze one sample annually. Monitoring requirement must be increased at State discretion.[1]
Distribution system turbidity	Community	State discretion[1]	Five distribution samples each week unless otherwise determined by the State. No two samples may be obtained on the same day and no two samples are to be collected from the same distribution point during the week. For systems with a 5 NTU monthly average entry point turbidity MCL, a free chlorine residual must be obtained whenever a turbidity sample is collected.
	Noncommunity	State discretion[1]	State discretion[1]

[1] State discretion shall mean requiring monitoring when the State has reason to believe the MCL has been violated, the potential exists for an MCL violation or the contaminant may present a risk to public health.

TABLE 9A-ORGANIC CHEMICALS
MONITORING REQUIREMENTS (Con't)

ontaminant	Specific Contaminants for Analysis
OCs	benzene bromobenzene bromochloromethane bromomethane n-butylbenzene sec-butylbenzene tert-butylbenzene carbon tetrachloride chlorobenzene chloroethane chloromethane 2-chlorotoluene 4-chlorotoluene dibromomethane 1,2-dichlorobenzene 1,3-dichlorobenzene 1,4-dichlorobenzene dichlorodifluoromethane 1,1-dichloroethane 1,2-dichloroethane 1,1-dichloroethene cis-1,2-dichloroethene trans-1,2-dichloroethene 1,2-dichloropropane 1,3-dichloropropane 2,2-dichloropropane 1,1-dichloropropene cis-1,3-dichloropropene trans-1,3-dichloropropene ethylbenzene hexachlorobutadiene isopropylbenzene p-isopropyltoluene methylene chloride n-propylbenzene styrene 1,1,1,2-tetrachloroethane 1,1,2,2-tetrachloroethane tetrachloroethene toluene 1,2,3-trichlorobenzene 1,2,4-trichlorobenzene 1,1,1-trichloroethane 1,1,2-trichloroethane trichloroethene trichlorofluoromethane 1,2,3-trichloropropane 1,2,4-trimethylbenzene 1,3,5-trimethylbenzene m-xylene o-xylene p-xylene

TABLE 9-ORGANIC CHEMICALS
MINIMUM MONITORING REQUIREMENTS (Con't)

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12. The vulnerability of each public water system shall be determined, by the State, based on an assessment of the following factors:

    a. previous monitoring results;

    b. number of persons served by the public water system;

    c. proximity of a smaller system to a larger system;

    d. proximity to commercial or industrial use, disposal or storage of volatile synthetic organic chemicals; and

    e. the degree of protection afforded the source of water supply.

TABLE 9-ORGANIC CHEMICALS
MINIMUM MONITORING REQUIREMENTS (Con't)

1. At least 25 percent of the quarterly samples must be obtained at distribution points reflecting maximum residence time; the remaining samples must be taken at representative distribution points. All samples for a quarter must be obtained on the same day.

2. The State may reduce the total trihalomethane monitoring frequencies at systems which do not exceed the MCL, in accordance with criteria acceptable to the commissioner.

3. The State may require a supplier of water to monitor for maximum total trihalomethane potential at a frequency specified by the State.

. State discretion shall mean requiring monitoring when the State has reason to believe the MCL has been violated, the potential exists for an MCL violation or the contaminant may present a risk to public health.

. Analysis according to EPA methods 502.1, 503.1, 524.1, 524.2 or 502.2 for the POCs listed on Table 9A, at a detection limit not to exceed 0.0005 mg/l. In addition, all community water systems with ground water sources and serving more than 149 service connections must analyze a sample according to EPA Method 504 for 1,2-dibromoethane (EDB) and 1,2-dibromo-3-chloro-propane (DBCP), at a detection limit not to exceed 0.00002 mg/l.

. At State discretion, analysis shall include EPA Method 504, 625, 604, 605, 608, 609, 611 or 612 as appropriate.

. The location for sampling of each ground water source of supply shall be at or before the first service connection and prior to mixing with other sources, unless otherwise specified by the State. Public water systems which take water from a surface water body or watercourse shall sample at points in the distribution system representative of each source or at entry point or points to the distribution system after any water treatment plant.

. The State may reduce the minimum number of samples, if contaminants are not detected, and the State determines that the source of water supply is not vulnerable to contamination.

. The State may reduce the frequency of monitoring to once per year for a system detecting POCs at levels consistently less than the MCL for three consecutive years.

0\. The State may require more samples, if the State determines that the source of water supply is vulnerable to contamination.

1\. Non transient noncommunity water systems with 150 or more service connections shall monitor according to the requirements for a community system serving the same number of persons.

TABLE 9-ORGANIC CHEMICALS
MINIMUM MONITORING REQUIREMENTS (Con't)

Contaminant	Type of Water System	Initial Requirement[7] [12]	Continuing Requirement Where Detected[9]	Continuing Requirement Where Not Detected[8]
Principal Organic Contaminants[5] [6]	Community serving 10,000 or more persons	Quarterly samples per source, for one year, by 12/31/88[8]	Quarterly	Quarterly, for one year, every three years
Vinyl chloride[5]	Community serving 3,300-9,999 persons	Quarterly samples per source, for one year, by 12/31/89[8]	Quarterly	Quarterly, for one year, every three years
	Community serving fewer than 3,300 persons and more than 149 service connections	Quarterly samples per source, for one year, by 12/31/90[8]	Quarterly	Quarterly, for one year, every three years
	Community serving fewer than 150 service connections	One sample per source by 6/30/91[10]	Quarterly	State discretion[4]
	Non transient Noncommunity[11]	One samples per source by 6/30/92[10]	Quarterly	State discretion[4]
	Noncommunity	State discretion[4]	Quarterly	State discretion[4]
Unspecified Organic Contaminants	Community and Noncommunity	State discretion[4]	State discretion[4]	State discretion[4]

TABLE 9-ORGANIC CHEMICALS
MINIMUM MONITORING REQUIREMENTS

Contaminant	Type of water system	Source type	
		Ground water only	Surface only or Surface and ground water
Endrin Lindane Methoxychlor Toxaphene 2,4-D 2,4,5-TP Silvex	Community	Point of use water, at State discretion.	Point of use water once every three years. Samples must be obtained between April 15 and October 15.
	Noncommunity	State discretion[4]	State discretion[4]
Total trihalomethanes[3]	Community Serving 10,000 or more people	All source types that receive chlorination. The supplier of water must collect four samples per quarter per disinfection station.[1] [2]	
	Community serving fewer than 10,000 people	State discretion[4]	
	Noncommunity	State discretion[4]	

TABLE 8-INORGANIC CHEMICALS
MINIMUM MONITORING REQUIREMENTS (Con't)

3. All systems with a Langelier Index less than -2.0 or a carbonate hardness or alkalinity less than 40 mg/l are required to monitor for heavy metals in the distribution system annually.

4. All community systems with sodium levels exceeding 20 mg/l will be required to collect an annual sample for sodium analysis.

5. State discretion shall mean requiring monitoring when the State has reason to believe the MCL has been violated, the potential exists for an MCL violation or the contaminant may present a risk to public health.

TABLE 8-INORGANIC CHEMICALS AND PHYSICAL CHARACTERISTICS
MINIMUM MONITORING REQUIREMENTS

		Source type	
Contaminant	Type of water system	Ground water only	Surface only or Surface and ground water
Primary Arsenic Barium Cadmium Lead Mercury Selenium Silver Fluoride Nitrate[1]	Community	Point of use water once every three years.	Point of use of water once per year.
	Noncommunity	State discretion[5]	State discretion[5]
Secondary Chloride Copper Corrosivity[2] [3] Iron Manganese Sodium[2] [4] Sulfate Zinc Color Odor	Community and Noncommunity	State discretion[5]	State discretion[5]

1. An annual sample for nitrates will be required if the noncommunity water system is permitted an increased MCL for nitrates.

2. All community water systems will be required to collect and analyze initial monitoring sample for sodium and corrosivity determination.

TABLE 7-RADIOLOGICAL
MAXIMUM CONTAMINANT LEVEL DETERMINATION

Contaminant	MCL	Type of Water System	Determination of MCL violation
Combined radium 226 and radium 228	5 picocuries per liter	Community	A violation occurs when the annual composite of four quarterly samples or the average of the analysis of four quarterly samples exceeds the MCL.
Gross alpha activity (including radium 226 but excluding radon and uranium	15 picocuries per liter		
		Noncommunity	Not applicable
Beta particle and photon radioactivity from manmade radionuclides	Four millirems per year as the annual does equivalent to the total body or any internal organ. The department shall determine the concentration capable of producing four millirems per year.	Community using surface water serving more than 100,000 people	A violation occurs when the annual composite of four quarterly samples or the average of the analyses of four quarterly samples exceeds the MCL.
		Community using surface source serving 100,000 or fewer people or community using ground water.	Not applicable
		Noncommunity	Not applicable.

TABLE 6-MICROBIOLOGICAL
MAXIMUM CONTAMINANT LEVEL DETERMINATION

Contaminants	MCL	Determination of MCL violation
Coliform bacteria	Membrane filter method (M.F.): (a) Reporting period average: 1 coliform per 100 ml average; and/or[1] (b) Maximum sample value criteria: 4 coliform per 100 ml in no more than one [1] [2] sample when less than 20 samples are taken, or no more than 5 percent of the samples when 20 or more samples are taken during the reporting period.	Membrane filter method (M.F.): A violation occurs when the reporting period average or the maximum sample value criteria during the reporting period is exceeded.
	Multiple tube fermentation technique (M.T.F.) (a) Reporting period criteria: Coliform shall not be present in more than 10 percent of all portions analyzed during the reporting period; and/or[1] (b) Maximum sample value criteria: Coliform shall not be present in three or more portions in no more than [1] [2] one sample when less than 20 samples are taken, or no more than 5 percent of the samples when 20 or more samples are taken during the reporting period.	Multiple tube fermentation technique (M.T.F.) A violation occurs when the reporting period average or the maximum sample value criteria during the reporting period is exceeded.

. The State may permit a supplier of water serving fewer than 9,400 people, to exclude one positive sample per reporting period in accordance with criteria acceptable to the commissioner.

. It a single sample exceeds 4 coliform per 100 ml. (M.F.) or coliform bacteria occur in three or more 10 ml. portions (M.T.F.) two consecutive daily check samples must be obtained from the same sampling point, using the same monitoring methods as the monitoring sample. Daily check samples must be taken until two consecutive daily samples are less than 1 ml. per 100 ml. or show no presence of coliform. If a check sample is positive, State notification must be made.

TABLE 5-DISTRIBUTION SYSTEM TURBIDITY MAXIMUM CONTAMINANT LEVEL DETERMINATION

Contaminant	MCL	Determination of MCL violation
Distribution system turbidity	5NTU (Monthly average)	A violation occurs when the monthly average of the results of all distribution samples collected in any calendar month exceeds the MCL (rounded off to the nearest whole number).

Pursuant to the authority vested in the Public Health Council by Section 22 of the Public Health Law, Part 5 of the State Sanitary Code, as contained in Chapter 1 of Title 10 (Health) of the Official Compilation of Codes, Rules, and Regulations of the State of New York, is amended to add Subpart 5-5 to read as follows:

SUBPART 5-5

WATER QUALITY TREATMENT DISTRICTS

5-5.1 Purpose. The rules contained in this Subpart have been promulgate to provide protection for persons served by nonpublic water supplies, and to conform to the requirements of the County Law and the Town Law.

5-5.2 Applicability and scope. This Subpart sets the requirements for State approval relating to the formation and operation of Water Quality Treatmen Districts within New York State.

5-5.3 Definitions. As used in this Subpart, the following words and terms shall have the indicated meaning, except as otherwise specifically provide

(a) **Nonpublic water system** means any water supply serving less than 25 individuals on a daily basis and having less than five service connections.

(b) Point-of-Use Treatment means any type of chemical added to the water or any type of treatment device or system of devices installed on a wate line within the property line of a consumer or on a nonpublic water source to improve water quality.

(c) Service connection means the pertinent pipes, valves and fittin that connect a distribution system to a consumer's facility.

(d) State means the State Commissioner of Health, or his designated representative.

(e) **Water Quality Treatment District** means a district established unde applicable provisions of the County Law and the Town Law which allow County or Town ownership and operation of Point-of-Use Treatment systems.

5-5.4 **Submission for approval.** Maps, plans and specifications submitt to the State for approval shall be signed and sealed by an engineer licensed t practice in New York State. Approval will be based on completeness of submissio appropriate treatment for the contaminants, demonstrated effectiveness of treatment units, provision for adequate installation, operation and maintenanc of treatment units and protection of the occupants and operators. Submissions shall include, but are not limited to, the following items:

(a) A map of the proposed Water Quality Treatment District. The ma or maps shall include:

(1) Location of district boundaries.

(2) Existing public water system boundaries adjacent to or within the proposed Water Quality Treatment District.

(3) Sites of proposed installation of Point-of-Use Treatment systems.

(4) Sites of samples collected to determine water quality. Number and distribution shall be adequate to determine extant and degree of contamination.

(5) Sites of existing installations of Point-of-Use Treatment systems.

(b) Plans and specifications of the proposed Point-of-Use Treatment systems.

(c) Plans and specifications of typical installations.

(d) An engineering report detailing the following items:

(1) Test results of sampling conducted to determine water quality at water sources within the proposed district.

(2) Alternate Point-of-Use Treatment solutions considered.

(3) Alternate types of Point-of-Use Treatment considered.

(4) Results of pilot studies.

(5) Recommended alternative showing the type and location of proposed Point-of-Use Treatment systems.

(6) Evaluation of existing Point-of-Use Treatment systems and necessary improvements.

(7) Operation and maintenance of the Point-of-use Treatment installations.

(8) Operator qualifications and training.

(9) Administration and financing of the Water Quality Treatment District. If all or part of the Water Quality Treatment District services are to be subcontracted to another agency, private company or individual by the County or Town, the qualifications and responsibilities of the subcontractor shall be included.

(10) Monitoring parameters and frequency of the Point-of-Use Treatment systems and sources within the Water Quality Treatment District.

(11) Disposal of waste water and materials.

5-5.5 Amendments and modifications. All amendments to Water Quality Treatment District plans and modifications to the approved plan of operation must be submitted to the State for approval before adoption.

5-5.6 Water quality. Treated water quality must meet all applicable water quality standards or guidelines for community water systems as defined by Subpart 5-1 of this Part.

5-5.7 District operation. The Water Quality Treatment District shall comply with all conditions detailed in the written approval from the State, and all provisions of this Subpart.

(a) All treatment systems in the Water Quality Treatment District shall be under responsible charge of an operator with demonstrated knowledge and experience with the type of treatment systems in use in the District, as determined by the State.

(b) The Water Quality Treatment District shall monitor treated and untreated water for the parameters and at the frequency stated in the written approval. Samples taken to demonstrate compliance with water quality standards or guidelines shall be analyzed in an approved laboratory as defined by Subpart 5-1.74 of this Part. Analysis of operational samples shall be made by an analyst with demonstrated competence using appropriate equipment, as determined by the State.

(c) The Water Quality Treatment District shall report all available sample results to the State quarterly within 15 days of the end of a quarter, except when treated water exceeds a standard or guideline requiring State notification. Results exceeding a standard or guideline requiring State notification shall be reported to the State and to the impacted consumers in the Water Quality Treatment District within 48 hours of learning the results.

(d) The Water Quality Treatment District shall submit an annual report covering the previous calendar year to the State on or before July 1 each year. The annual report shall contain but not be limited to the following applicable items:

(1) Number, type and location of treatment systems in service, and the number and type of treatment systems added or deleted during the year.

(2) Effective life of units.

(3) Treatment system failures.

(4) Maintenance problems.

(5) Operational problems.

(6) Supply problems.

(7) Changes in types of treatment devices in service.

(8) Consumer complaints.

(9) Summary and trends in monitoring test results.

(10) Changes in Water Quality Treatment District Boundary.

(11) Changes in Water Quality Treatment District operational and/or administrative procedure.

(12) List of names, addresses and telephone numbers of administrators and operators of the Water Quality Treatment District.

CHAPTER I STATE SANITARY CODE

PART 5
DRINKING WATER SUPPLIES
(Statutory Authority: Public Health Law §225)

SUBPART 5-6
BOTTLED AND BULK WATER STANDARDS

SUBPART 5-6

BOTTLED AND BULK WATER STANDARDS

5-6.1 Applicability. The provisions of sections 5-6.2 through 5-6.18 of this Subpart shall apply to bottled and bulk water produced, used and/or sold in New York State.

5-6.2 Distribution of bottled or bulk water. No person shall sell, offer for sale or deliver bottled or bulk water for human consumption, food preparation or culinary purposes unless certified by the commissioner in accordance with the requirements of this Subpart. The commissioner may exempt bottled water from the chemical and radiological maximum contaminant levels (MCLs) based on justification submitted to him by the person selling, offering for sale or delivering bottled water, that establishes that the granting of the exemption would not constitute a hazard to the health of the consumers of such bottled water. In all situations where the commissioner has exempted bottled water, an appropriate label, approved by the commissioner, shall be conspicuously placed on all bottles or containers of such exempted water manufactured, distributed or sold at retail within the State of New York.

5-6.3 Bottled and bulk water standards. (a) These standards serve as the minimum requirements considered necessary to maintain the purity of water bottled, packaged, or delivered for drinking, food preparation, or culinary purposes. They are to be used in the design and preparation of plans and specifications, and to serve in operation and maintenance of bulk water facilities or bottled water facilities. The following references were used as a basis for this standard:

(1) Rural Water Supply, New York State Health Department, 1966.

(2) Product Excellence Program Guidelines (G.M.P.'s), American Bottled Water Association, 1972.

(3) Plant Technical Manual I & II, American Bottled Water Association, 1976.

(4) CFR 21, Code of Federal Regulations, US FDA.

(5) Recommended Standards for Water Works, New York State Health Department, Bulletin 42, 1987.

(b) The information contained in this Subpart outlines the minimum requirements for source control, equipment design, treatment, bottling or packaging, analytical testing, record keeping, and reporting. Certification requirements and procedures are also outlined.

5-6.4 Definitions. As used in this Subpart, the following words or terms shall have the indicated meaning, except as otherwise specifically provided:

(a) Approved laboratory shall mean a laboratory approved by the New York State Department of Health; or approved by the United States Environmental Protection Agency (EPA); or approved by another state which has been granted primacy by EPA; or approved by a third-party organization acceptable to the primacy state to do drinking water analyses in accordance with water quality testing procedures outlined by the EPA.

(b) Approved source shall mean the source of water from a spring, artesian well, drilled well, municipal water supply, or any other source which has been evaluated and found to be of satisfactory sanitary quality as determined by the State.

(c) Artesian well water shall mean water that comes from a deep well where water is forced up by underground pressure.

(d) Bottled or packaged water shall mean any product, including natural spring or well water taken from municipal or private utility systems or other water, distilled water, deionized water, or any of the foregoing to which chemicals may be added, which are put into sealed bottles, packages, or other containers, to be sold for domestic consumption or culinary use, involving a likelihood of such water being ingested by human beings.

(e) Bottled and Bulk Water Standards shall mean this Subpart.

(f) Bulk water shall mean water intended for potable uses which is transported by means of tank trucks.

(g) Commissioner shall mean the Commissioner of Health of the State of New York.

(h) Food and Drugs 21 CFR shall mean the Code of Federal Regulations, Title 21, Food and Drugs, as published in the Federal Register, Volume 42, Page 14355, March 15, 1977, as amended by Volume 44, Page 12175, March 6, 1979 and found in 21 CFR, Part 129 - Processing and Bottling of Bottled Drinking Water, Pages 137 through 141, revised as of April 1, 1988. A copy is available for public inspection at the offices of the Records Access Officer of the Department of Health, Empire State Plaza, Corning Tower, Albany, New York 12237.

(i) Maximum contaminant level (MCL) shall mean the maximum permissible level of a physical, chemical, radiological or microbiological substance in water.

(j) Multi-use containers shall mean those containers which are intended by the bottler for more than one use.

(k) Nontoxic materials shall mean transporting, storing, and packaging materials which are free of substances which may render the water injurious to health or which may adversely affect the flavor, color, odor, or microbiological or chemical quality of the product.

(l) Person shall mean an individual, corporation, company, association, partnership, State agency, municipality, County or Federal agency.

(m) Person in charge shall mean the designated employee or employees who are appointed and in responsible charge of the bottling facility, and who are present at all times during the bottling operation.

(n) Principal organic contaminant (POC) shall mean any organic chemical compound belonging to the following classes, except for trichloromethane (chloroform), dibromochloromethane, bromodichloromethane, tribromomethane (bromoform) and any other organic contaminant with a specific MCL listed in Section 5-6.14 of this Subpart:

(1) Halogenated Alkane.

(2) Halogenated Ether.

(3) Halobenzenes and Substituted Halobenzenes.

(4) Benzene and Alkyl- or Nitrogen-Substituted Benzenes.

(5) Substituted, Unsaturated Hydrocarbons.

(6) Halogenated Non-aromatic Cyclic Hydrocarbons.

(o) Recommended Standards for Water Works shall mean New York State Health Department Bulletin 42, 1987 edition, published by Health Research, Inc., 15 Brookview Avenue, Delmar, New York 12054 and is available for public inspection at the offices of the Records Access Officer of the Department of Health, Empire State Plaza, Corning Tower, Albany, New York 12237.

(p) Rural Water Supply shall mean the New York State Department of Health publication as copyrighted in 1966 and reprinted in 1988 and is available for public inspection at the offices of the Records Access Officer of the Department of Health, Empire State Plaza, Corning Tower, Albany, New York 12237.

(q) Spring water shall mean water derived from an underground formation from which water flows naturally to the surface of the earth.

(r) Standard Methods for the Examination of Water and Wastewater shall mean the joint publication of the American Public Health Association, the American Water Works Association and the Water Pollution Control Federation and is available for public inspection at the offices of the Records Access Officer of the Department of Health, Empire State Plaza, Corning Tower, Albany, New York 12237.

(s) State shall mean the State Commissioner of Health, or his designated representative.

(t) Total trihalomethane (TTHM) shall mean the sum of the concentration of trichloromethane (chloroform), dibromochloromethane, bromodichloromethane, and tribromomethane (bromoform).

(u) Unspecified organic contaminant (UOC) shall mean any organic chemical compound not otherwise specified in this Subpart.

(v) Violation shall mean the failure to comply with or conform to the provisions of this Subpart, exceedance by a single sample of a maximum contaminant level, or failure to comply with or conform to monitoring, reporting or certification requirements.

(w) Well water shall mean water that is taken from below the ground through piping or similar installed device utilizing external force or vacuum.

5-6.5 Sources of water. All sources of water must be approved prior to use.

(a) The sources of all bulk or bottled drinking water located in New York State must be approved by the State. Sources of all bulk or bottled drinking water located outside New York State must be approved by the agency having jurisdiction.

(b) Sources shall, at a minimum, meet the following requirements:

(1) All sources shall be developed in conformity with up-to-date sanitary engineering practices as set forth in Rural Water Supply and the Recommended Standards for Water Works.

(2) All sources shall be located, developed, and protected so they are not subject to natural or artificial contamination

(3) Routine chemical, physical, radiological, and microbiological monitoring of all source waters is essential for public health protection. Each source shall be sampled to characterize the microbiological, physical, radiological, and chemical quality at the minimum frequency prescribed in Section 5-6.14 of this Subpart, or as otherwise required by the State.

(4) Unusual source and source development situations shall be discussed with staff of the State, before such sources are approved and developed.

(c) All spring sources shall, at a minimum, meet the following requirements:

(1) A watertight wall shall completely surround the spring, not less than 12 inches above the highest point of ground, and extend down through the overburden to the water-bearing stratum. On rock, such walls shall be keyed and sealed with cement grout to the rock. The top of the wall shall be level to accommodate a cover.

(2) A tight-fitting, locked cover shall be installed on the top of the encircling wall. The cover shall be constructed so as to provide reliable protection against contamination by animals or humans.

(3) Where the spring is protected by a spring house, the building shall be verminproof and shall be kept locked.

(4) A ditch, or berm, shall be constructed and routinely maintained to divert surface water away from the spring.

(5) Spring water shall be collected only at the natural orifice of the spring or through a bore hole that is adjacent to the natural orifice. Spring water collected with the assistance of external force or through a bore hole, or through a spring head that is otherwise altered to protect the water source shall retain all the physical properties of and be of the same composition and quality as the water that flows naturally to the surface of the earth.

(d) All drilled wells shall, at a minimum, meet the following requirements:

(1) A watertight casing shall be installed to the depth necessary to prevent surface contamination and to seal off contamination of undesirable strata. The casing shall be sealed by filling the annular opening between the casing and the earth with cement or cement-sand grout, or other approved sealant, at least 1 1/2 inches thick. This seal shall extend from ground surface to a point not less than six inches below groundwater level.

(2) A permanent casing shall be installed to at least 12 inches above the pumphouse floor or concrete apron surface and at least 18 inches above final ground surface.

(3) Wells shall be located on sites not subjected to flooding, or be provided with an earth berm surrounding the casing and terminating at an elevation at least two feet above the highest known flood elevation, or have other suitable protection as determined by the State.

(4) Wells shall be equipped with an approved pitless adaptor unit installed at the joint where the discharge pipe passes through the well casing.

5-6.6 Required treatment. All bottled water facilities packaging water for distribution in New York State must provide satisfactory treatment of each water supply source used.

(a) Minimum treatment of each water supply source used shall be disinfection by chlorination, ozonation, ultraviolet radiation or other disinfection methods as protective of the public health as the above.

(b) The commissioner may, when requested in writing, grant a waiver which is renewable annually, to the disinfection requirement for groundwater sources, provided that:

(1) The record of the bacteriological characteristics for each groundwater source demonstrates conformance to the maximum microbiological contaminant levels in Section 5-6.14 of this Subpart, for the 12 months immediately preceding the date of application for waiver; such record shall be established under procedures provided by the commissioner.

(2) A laboratory, as described in Section 5-6.12 of this Subpart is used by the bottling facility to provide monitoring of finished product water quality.

(c) Where treatment is provided, all equipment must meet, as a minimum, the standards outlined in Recommended Standards for Water Works.

5-6.7 **Bottling plant facilities.** Bottling plants must be constructed to facilitate cleanliness, and be maintained to maximize sanitation and public health protection.

(a) Buildings and rooms shall be of sufficient size to allow for the proper installation of equipment and to allow for movement of personnel during operation.

(b) The bottle filling operations shall be separated from other plant operations or storage areas by tight walls, ceilings, and self-closing doors or other appropriate barriers to isolate these areas and provide protection against incidental contamination. Conveyor openings shall not exceed the size required to permit passage of containers.

(c) Plant buildings shall be verminproof.

(d) Walls and ceilings shall be smooth, light color, washable, and kept in good repair. Overhead structures, fixtures, ducts, and pipes shall not be suspended over working areas so that drip or condensate may contaminate products, or product contact surfaces.

(e) Floors shall be smooth, nonabsorbent, and verminproof. Floors are to be graded to adequate drains equipped with traps and grills.

(f) Doors and windows to outside areas shall be adequately screened and/or otherwise protected against entry of vermin, airborne contamination, and particulates.

(g) All rooms are to be provided with sufficient ventilation to keep them free of excessive heat, steam, condensation, vapors, odors, and fumes.

(h) Lighting, either natural or artificial, shall be provided in all rooms where bottled or packaged waters are produced. An intensity of not less than 50 footcandles shall be provided in inspection areas; 30 footcandles in work spaces, and 5 footcandles in storage areas. Light bulbs, fixtures, skylights, or other glass suspended over exposed production areas shall be of the safety type or otherwise protected from breakage to prevent product contamination.

(i) Washrooms shall be convenient, separate and apart from any room or rooms where bottled or packaged water is processed, and from areas where bottles and packages are sanitized. Toilets, urinals, and wash basins shall be provided, as appropriate, for the number of employees. Washrooms shall be equipped with self-closing doors and fitted with windows or separate ventilation to the outside. Signs shall be posted directing employees to wash their hands after using the toilet.

(j) Clean, dry storage facilities shall be provided for product containers and packaging materials.

(k) Dressing rooms shall be provided for changing and hanging street apparel and shall be apart and separate from work areas.

(l) Wastewater disposal shall be provided and have discharge to a municipal wastewater system or a State approved individual wastewater disposal system.

5-6.8 Production, equipment and packaging. All bottled water production, including transporting, packaging, and storage, shall be conducted under such conditions and controls as are necessary to minimize the potential for chemical contamination, undesirable bacterial or other microbiological growth, toxic formation, deterioration, or contamination of the processed product.

(a) Bottles must be mechanically filled and closed.

(b) Existing State certified bottling operations employing hand filling and capping of containers must demonstrate that protection from contamination is provided. The State will require these facilities to use mechanical filling and closing methods when protection from contamination is not demonstrated, or unsatisfactory or unsanitary conditions are found.

(c) Fillers, piping, pumps, and other process equipment used in the production of bottled water products may not be used for the production of milk, and/or dairy products. Other beverage production that may impart deleterious substances to bottled water produced in the same equipment or cause microbiological contamination of the bottled water, may also be prohibited when the contamination is confirmed by two documented cases.

(d) All equipment shall be of sanitary design and shall be constructed of nontoxic, nonabsorbent material which will not impart flavor, color, or odor to the bottled water. All equipment shall be installed and maintained to facilitate the cleaning of equipment and of all adjacent spaces.

(e) Storage tanks used for bottled water production shall be:

(1) Tightly closed to exclude all foreign matter, and vented through inverted approved air filters.

(2) Without connections to sources of water not approved in writing, by the State or the governmental regulatory agency having jurisdiction over facilities located outside the State.

(3) Protected from cross connection and equipped with backflow prevention devices approved by the State, or the governmental regulatory agency having jurisdiction over facilities located outside the State.

(4) Equipped with linings or coatings conforming to the listing of acceptable linings for process and potable water

tanks from the State, or the governmental regulatory agency having jurisdiction over facilities located outside the State.

(5) Used only for water and not for storage of any other food product or non-food substance.

(f) All pipelines and valves shall have no cross connections between finished product water lines and any other water pipelines.

(g) Hoppers shall be provided with covers.

(h) Fillers shall have the inlet so designed as to prevent the entrance of condensation. Filling valves shall be equipped with a condensation diverting apron.

(i) Containers and packaging shall, at a minimum, meet the following requirements:

(1) Packaging processes and materials shall not transmit contaminants, or objectionable, toxic or deleterious substances to the bottled water.

(2) Containers and closures for bottled water shall be in compliance with those requirements contained in Food and Drugs 21 CFR.

(3) Only sanitary, nontoxic lubricants shall be used on container contact surfaces.

(4) Bottles shall be provided with a tamper-evident seal or cap.

(5) Screw, snap and crown caps shall be new.

(6) Screw, snap, and crown caps must be sanitized unless protected and received clean and kept free from bacterial contamination.

(7) When sanitized bottles cannot be filled immediately, they shall be closed or covered immediately when removed from packages. When they are to be filled, such closed bottles shall be opened, resanitized, filled, and closed immediately in one continuous operation.

(8) All cleaned bottles shall be protected from dust, dirt, insects, debris, and other forms of contamination.

(9) Each container of bottled drinking water shall be identified by a production code. The production code shall identify a particular batch or segment of a continuous production run and the day produced. The plant shall record and maintain information as to the kind of product, volume produced, date produced, production code used, and the

distribution of the finished product to wholesale and retail outlets to which the plant directly supplies product.

(j) The plant shall have on file a State approved, written recall plan which shall detail procedures for recall of any particular batch as identified by the production code.

5-6.9 Sanitation and maintenance. Buildings, fixtures, and other physical facilities of the plant shall be kept in good repair and shall be maintained in a sanitary condition. Cleaning operations shall be conducted in such a manner as to minimize the danger of contamination of product and product contact surfaces. Detergents, sanitizers, and other materials employed in cleaning and sanitizing procedures shall be free of chemical or microbiological contamination and shall be safe and effective for their intended use. Only such materials as required to maintain sanitary conditions, for use in laboratory testing procedures, for plant and equipment maintenance and operation, or used in manufacturing or processing operations, shall be stored in the plant. These materials shall be identified and used only in such manner and conditions that will be safe for their intended use.

(a) Buildings shall, at a minimum, meet the following requirements:

(1) Immediate plant grounds shall be kept clean of litter, waste, refuse, uncut weeds and grass, and free from conditions which might attract or harbor birds or vermin. Areas within the immediate vicinity of the plant must be properly drained to prevent seepage or footborne filth.

(2) Buildings shall be verminproof and kept in good repair. Only pesticides approved for use by the New York State Department of Environmental Conservation and/or registered with the U.S. Environmental Protection Agency shall be used for vermin control.

(3) Walls and ceilings in bottling areas shall be kept clean. Overhead structures, fixtures, and ducts in non-bottling areas shall be kept free from accumulations of dust and soil.

(4) Floors shall be kept clean and free of waste, litter, and extraneous material. Floors in the bottling areas shall be cleaned daily and sanitized with a 200 part per million (ppm) chlorine solution or equivalent quaternary ammonium compounds.

(5) Doors and windows shall be kept clean and in good repair.

(6) Ventilation equipment shall not create conditions that may contribute to product contamination by airborne contaminants and shall be kept free of accumulation of dust and soil.

(7) Washrooms shall not be utilized for storage of garments, food products, utensils, or packaging and wrapping materials. Hot and cold running water; powdered, liquid,

or bar soap; and single-use sanitary towels are to be provided. The toilet room and fixtures shall be maintained in a sanitary condition and kept in good repair at all times.

(8) Storage facilities shall be kept clean and dry and provide protection from splash, insects, dust, and other contamination.

(9) All refuse shall be stored in properly identified, covered containers.

(b) Storage tanks shall, at a minimum, meet the following requirements:

(1) Inspected for cleanliness on a monthly basis and kept free of scale, evidence of oxidation, and residue.

(2) Cleaned on a monthly basis by sanitizing with one of the following and flushing with product water:

(i) Chlorine water solution of 200 ppm for a minimum of five minutes.

(ii) Spray wet surface with 200 ppm chlorine water solution. This is to be used on surfaces that are not reached by the above soaking treatment.

(iii) Bactericides, such as organic chlorine compounds, and bactericidal agents containing iodine or bromine.

(iv) 0.1 ppm ozone water solution for not less than ten minutes contact time.

(c) Product water pipelines shall, at a minimum, meet the following requirements:

(1) Kept free of scale, evidence of oxidation, and residue.

(2) Cleaned on a daily basis by sanitizing with one of the following:

(i) Chlorine water of 200 ppm for a minimum of five minutes followed by flushing with product water.

(ii) The continuous recirculation of at least 0.1 ppm ozonated water.

(d) Product equipment shall, at a minimum, meet the following requirements:

(1) Cappers shall be kept free of residue and sanitized on a daily basis.

(2) Hoppers shall be kept covered, free of residue, and sanitized on a daily basis.

(3) Ozone mixing tanks and equipment, soft water tanks, and other associated equipment shall be inspected on a monthly basis, disassembled if necessary, cleaned, and sanitized as needed.

(4) Bottle washing equipment shall be kept free of paper residue and substances which may interfere with proper operation of jets. Internal sprays shall be checked on a daily basis to assure proper timing and adequate washing of bottles.

(5) Fillers shall be kept free from scale, evidence of oxidation and residue, and shall be sanitized on a daily basis. Filling and capping operations shall be so conducted as to prevent contamination of water being bottled. The filler reservoir shall be kept covered at all times.

(e) Personnel shall, at a minimum, meet the following requirements:

(1) Employees shall wear clean outer garments and caps while bottling, packaging water, or sanitizing bottles and packages.

(2) Expectorating is prohibited, except into receptacles for wastewater or sewage.

(3) Before starting work, and immediately after visiting a toilet, smoking, eating, drinking, or any other activity that soils the hands, every person shall wash his hands and forearms with soap and warm water and thoroughly rinse them in clean water.

(4) No person affected by disease in a communicable form, or while a carrier of such disease, or while affected with boils, sores, infected wounds, or other abnormal sources of microbiological contamination, shall knowingly be permitted to work in a bottled water plant in any capacity in which there is a reasonable possibility of finished product water becoming contaminated by such person, or of disease being transmitted by such persons or other individuals.

(5) Tobacco shall not be used in any product-processing room.

(6) Eating and drinking is prohibited in product-processing rooms.

5-6.10 Sanitizing bottles. The bottles shall be properly sanitized before use by using approved methods and approved sanitizing agents.

(a) Before filling, all multi-use containers shall be thoroughly washed in an effective cleansing agent and water solution, having a temperature not less than 120 degrees Farenheit, followed by application of a bactericidal solution, and the inside rinsed with product water to remove traces of sanitizing agents.

(b) The bactericidal procedure for the inside of bottles, as a minimum, shall be one of the following:

(1) Sanitize with 100 ppm chlorine water solution at 75 degrees Farenheit for not less than 30 seconds.

(2) Sanitize with a 2 1/2 percent caustic solution at a minimum temperature of 120 degrees Farenheit followed by a rinse containing not less than 10 ppm free chlorine. Note: When caustic is discharged by means of high-velocity jets, this procedure shall be considered to satisfy both cleaning and bactericidal requirements.

(3) Sanitize with water at an inside bottle temperature of not less than 170 degrees Farenheit for not less than 15 seconds.

(4) Sanitize by exposing all surfaces to a 3 percent caustic solution at a minimum temperature of 120 degrees Farenheit for five minutes -- by means of automatic bottle washers utilizing high-velocity, hydro-type jets or by means of soaker washers -- followed by a rinse containing not less than 10 ppm free chlorine.

(5) Other methods equally protective of public health as the above, when approved by the State, may be used.

(c) Single-use bottles or containers, which are free of all bacteria, dust, or other contamination, need not comply with the above sanitizing requirement prior to filling.

5-6.11 Labeling. Each bottle or container shall bear a label, to be affixed to each bottle or container before it leaves the plant. Wording shall be printed in English, in legible type which shall be in contrast by typography, layout, or color, with other printed matter on the label, cap, or container.

(a) Each label shall indicate:

(1) The type of source water:

(i) For water coming from springs: "Spring Water."

(ii) For artesian or pumped water taken from the ground, from drilled wells, or approved dug wells: "Well Water."

(iii) For a municipal water supply source, the name of the municipal supply, such as "New York City Public Water Supply", "Buffalo City Public Water Supply", etc.

(iv) For bottled waters identified on the label as being distilled, the type of source water does not need to be indicated.

(2) Address, and location of the bottling facility or corporate offices.

(3) Net contents and/or capacity of the container.

(4) The assigned New York State Health Department certificate number. Abbreviations are limited to "NYSHD Cert. #000."

(b) In all situations where the commissioner has exempted a bottled water from the chemical and/or radiological maximum contaminant levels, an appropriate label, approved by the commissioner, shall be conspicuously placed on all bottles or containers of such exempted water manufactured, distributed, or sold at retail within the State of New York.

(1) Acceptable wording on the label of those bottled water products that have received exemption from the health-related radiological and inorganic chemical MCLs is:

"This water contains levels of minerals* in excess of standards for drinking water established by the New York State Commissioner of Health and, therefore, should not be used as a principal or sole source of drinking water."

*The specific minerals in excess of standards may be placed anywhere on the bottle.

(2) Acceptable wording on the label of those bottled water products that have received exemption from only the aesthetic-related inorganic chemical MCLs is:

"This is a mineral water and should not be used as a sole source of drinking water."

5-6.12 **Sampling, methods and record keeping.** Bottled waters must be routinely sampled and analyzed for physical, chemical, radiological, and microbiological quality. The results of these analyses must be recorded and routinely forwarded to the State.

(a) Bottled water shall be sampled at the frequency and analyzed for the water quality parameters outlined in Section 5-6.14 of this Subpart.

(b) Samples for any water quality parameter not specified in Section 5-6.14 of this Subpart shall be collected and analyzed as may be required by the State.

(c) Sampling methods and analyses shall, at a minimum, meet the following requirements:

(1) Source water samples shall be taken from each approved source.

(2) Product water samples shall be taken from a batch or segment of a continuous production run for each type of bottled water produced during a day's production. The

representative sample shall consist of a primary container of the product.

(3) All required product water quality analyses must be performed by an approved laboratory.

(4) All required source water quality analyses must be performed by a laboratory meeting one of the following criteria:

(i) An approved laboratory.

(ii) A foreign laboratory approved by the appropriate government agency for source water analysis in that foreign country.

(5) If a laboratory other than a New York State approved laboratory is used, each bottler must submit proof of approval by the appropriate governmental agency to perform the designated analyses.

(6) All firms bottling in New York State must use a laboratory approved by the State for all analyses except for radiological constituents, which can be performed in a U.S. Environmental Protection Agency approved laboratory.

(7) Analyses shall be conducted in accordance with the analytical requirements set forth in Standard Methods for the Examination of Water and Wastewater, current edition, and/or applicable procedures acceptable to the commissioner.

(d) Container sampling for each container size shall, at a minimum, meet the following requirements:

(1) Containers and closures shall be inspected to ascertain that they are free from contamination.

(2) At least once every three months, a total coliform swab and/or rinse count should be made from at least four containers and closures selected just prior to filling and sealing. No more than one of the four samples may exceed more than one bacteria per milliliter of capacity or one colony per square centimeter of surface area. All samples shall be free of coliform organisms. The procedure and apparatus for these total coliform tests shall be in conformance with those recognized by the State. Tests shall be performed by qualified plant personnel or an approved laboratory.

(e) Record retention and reporting shall, at a minimum, meet the following requirements:

(1) Records shall be kept of all inspections, cleaning, and sanitizing operations and bottling production. Records of all microbiological and chemical testing must also be

maintained by owners and operators of bottled and bulk water facilities, and shall be available to the State for the most recent two year period.

(2) Monthly operating reports for bottlers operating in New York State shall be submitted to the local health unit having jurisdiction. Reports shall include the total monthly production and all physical, chemical, radiological, and microbiological analytical results for that month; the treatment processes and chemicals used; sources of water; and other pertinent data. Form GEN 221, Report on Bottled Water Operation, or a form acceptable to the commissioner, shall be used for this purpose.

(3) Failure to submit these reports shall be cause for suspension and/or revocation of the Certificate of Approval.

(4) Out-of-State bottlers shall submit their monthly operating reports no later than the 10th of the month following the month of the reporting period. The annual inspection report performed by the government agency having jurisdiction shall be submitted each year. The monthly operating reports and annual inspection report are to be forwarded directly to:

New York State Department of Health
Bureau of Public Water Supply Protection
2 University Place
Western Avenue, Room 406
Albany, New York 12203-3313

5-6.13 Maximum contaminant levels. The MCLs listed in Section 5-6.14 shall not be exceeded. In the case where an MCL is exceeded, the owner or operator shall take the necessary steps to comply with this section as deemed appropriate by the State or be granted a maximum contaminant level exemption by the State as outlined in this Subpart.

5-6.14 Tables.

TABLE 1 - BOTTLED WATER SAMPLING REQUIREMENTS

			NUMBER
CONTAMINANT	MAXIMUM CONTAMINANT LEVELS	FREQUENCY OF SAMPLES	SOURCE WATER
MICROBIOLOGICAL:		See Table 1A	
- Standard Plate Count	*		
- Total Coliform	Less than 1 colony per 100 ml		
RADIOLOGICAL:			
- Gross Alpha Particle Activity (including Radium 226 but excluding Radon and Uranium)	15 picocuries per liter	Every 4 years	1
- Combined Radium 226 and Radium 228	5 picocuries per liter	Every 4 years	1
- Beta particle and photon activity from manmade radionuclides	4 millirems per year	None specified	
PHYSICAL:		Yearly	1
- Turbidity	5 units		
- Color	15 units		
- Odor	Threshold Odor No. 3		

* No Maximum Contaminant Level Established.

5-6.14 Tables.

TABLE 1 (CONT'D)

CONTAMINANT	MAXIMUM CONTAMINANT LEVELS IN MILLIGRAMS/LITER	FREQUENCY OF SAMPLES	NUMBER OF SA	
			SOURCE WATER	FIN PRO
INORGANIC CHEMICAL:		Yearly	1	
Arsenic (As)	0.05			
Barium (Ba)	1.0			
Cadmium (Cd)	0.01			
Chloride (Cl)	250.0			
Chromium (Cr)	0.5			
Copper (Cu)	1.0			
Cyanide	0.2			
Fluoride (F)	2.2			
Iron (Fe)	0.3			
Lead (Pb)	0.05			
Manganese (Mn)	0.3			
Mercury (Hg)	0.002			
Nitrate (N)	10.0			
Selenium (Se)	0.01			
Silver (Ag)	0.05			
Sulfate (SO4)	250.0			
Zinc (Zn)	5.0			
Alkalinity	*			
Corrosivity	*			
Hardness	*			
Phenols	*			
pH	*			
Potassium (K)	*			
Sodium (Na)	*			
Total Dissolved Solids	*			

* No Maximum Contaminant Level Established.

5-6.14 Tables.

TABLE 1 (CONT'D)

CONTAMINANT	MAXIMUM CONTAMINANT LEVELS IN MILLIGRAMS/LITER	FREQUENCY OF SAMPLES	NUMBER OF SA	
			SOURCE WATER	FI PR
	ORGANIC CHEMICAL:			
<u>PESTICIDES/HERBICIDES</u>		Every 3 Years	1	
Endrin	0.0002			
Lindane	0.004			
Methoxychlor	0.050			
Toxaphene	0.005			
2,4-D	0.050			
2,4,5-TP(Silvex)	0.01			
<u>TRIHALOMETHANES</u>		Yearly		
Total Trihalomethane (TTHM)	0.10			
<u>GENERAL ORGANIC CHEMICALS</u>				
Principal Organic Contaminant (See Table 1B for listing of monitored contaminants.)	0.005	Every 3 Years	1 per quarter	1 qu
Unspecified Organic Contaminants	0.050	None specified		
Total of all POCs and UOCs	0.10	None Specified		
Vinyl Chloride	0.002	Every 3 Years	1	

5-6.14 Tables.

TABLE 1A - MICROBIOLOGICAL SAMPLING FREQUENCY

TOTAL GALLONS PRODUCED PER MONTH	MINIMUM NUMBER OF SAMPLES					
	UNCARBONATED BOTTLED WATER		CARBONATED BOTTLED WATER		BULK WATER	
	Finished Product	Source Water	Finished Product	Source Water	Finished Product	Source Water
	per week	per month	per month	per month	per month	per month
1 to 39,999	1	1	1	1	1	1
40,000 to 79,999	2	2				
80,000 to 299,999	3					
300,000 to 699,999	4	3				
700,000 and more	5					

5-6.14 Tables.

TABLE 1B - PRINCIPAL ORGANIC CHEMICALS

benzene
bromobenzene
bromochloromethane
bromomethane
n-butylbenzene
sec-butylbenzene
tert-butylbenzene
carbon tetrachloride
chlorobenzene
chloroethane
chloromethane
2-chlorotoluene
4-chlorotoluene
dibromomethane
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
dichlorodifluoromethane
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
cis-1,2-dichloroethene
trans-1,2-dichloroethene
1,2-dichloropropane
1,3-dichloropropane
2,2-dichloropropane
1,1-dichloropropene
cis-1,3-dichloropropene
trans-1,3,-dichloropropene
ethylbenzene
hexachlorobutadiene
isopropylbenzene
p-isopropyltoluene
methylene chloride
n-propylbenzene
styrene
1,1,1,2-tetrachloroethane
1,1,2,2-tetrachloroethane
tetrachloroethene
toluene
1,2,3-trichlorobenzene
1,2,4-trichlorobenzene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene
trichlorofluoromethane
1,2,3-trichloropropane
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
m-xylene
o-xylene
p-xylene

5-6.15 **Bulk water.** All bulk water sources and facilities must be approved and maintained for sanitary quality at all times.

(a) All sources of water for bulk water shipment must be approved by the New York State Health Department and must meet the source requirements outlined in Section 5-6.5 of this Subpart, and the treatment requirements outlined in Section 5-6.6 of this Subpart.

(b) All water storage facilities must be maintained clean and sanitary at all times and must meet the requirements outlined in Section 5-6.9 of this Subpart.

(c) Tank trucks, loading and unloading facilities, and other equipment used to transport bulk water shall be maintained clean and sanitary at all times. Tanks previously used to transport toxic materials, petroleum products, or other deleterious substances shall not be used to haul drinking water.

(d) Bulk transport and transfer procedures shall, at a minimum, meet the following requirements:

(1) Prior to filling, tank interior shall be cleaned, flushed with potable water, sanitized with not less than 100 ppm chlorine water solution for a contact period of not less than 20 minutes, and rinsed with potable water.

(2) Tanks also used for the transport of dairy products must have the interior of the tank inspected with an ultraviolet lamp by the hauler each time water is to be transported. Tanks shall be rejected for use when odors or contaminants are found. The dome cover shall be closed immediately after inspection.

(3) All hoses, connections, and fittings shall be sanitized with a concentrated solution of chlorine, 3 oz. of 5 1/4% household bleach to 2 gallons of water, by brushing solution on all exposed parts.

(4) The cover shall not be opened after sanitizing.

(5) Not-withstanding the above, the frequency of tank sanitization may be reduced, upon approval by the State, based on satisfactory demonstration of sanitary handling for bulk tanks used solely for potable water transport.

(6) Tank trucks or tank trailers may be filled through the fitting on the inner dome cover when the tail pipe cannot be used.

(7) Water quality in the tank, after 20-30 gallons have been delivered into the tank, shall be checked as follows:

(i) Stop filling.

(ii) Have discharge valve opened.

(iii) Inspect water as it discharges. If water has unpleasant odor and/or looks dirty, it shall be rejected for use.

(iv) When these checks indicate satisfactory water quality, proceed to fill the tank.

(8) The dome cover shall be closed and sealed after filling to volume desired.

(9) The tank discharge valve cover shall be closed and sealed after filling.

(10) When a fill connection is used, it shall be constructed in a manner to prevent contamination and shall be capped at all times when not in use.

(e) The number and type of samples, frequency, and points of sampling shall be in accordance with requirements outlined in Section 5-6.14 of this Subpart or a program approved or directed by the State.

(f) Analysis of the samples must be performed for the plant by an approved laboratory as outlined in Section 5-6.12 of this Subpart.

(g) Records shall, at a minimum, meet the following requirements:

(1) Records shall be maintained and include the number of gallons delivered daily, cleansing and sanitizing methods used for tank truck and tank trailer interiors, risers, connections, hoses, etc.

(2) Records shall include date, time and location of delivery, concentration of solution, time of contact when applicable, and water quality analysis results as evidence of compliance with the sampling requirements of this Subpart.

(3) The above records shall be submitted on a monthly basis to the local public health agency having jurisdiction.

5-6.16 Certification procedures. All bottled or bulk water products sold or distributed in New York State must be certified. In addition, there is a provision for certifying products which are found to exceed certain maximum contaminant levels in the drinking water standards, upon approval of an exemption request by the commissioner. The procedure to apply for certification includes the following:

(a) Any person applying for bottled water certification shall, at a minimum, meet the following requirements:

(1) A form, GEN 222 Application for Certification of Approval for Distribution of Bottled or Bulk Water, must be completed and signed by the owner or operator in responsible charge of the bottling facility. All questions must be answered.

(2) A statement must be submitted from the appropriate

regulatory agency of the state or country having jurisdiction over the bottling operation, indicating that the facility has been approved to bottle or package water for human consumption. This approval may be in the form of a copy of a certificate, license, permit, or a letter or approval from the agency. A copy of the laws and regulations on bottled water processing from the regulatory agency having jurisdiction must also be submitted. When another state or country has no program for inspection and approval of bulk or bottled water facilities, the commissioner may determine acceptability based on an inspection and evaluation by an independent individual or organization knowledgeable in bulk or bottled water handling practice.

(3) An engineering report, plans, and specifications for the proposal must be prepared by a registered Professional Engineer licensed to practice in New York State or in the state in which the facility is located. This submittal must include, but not be limited to, the development of the source, methods employed in the bottling operation, the water treatment used, and laboratory control of water quality provided, and a flow diagram from source through the bottling operation. The report submitted with the application must show compliance with the requirements of this Subpart.

(4) Two caps and two labels for each container size of the bottled water product that is to be certified must be submitted.

(5) A complete inorganic chemical, organic chemical, microbiological, and radiological analysis of contaminants as listed in Section 5-6.14 must be performed on each source and each finished bottled water product to be distributed in New York State. Results of these analyses must be submitted with the application. Additional analyses may be required, if in the judgment of the commissioner they are needed to determine the acceptability of the source or treatment provided.

(6) All analyses must be performed by an approved laboratory and in accordance with the sampling methods as outlined in Section 5-6.12 of this Subpart.

(7) All analyses must have been performed within the last six months from the date of the application for certification, with the exception of the microbiological analyses which must have been performed within thirty days from the date of the application for certification.

(8) A list of names, addresses, and telephone numbers of those who are now or are expected to be distributing your product in New York State must be provided.

(9) A recall plan must be submitted in accordance with the

requirements as outlined in Section 5-6.8 of this Subpart.

(b) Any person applying for a maximum contaminant level exemption of a bottled water product shall, at a minimum, meet the following requirements:

(1) An exemption request must be submitted with the above certification data for each chemical or radiological contaminant that exceeds the MCL. No exemption will be given for microbiological or organic chemical MCLs.

(2) This request must include documentation that the contaminant exceeding the MCL will not constitute an unreasonable health risk. The documentation must include:

(i) The identification of the contaminant or contaminants exceeding the MCL.

(ii) The concentration level in milligrams per liter (mg/l) of the contaminant, including the maximum, minimum, and average value found in the product.

(iii) The target consumer group.

(iv) The consumption pattern in milliliters per day of the consumers based on estimated or actual market surveys.

(v) The health significance of the higher contaminant concentration level.

(c) Any person applying for bulk water certification shall, at a minimum, meet the following requirements:

(1) A form, GEN 222 Application for Certification of Approval for Distribution of Bottled or Bulk Water, must be completed and signed by the owner or the operator in responsible charge of the bulk water facility. All questions must be answered.

(2) A statement must be submitted from the appropriate regulatory agency of the state having jurisdiction over the bulk water operation indicating that an inspection of the water source, transporting vehicles, and sanitation procedures has been made and is in conformance with the appropriate minimum standards as outlined in this Subpart. When another state has no program for inspection and approval of bulk water operators, the commissioner may determine acceptability based on an inspection and evaluation by an independent individual or organization knowledgeable in bulk water handling practices.

(3) A report must be submitted that includes the procedures used in the sanitizing of the tank interior, the name and location of the source water, source treatment, other uses of the tank truck, frequency and type of water quality analyses performed, quantities and frequencies of shipments,

primary use of potable water shipped, and loading and unloading procedures.

(4) A complete inorganic chemical, organic chemical, microbiological, and radiological analysis of contaminants as listed in Section 5-6.14 must be performed on each source to be used. Results of these analyses must be submitted with the application. Additional analyses may be required if, in the judgment of the commissioner, they are needed to determine the acceptability of the source or treatment provided.

(5) All analyses must be performed in accordance with the sampling methods as outlined in Section 5-6.12 of this Subpart.

(6) All analyses must have been performed within the last six months from the date of the application for certification, with the exception of the microbiological analyses which must have been performed within thirty days from the date of the application for certification.

(d) The conditions for maintaining certification approval are as follows:

(1) Each year, a statement must be submitted from the appropriate regulatory agency of the state having jurisdiction over the bottling facility indicating that the facility has been inspected and approved to bottle or package water for human consumption.

(2) Each month, a form, GEN 221 Report on Bottled Water Operation, must be completed and submitted no later than the 10th of the month following the month of the reporting period. The microbiological sample results on source and finished products must conform to the requirements of Sections 5-6.12 and 5-6.13 of this Subpart. Result of each analysis must be entered on the GEN 221 opposite the date the sample was collected. The quantity of water shipped for distribution in New York State must be entered on the GEN 221 in the daily product column opposite the date of actual shipment.

(3) The required organic chemical, inorganic chemical, and radiological analyses on the source and finished water product, must be completed for the calendar year. Copies of official laboratory results are to be submitted by July 1 to this Department and must be from an approved laboratory as required in Section 5-6.12 of this Subpart.

(4) Any interruption or change in the operation or treatment, or a change of source shall be reported immediately to the State. Submission of plans or an engineering report may be required.

(5) All exemptions must be submitted by July 1 for the calendar year. The required annual water quality monitoring data will be reviewed along with any other available data. In addition to the submission of data for maintaining approval, the data as outlined in Section 5-6.16 (b) of this Subpart, must also be submitted.

(6) Unless immediate revocation of a Certificate of Approval is necessary to protect public health and safety, notice and opportunity for a hearing will be afforded prior to revocation.

5-6.17 Violations. Violations of this Subpart may subject the owner or operator of the bottled or bulk water facility to civil penalties of up to $1,000 per violation, in addition to revocation of the certification of the bottled or bulk water facility and prohibition of the distribution, sale, or offering for sale of the product within New York State.

5-6.18 Separability. If any provision of this Part are held invalid, such invalidity shall not affect other portions which can be given effect without the invalid provisions.

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Relationship Between Water Solubility, Soil Sorption, Octanol-Water Partitioning, and Concentration of Chemicals in Biota

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ABSTRACT: There is a need for a method of preliminary estimation of bioconcentration factors in fish and soil sorption coefficients for chemicals. A data base was assembled for 170 compounds having average values for these two parameters and also average values for water solubility and *n*-octanol-water partition coefficients. Binary regression equations between the logarithms of these values gave correlation coefficients that were all significant below the 1 percent level. Using these equations, measured average values for any of the four parameters could be used to estimate average values for the unmeasured parameters. The 95 percent confidence limits for the calculated values were about ±1 to 3 orders of magnitude of the measured values. The relatively large variation of the actual from the predicted values was due both to the variation in the type of methodology used to make the measurements and also to the intrinsic variation in values attributable to the nature of the chemicals, the characteristics of the soils and fish, and the environmental conditions employed in the studies. Much less variation between actual and predicted values has been achieved when more uniform methodology is adopted for measuring these parameters. Despite the variability, the data are useful for early assessment of the potential for bioconcentration and mobility in the environment. Knowledge of the two factors is needed for hazard assessment in the environment.

Bioconcentration factor values for *Daphnia* appear to be as valid for correlation purposes as those for fish.

KEY WORDS: aquatic toxicology, water solubility, soil sorption, *n*-octanol-water partitioning, bioconcentration, partition coefficients, predictive equations

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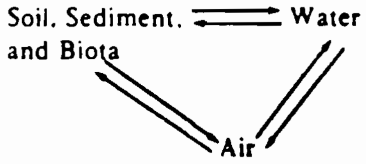
All chemicals are continually being transported and redistributed between the solid, liquid, and gaseous phases of our environment, as illustrated in the following diagram:



In most instances, transport of chemicals from soil, sediment, and biota to the air, and vice versa, takes place through water, simply because these solids are almost always sheathed with water. The rate of transport of the chemicals between the phases depends on the concentrations of the chemicals and their equilibrium distribution coefficients between the various phases.

For modeling and prediction purposes, the equilibrium distribution coefficients between water and air can be either measured or calculated from the vapor pressures and water solubilities of the chemicals by using the Henry's law relationship [*1-3*].[2] For pesticides, the values for the water-air concentration ratio vary from as little as 4.1 for methyl bromide [*1*] to as high as 281 000 000 for dimethoate [*3*].

The distribution coefficients between water and soil, and water and biota are also ordinarily measured for modeling and prediction purposes [*1,4,5*]. However, it would be useful to be able to rely on somewhat simpler parameters for predicting the relative tendency of chemicals to partition between water and solids in the environment. Two parameters that have been considered are water solubility and *n*-octanol-water partition coefficients.

The relationships of these two parameters to each other and to partition coefficients between water and soil, sediment, or biota have been examined in a number of ways. Fat solvent-water partition coefficients (PC) have been determined with oil [*6,7*], hexane [*8*], and more extensively with *n*-octanol [*9-11*], and the last PCs have been related to bioconcentration factors for certain lipid-soluble insecticides in fatty tissues of animal organisms [*12-16*]. Water solubility has been related to bioconcentration in biota [*17-19*] and to sorption by soils [*20,21*]. The *n*-octanol-water PCs have been related to bioconcentration in fish [*22,23*]. Soil sorption has been related to *n*-octanol-water PCs [*15,21,24*]. Soil organic carbon content has been related to soil sorption from water [*25-40*]. Water solubility has been related to *n*-octanol-water PCs [*19*].

From these comparisons, it would appear that the octanol-water PC and possibly the water solubility, at least for nonionic organic compounds, might both be suitable preliminary indicators of the potential for sorption of the chemical by soil or sediment or the potential for concentration in

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[2] The italic numbers in brackets refer to the list of references appended to this paper.

biota. The latter two pieces of data are highly useful for predicting the behavior of chemicals in the environment.

The main problem is the difficulty in assembling sufficient data obtained by adequate test methods for valid correlation studies. In spite of this problem, an attempt is made in this paper to examine the relationships between water solubility, soil sorption coefficients, octanol-water coefficients, and bioconcentration factors in biota.

Literature Review of Parameters Used in Correlation Studies

Water Solubility (*WS*)

The primary sources of WS data used in this paper are the *Herbicide Handbook* [*41*], *Herbicide Report* [*42*], British Crop Protection *Pesticide Manual* [*43*], MacKay and Wolkoff [*44*], Gunther et al [*45*], Chiou et al [*19*], Kenaga [*13,23*], Goring [*5*], Haque et al [*30*], Metcalf [*46*], Martin and Worthing [*47*], Biggar and Riggs [*48*], and Sanborn et al [*49*]. The data reported are somewhat variable. We believe that the estimates of water solubility we report in Table 4 gleaned from these and other sources are accurate within about one order of magnitude and, in many instances, within a twofold factor.

Gunther et al [*45*] have noted that "comparatively few *numerically* useful solubilities of pesticides in water have been recorded" and that "glaring inconsistencies and lamentable gaps occur in the literature" that is commonly available to research workers. Variability in methods of determination and conditions of measurement of water solubilities appear to become much more important as the WS of the compound falls below 1 ppm. Variables known to affect such measurements include properties of the water (temperature, pH, suspended solids, salt content, organic content); the physical state of the chemical, particularly its particle size in equilibrium with the water [*48*]; the purity of the chemical; and adsorption of the chemical on the walls of the container used to measure water solubility. Achieving saturation of the water with the chemical is often a tedious procedure. The formation of micelles or suspended microcrystals may result in false readings.

Soil Sorption Coefficient (K_{oc})

The soil sorption coefficient (K_{oc}) is the concentration of chemical sorbed by the soil expressed on a soil organic carbon basis divided by the concentration of chemical in the soil water.

Soil sorption has been reviewed by Bailey and White [*51*], Goring [*1*], and Hamaker and Thompson [*4*]. Various types of intermolecular interactions can be involved in sorption, including van der Waals-London interactions, hydrophobic bonding and water structure, hydrogen bonding, charge transfer, ligand exchange, ion exchange, direct and induced ion-dipole and dipole-dipole interactions, magnetic interactions, and chemisorption [*4*].

Despite the tremendous complexity of the sorption process in soil, a remarkably good relationship has been found between the organic matter of soils and their capacity to sorb most organic chemicals, in particular nonionic organic chemicals. Recognition of this relationship of organic matter to sorption of organic chemicals by soil dates at least as far back as 1943, when Chisholm and Koblitsky [*52*] measured the sorption of methyl bromide by soil in a fumigation chamber. Since then, hundreds of publications [*1,4*] have continued to emphasize the importance of organic matter in soil sorption. In 1960, Hartley [*54*] suggested that organic chemicals dissolve in the oily constituents of soil organic matter. In 1962, Goring [*55*] calculated sorption coefficients for nitrapyrin and found them to vary only about threefold when expressed on a soil organic matter basis. In contrast, the variation in sorption coefficients calculated on a soil basis was about 140-fold. The role of soil organic matter in sorbing pesticides was highlighted and discussed in detail in 1965 by Lambert et al [*56*]. Goring in 1967 [*1*] published the first compendium of sorption coefficients based on soil organic matter, and Hamaker and Thompson in 1972 [*4*] published the most comprehensive compendium of sorption coefficients expressed on a soil organic carbon basis. Hamaker and Thompson [*4*] converted all organic matter percentages to organic carbon percentages by dividing by 1.724.

Expressing sorption of chemicals on a soil organic carbon basis rather than on a total soil basis eliminated much, but not all, of the variation in sorption coefficients ordinarily encountered from soil to soil [*25–40*]. Residual variation in sorption expressed on the basis of organic carbon is caused by (*a*) inherent differences between soils in the sorption characteristics of its organic matter, (*b*) variation in the methods used to measure sorption, (*c*) the impact of other soil properties and soil constituents, and (*d*) the inherent characteristics of the chemicals being sorbed.

Soil organic matter consists of nonhumic substances such as carbohydrates, proteins, fats, waxes, resins, pigments, and low molecular weight compounds physically associated with humic acids [*57*]. The humic acids are amorphous, three-dimensional, polymeric, acidic substances of high molecular weight and aromatic structure [*57,58*]. Although the precise structures of the polymers are not known, they do contain hydroxyl and carboxyl groups in various amounts and ratios, depending on the degree to which the organic matter has been oxidized [*58*]. Thus, we can expect some variation in the sorption characteristics of organic matter from different soils, probably in the extent to which the surfaces are neutral or acidic. Although the acidic character of organic matter mitigates against direct sorption by the acid surfaces of clays, interaction of soil organic matter with clays does take place, probably via linkages through cations such as aluminum. The degree to which such interaction takes place will also affect the amount of organic matter surface available for sorption [*58*].

Some variation in the sorption coefficients obtained can also be expected as a result of differences in the methodology used to measure sorption.

Sorption coefficients are relatively constant at low concentrations of chemical in water but tend to decrease as the concentration of the chemical in the water is increased [*4,26,36,59-62*], especially for chemicals with high water solubilities. However, most sorption studies are done at concentrations that are low enough to minimize the variation in sorption coefficients attributable to this factor.

Sorption coefficients can also be influenced by incubation temperature [*4*], the ratio of soil to water [*63-68*], and the presence of salts or other possible interfering materials [*4,68,69*], although none of these factors appears to be of great significance within the range of conditions normally occurring in soils.

An additional methodology factor influencing sorption coefficients is incubation time. It now seems quite clear [*1,4*] that sorption does not reach equilibrium conditions in a short period of time. There appears to be an immediate rapid sorption followed by slow continued sorption over a long period of time [*1,4*]. Presumably, initial sorption is a surface phenomenon followed by a slow migration of the chemical into the organic matter matrix. This kind of sorption behavior suggests that desorption would approach equilibrium at an even slower rate and that distribution coefficients obtained from desorption data would be substantially higher than coefficients obtained from sorption data. Indeed, this seems to be true [*4,25,37,40,59,61,70-72*].

Much greater variability in sorption coefficients expressed on the basis of the organic carbon content of soil can be expected for ionic organic chemicals than for nonionic organic chemicals. Nonionics probably interact with the nonionic portions of the soil organic matter surfaces, which are probably not greatly influenced by the pH of the soil. However, carboxylic acids in ionic form will not be sorbed and may even be repelled from the soil surfaces at high pH values simply because of the negative charge on the soil organic matter surfaces [*1,4*]. As the pH of the soil is lowered, the amount of unionized organic matter surface and unionized compound increase. Sorption increases simply because the compound behaves more and more like a neutral molecule. Chemicals such as 2,4-dichlorophenoxyacetic acid (2,4-D acid), 2,4,5-trichlorophenol (2,4,5-T), dalapon, tricarboxylic acid (TCA), dinitro-ortho-secbutylphenol (DNBP), dicamba, chloramben, and picloram behave in this manner. These compounds also tend to be sorbed strongly by hydrated iron and aluminum oxides in soil, especially at low pH values [*1,4*]. Sorption of a phosphonic acid such as glyphosate appears to be related to the phosphorus-fixing capacity of the soil, not to the organic matter content [*31, 73, 74*]. Sorption of cationic materials such as the bipyridyl herbicides [*1, 4, 53, 75*] is related to the cation exchange capacity of the soil, but only an unpredictable portion of the exchange capacity of soil can be attributed to soil organic matter.

Despite the imperfections in soil sorption coefficients based on the organic carbon content of soil, they represent the best way currently available for comparing the sorption characteristics of chemicals and relating these characteristics to other bioconcentration measurements such as *n*-octanol-water partition coefficients and bioconcentration factors for biota. They also represent the most useful and reproducible measure of comparative leachability in soil, since the leachability of chemicals has been shown to correlate well with distribution coefficients based on soil organic carbon, the organic matter content of the soil, and the sorption capacity of the soil [*27, 33, 35, 36, 40, 60, 68, 76-88*].

n-*Octanol-Water Partition Coefficient* (K_{ow})

Partition coefficients are the distribution of chemicals between two immiscible liquids, such as might occur in binary solvent extraction or between blood and fat in animal organisms. When *n*-octanol and water are used, the distribution coefficient is called K_{ow} by convention.

The main sources of information for K_{ow} data used here are Tulp et al [*12*], Chiou et al [*19*], Karickhoff et al [*21*], Kenaga [*13, 23*], Neely et al [*22*], Lu et al [*89, 90*], Zitko [*91*], Hansch et al [*92*], Leo [*93*], Leo et al [*10*], Fujita et al [*9*], and Freed et al [*94*].

The choice of the solvent-water system for correlation of PCs with bioconcentration of pesticides in animal fat is certainly arbitrary. The PCs for dichlorodiphenyltrichloroethane (DDT) between water and olive oil, hexane, or *n*-octanol are all high; however, K_{ow} values seem to correlate most closely with bioconcentration factors observed under field conditions. *n*-Octanol has a relatively low water solubility (estimated between 300 and 540 ppm) and is believed to imitate best the fatty structures in plant and animal systems exposed to pesticides.

For anionic herbicides the K_{ow} become larger as the pH of the water medium falls. This is simply because a smaller fraction of the material is dissociated, and the undissociated species is more soluble in octanol than the dissociated species [*23*]. These types of chemicals ordinarily have low K_{ow} values even under acid conditions, unless a very bulky lipophilic group is attached to the acid group.

Variability in K_{ow} for a given chemical are frequently encountered in the literature [*21*]. As with water solubility, factors such as temperature, pH, purity of the solvents, purity of the chemical, time of mixing, and time of phase separation are all apt to influence the results obtained. The use of gas-liquid chromatography methods for chemicals such as DDT may give high K_{ow} because of the problem of determining low concentrations in water. Radiolabeling techniques may give low K_{ow} values because of trace radioactive impurities that are more water soluble than the chemicals whose K_{ow} are being measured. The latter problem can be minimized by repeated extractions of the octanol layer with water until a constant ratio of radioactivity between the two layers is obtained.

K_{ow} values are not available for most chemicals. Thus, it is desirable to be able to arrive at values by prediction as an alternative to experimentation. Fujita et al [9] determined K_{ow} for 203 monosubstituted and disubstituted benzenes. From these data, a substituent constant, π, was calculated for 67 functional groups of benzene. It has been found that π values are relatively constant from one system to another as long as there are no special steric or electronic interactions of the substituents not contained in the basic reference molecule. The K_{ow} can be calculated by use of the additive-constituent characters for various groups such as CH_2, OH, or NH_2, onto known values of known molecules. Leo et al [10] studied the substituent free energies and interaction terms affecting π values, as influenced by inductive, resonance, steric, and conformational effects and by aliphatic chain branching. These π values can be used together with "uncertainty units" for various groups to calculate log values of K_{ow} for many chemicals. Hansch et al [92] gave examples of the comparative values of calculated and experimental K_{ow}. The calculated values were, however, still considered crude estimates.

Abrams and Prausnitz [95] devised a new expression for measuring the activity coefficients for multicomponent mixtures of nonpolar and polar liquids, including those that participate in hydrogen bonding. These measurements are based on the effects of molecular size and shape on the excess Gibbs free energy of the mixture as a function of the composition and are expressed as a universal quasi-chemical (UNIQUAC) equation. Fredenslund et al [96] has described a group contribution estimation method for the prediction of the activity of specific groups in nonelectrolyte mixtures. This method combines the solution tendencies of the functional groups concept with a model for activity coefficients based on an extension of UNIQUAC and is called a UNIFAC model. The system has been computerized by the Dow Chemical Co. for calculation of K_{ow}. A limitation so far is the lack of data on the effect of steric variations in molecules on the equation.

The variation between calculated and analytically determined K_{ow} may be as much as one order of magnitude. Calculated values for large K_{ow} ($>10\ 000$) may tend to be high.

Recently, a rapid and inexpensive method of estimating K_{ow} was developed by Veith and Morris [97] using reverse-phase high-pressure liquid chromatography. A linear calibration of the logarithm of retention time (RT) with the logarithm of K_{ow} gives a relationship that can be summarized by the equation

$$\log K_{ow} = 5.106 \log \mathrm{RT} - 1.258$$

with a correlation coefficient of 0.975. Using this formula on 18 organic compounds, the K_{ow} values were estimated to within about one order of magnitude of the reported literature values. The technique does not require a knowledge of structure and can be used with mixtures of compounds such as those found in effluents.

Bioconcentration Factor (BCF)

The bioconcentration factor, as used in this paper, is the concentration of a chemical in an organism, or in the tissue of an organism, divided by the concentration in water. Other similar terms used in the literature are "bioaccumulation" and "biomagnification."

Macek et al [*98*] measured the effect of dietary and aqueous exposures of three chemicals on uptake and consequent BCF values in fish. The steady-state body burden due to dietary uptake was indistinguishable from that due to uptake from water. This and other data support the conclusion that "ecological magnification," "bioaccumulation," and "biomagnification" are probably unsuitable terms. They tend to imply successively increasing BCF values in aquatic food chain organisms, terminating at the top of the food chain with a BCF value greater than would be obtained by direct exposure of the organism at the top of the food chain to water containing the chemical.

Three principal test methods are commonly used for measurement of BCFs: (*a*) exposure of fish in an aquarium to flowing water treated with the chemical [*98–100*], (*b*) a model ecosystem containing plant or animal organisms or both in water [*18*], and (*c*) a terrestrial-aquatic model ecosystem containing soil and animal and plant organisms [*101*]. A comparative view of these test methods is shown in Table 1.

The actual bioconcentration factor obtained for a compound is influenced by many factors, such as those that influence stability and solubility, particularly in water [*15*]. Algae, which have a high surface-to-volume ratio compared with large organisms, are apt to give high BCF values [*23*].

Roberts et al [*105*] have shown that bioaccumulation of chlordane fed to Northern redhorse suckers is directly related, and the rate of clearance inversely related, to the size of its lipid pool. Lean fish did not bioaccumulate from treated food.

Since chemicals tend to bioconcentrate in fatty portions of tissues, when

TABLE 1—*Comparison of aquatic organism bioconcentration methods using flowing water or static water ecosystem.*

Bioconcentration Test Method Variables	Terrestrial-Aquatic Methods of Metcalf [*46*]	Static Water Method of Lu and Metcalf [*89*]	Flowing Water Methods of Branson et al [*99*], Macek et al [*98*], Mayer et al [*114,115*], Schimmel et al [*102*], Parrish et al [*103*], Hansen et al [*104*]
Water system	static (lentic)—runoff from treated plants to soil and water, all within test chamber (terrestrial-aquatic ecosystem)	static water—treated	flowing (lotic)—replacement of water occurs at variable rates of turnover from outside test chamber
Soil	present	none	none
Organisms used in same test chamber	plankton, insects, algae, snails, mosquito larvae, plants, mosquito larvae (with microorganisms)	algae, snails, *Daphnia*, *Culex*, larvae, mosquito fish	fish or invertebrate organism (not both)—rainbow trout, bluegill, brook trout, fathead minnow, carp, or *Daphnia*
Numbr of times chemical was applied	once	once	constantly or intermittently
Parent chemical—metabolites and degradates	not lost by water exchange	not lost by water exchange	lost by water exchange
Fish residue measurements	whole fish	whole fish	muscle, pithed, or whole fish
Bioconcentration exposure time for fish	3 days, starting 30 days after introduction of chemical into ecosystem	1 day, starting 2 days after introduction of chemical into ecosystem	a few days to several weeks exposure or until an apparent steady state is observed, with or without depuration in a constant flow

fish are eviscerated or skinned and beheaded, the remaining portions, which ordinarily have a lower fat content, usually have a lower BCF than the whole fish.

Hansen et al [*104*] found that residue levels of a polychlorinated biphenyl (PCB) mixture (Arcoclor 1016) varied considerably in the different tissues of pinfish. The PCB content of the whole fish averaged 3.7 times that of the "flesh," and the "flesh plus skin" averaged 1.4 times that of the "flesh." Maximum concentrations were not reached until 21 to 28 days.

Lieb et al [*106*] measured the lipid content of rainbow trout starting with 14-week-old fish over a period of 32 weeks. The lipid content doubled in this time from 4.4 percent to 8.4 percent. Trout contained lipids distributed in various tissues as follows: viscera, 92.8 percent; gill, 9.7 percent; muscle, 2.7 percent; stomach, 6.5 percent; liver, 3.5 percent; and whole fish, 8.5 percent. Trout fed dietary concentrations of PCB contained PCB residues in direct proportion to the fat content of these respective tissues.

The U.S. Food and Drug Administration [*107*] published the fat content of many species of raw fish and other aquatic organisms. The following variation in the percentage of fat (raw fish-edible portion) was observed: Atlantic herring, 11.3; carp, 4.2; freshwater catfish, 3.1; yellow perch, 0.9; salmon (various species), 3.7 to 15.6; brook trout, 2.1; rainbow trout, 11.4; and shrimp, 0.8.

Lu et al [*18*] found the lipid content of some aquatic organisms to be as follows: algae, 2.32 percent; *Daphnia*, 1.28 percent; mosquito larvae, 1.46 percent; snails, 1.6 percent; and *Gambusia* fish, 6.15 percent. Surprisingly, a negative correlation was observed between fat content and the BCFs for six benzene derivatives, the fish being lowest and the algae highest. The explanation for the higher BCFs in the lower fat organisms may be the large surface-to-volume ratio of the algae relative to that of fish and the short time period allowed for bioconcentration in the fish (3 days).

The time necessary to reach the maximum residue concentration in organisms seems to vary greatly for chemicals and species [*14,15,23*]. When a hydrophobic compound is easily metabolized or degraded in water, the tendency to bioconcentrate is offset by a rapid rate of degradation, and significant levels of residues do not occur in biota. Chlorpyrifos, which because of its hydrophobic nature, might otherwise have the potential for substantial bioconcentration [*108*], is an example of such a compound.

Stable chemicals that are very low in water solubility, such as the highly chlorinated PCBs, take the longest time to reach maximum residues in organisms, perhaps several weeks or months. This delay is a reflection of the slow distribution of the compound throughout the organism. As suggested previously, slowness of internal distribution may be correlated directly with the size of the organism. Reinert [*109*] studied the concentration of dieldrin in algae, *Daphnia*, and guppies in static water tests. The time required to reach maximum residues (BCFs) was directly proportional to size. Maximum BCFs were reached in 1 day for algae (1282), 3 days (13 954) for *Daphnia*, and 16 days (49 307) for guppies.

Matsumura [*110*] studied the accumulation and elimination of pesticides in static water ecosystems in contact with soil. With decreasing fish size, the BCF for DDT increased, but the total DDT content per fish was similar. When the volume of the water was held constant and the depth varied, uptake of DDT by fish was greater in shallow water, which had the highest ratio of soil surface to water volume. Residues in small organisms like ostracods reached peak concentrations within 1 to 4 days. The BCF for DDT in fish increased linearly with increasing temperature.

Halter and Johnson [*111*] found that fathead minnows in direct contact with PCB-contaminated (Aroclor 1254) sediments accumulated PCB residues at six times the rate of those screened from direct exposure to the sediments. This was thought to be due to "mouthing" the soil rather than ingestion. The four organisms most frequently used in the terrestrial-aquatic ecosystem are algae, snails, mosquito larvae, and mosquito fish (*Gambusia affinis*). The ranking of these organisms in order of increasing BCF varied somewhat from chemical to chemical except for closely related compounds. The chlorinated cyclodiene derivatives (dieldrin, aldrin, heptachlor, and chlordane) were usually bioconcentrated to the highest degree in snails. This was also true of the PCBs, methoxychlor, and toxaphene. DDT, DDD, and dichlorodiphenyldichloroethane (DDD), and dichlorodiphenyldichloroethylene (DDE) were most highly concentrated in fish. This selectivity in bioconcentration was not always reflected in toxicity, since the chlorinated cyclodienes are not very toxic to snails, while DDT is quite toxic to fish.

Lu et al [*90*] pointed out that one reason why snails may excessively bioconcentrate some chemicals is that they are deficient in certain degradative enzymes such as microsomal oxidases or mixed-function oxidases. Metabolic mechanisms for degradation that tend to reduce bioconcentration include hydroxylation, conjugation, *O*-dealkylation, reduction, methylation, oxidation, and reductive dechlorination.

Metcalf et al [*112*] compared the BCFs of six chlorinated hydrocarbons in a static water ecosystem against three organisms: *Daphnia magna*, *Culex pipiens quinquefasciatus*, and *Gambusia affinis*. Bioconcentration was greatest with *Daphnia*, often being five to ten times greater than in the other two organisms. On the average, *Culex* reached the residue peak in 1 day, *Daphnia* in 2 days, and *Gambusia* in 3 days.

Metcalf [*113*] and his students studied the reproducibility of BCFs obtained from the terrestrial-aquatic model ecosystem and were able to obtain quite reproducible results.

Mayer et al [*114,115*] reported residue data for three life stages and three species of fish when exposed to continuously flowing water containing five concentrations of toxaphene, ranging through about a 13-fold difference in concentration. The egg stage of the three species had BCFs in the range of 5000 to 10 000, the fry stage 15 000 to 76 000, and the adult 17 000 to 76 000. Variations between BCF values are given in Table 2. Thus, considering all the variables mentioned above, the BCFs for toxaphene in fish varied 15.5-fold, depending on the concentration, species, and life stage used.

Hamelink [*116*] has written a comprehensive summary of current bioconcentration test methods and theory.

Binary Regression Equations from the Literature

Binary regression equations have been published for six combinations of the twelve possible between WS, K_{oc}, K_{ow}, and BCF (20 combinations are possible if BCF is split into BCF(f) (flowing water ecosystem) and BCF(t) (terrestrial-aquatic ecosystem). The published equations, shown in Table 3, are a heterogeneous group sometimes derived by different statistical methods and using differing units of measurement. Thus, they are not readily usable for comparative purposes. Furthermore, they were derived from twelve chemicals or fewer in all but two of the examples.

In this paper, equations will be derived for all 20 possible combinations of WS, K_{oc}, K_{ow}, BCF(f), and BCF(t), with sufficient examples to make all the equations representative of the behavior of a widely varying group of chemicals.

Equations from the literature and some historical background for the equations are summarized as follows:

Water Solubility (WS) Versus Soil Sorption Coefficients (K_{oc})

The direct relationship of high water solubility to high leachability in soil has long been observed for many pesticides. Furthermore, Goring [*5*] has stated that "there is abundant evidence that neutral organic substances are sorbed principally by soil organic matter and that distribution coefficients are useful for judging their relative susceptibility to leaching."

TABLE 2—*Variations between BCF values for toxaphene reported by Mayer et al* [114,115].

Comparison	Differences Between BCF Values—Minimum to Maximum
Between three species for all life stages (channel catfish, brook trout, and fathead minnow)	2.7- to 4.9-fold
Between life stages for each species (egg, fry, adult)	7.4- to 11.9-fold
Between five concentrations (within a given life stage and species)	1.05- to 1.85-fold
Between all factors	18.5-fold

Note: log means $\log_{10}$

WS = mole fraction

TABLE 3—*Published equations useful for correlation between chemical properties of water solubility, soil sorption coefficients, octanol-water partition coefficients, and bioconcentration factors in fish.*

Correlation	Equation	No.	Ref.
K_{oc}-WS	$\log K_{oc} = 0.44 - 0.54 \log \text{WS}$	(1)	[*21*]
	WS = mole fraction, $r = 1.00$, $n = 10$, linear least squares fitting log-log plots		
K_{ow}-WS	$\log K_{ow} = 5.00 - 0.670 \log \text{WS}$	(2)	[*19*]
	WS = μmol/litre, $r = 0.985$, $\alpha = 0.005$, $n = 34$		
WS-BCF	$\log \text{WS} = 5.99 - 1.176 \log \text{BCF}$	(3)	[*112*]
	WS = ppb, $r = 0.87$, $\rho = 0.0005$, least squares analyses, $n = 12$; terrestrial-aquatic static ecosystem		
BCF-WS	$\log \text{BCF} = 3.9950 - 0.3891 \log \text{WS}$	(4)	[*89*]
	WS = ppb, $r = -0.9228$, $n = 11$, variable linear regression; static water ecosystem		
BCF-WS	$\log \text{BCF} = 3.41 - 0.508 \log \text{WS}$	(5)	[*19*]
	WS = μmol/litre, $r = -0.964$, $\alpha = 0.005$, $n = 8$; flowing water ecosystem		
K_{oc}-K_{ow}	$\log Q = \log (K_{oc}/1.724) =$ $(0.524 \pm 0.48) \log K_{ow} + (0.618 \pm 0.113)$	(6)	[*118*]
	$r = 0.917$, $n = 30$, 1.724 = correction from percent carbon to organic carbon		
K_{oc}-K_{ow}	$\log K_{oc} = -0.21 + 1.00 \log K_{ow}$	(7)	[*21*]
	$r = 1.00$, linear regression coefficient, $n = 10$		
BCF-K_{ow}	$\log \text{BCF} = 0.124 + 0.542 \log K_{ow}$	(8)	[*22*]
	$r = 0.948$, SE = 0.342, $\alpha = 0.001$, $n = 8$; flowing water ecosystem		
BCF-K_{ow}	$\log \text{BCF} = 0.7285 + 0.635 \log K_{ow}$ (π constant)	(9)	[*24*]
	$r = 0.7879$, $n = 11$; static water ecosystem		

Kenaga [*117*] pointed out the relationship of low water solubility to strong soil binding and reduced leaching and regarded it as a useful tool in predicting adsorption of pesticides by soil.

The sorption of ten hydrophobic aromatic and chlorinated hydrocarbons, varying in water solubility from 1 ppb to 1000 ppm, on aquatic sediments was correlated with water solubility by Karickhoff et al [*21*]. The correlation coefficient between WS and K_{oc}, shown in Eq 1 in Table 3, was excellent.

Water Solubility (WS) Versus Octanol-Water Partition Coefficients (K_{ow})

Chiou et al [19] compared K_{ow} ranging over six orders of magnitude with WSs ranging over more than eight orders of magnitude for 34 chemicals. An empirical equation (Table 3, Eq 2) was derived to allow the assessment of K_{ow} from WS with a predicted error of less than one order of magnitude.

Water Solubility (WS) Versus Bioconcentration Factor (BCF)

Metcalf et al [112] correlated water solubility and BCFs for twelve chlorinated hydrocarbon and DDT-related insecticides using mosquito fish in his terrestrial-static water ecosystem BCF(t). When the results for hexachlorobenzene were excluded, a good correlation was obtained, as shown by Eq 3 in Table 3.

Metcalf and Sanborn [17] studied the relationship between water solubility and bioconcentration in mosquito fish under static water conditions with 48 pesticides. The data were plotted on log-log paper, and a statistically significant inverse relationship was noted between water solubility and pesticide bioconcentration. The correlation coefficient, r, was -0.76.

Lu and Metcalf [89] correlated water solubility with BCFs for mosquito fish obtained for eleven organic compounds under static exposure conditions. An excellent correlation was obtained, as illustrated by Eq 4 in Table 3.

Haque et al [30] reviewed the relationship between water solubility and BCFs of five compounds on various aquatic organisms.

Chiou et al [19] correlated the water solubility of seven organic chemicals with their BCFs from rainbow trout in flowing water tests BCF(f). The regression equation (Eq 5) derived from this study is also shown in Table 3.

Soil Sorption Coefficient (K_{oc}) *Versus Octanol-Water Partition Coefficients* (K_{ow})

Briggs [118] developed an equation for the relationship between soil sorption of organic chemicals and their K_{ow}. Soil sorption could be stated in terms of soil organic matter-water partition coefficients or in terms of R_f values from soil thin-layer chromatography. Soil organic matter values (Q values) determined by Briggs [119] on 30 compounds were correlated with K_{ow} obtained from Leo et al [10] or determined spectrophotometrically by Fujita et al [9]. An equation (Eq 6) derived from these data is shown in Table 3. The correlation was excellent.

The R_f values from soil thin-layer chromatography for 25 compound from the work of Helling [*120*], were correlated with K_{ow} values, and the equation

$$\log(1/R_f -) = 0.517\ (\pm\ 0.22)\ \log K_{ow} - 0.951\ (\pm\ 0.075)$$

was developed by Briggs [*118*]. The slopes of the two equations (0.524 and 0.517) are so similar, that Q can be estimated from the R_f equation.

Karickoff et al [*21*] chose compounds ranging from 1 ppb to 1000 ppm in water solubility to use for a correlation of K_{oc} with K_{ow} values. An equation (Eq 7) derived from these data is shown in Table 3. The correlation of K_{oc} with K_{ow} was somewhat better than with WS (Eq 1), although both correlations were excellent.

Soil Sorption Coefficient (K_{oc}) *Versus Bioconcentration Factor* (*BCF*)

Goring [*5*] compared the soil sorption coefficient based on soil organic matter and BCFs in algae, fish, and *Daphnia* for DDT and found them similar. He suggested that a similar relation existed for other compounds, but no equation to correlate K_{oc} with BCF is found in the literature.

Octanol-Water Partition Coefficient (K_{ow}) *Versus Bioconcentration Factor* (*BCF*)

Neely et al [*22*] found that BCF values of eight organic nonpolar compounds in rainbow trout in a flowing water ecosystem followed a straight line relationship with K_{ow}. The regression equation (Eq 8) for the best fit is shown in Table 3. This equation was used to predict values that agreed with experimental values in the literature.

Lu and Metcalf [*89*] correlated K_{ow} with BCFs in mosquito fish, using a static water ecosystem and the same eleven organic compounds used for their WS-BCF correlation study (Eq 4). The former correlation (Eq 9) was good, but not as good as the latter, probably because the K_{ow} values were more uncertain.

Lu et al [*90*] in similar tests found that the log K_{ow} versus log BCF correlation of two carcinogens, when plotted with the eleven compounds just mentioned, fit the same regression equation.

Limitations to the use of these equations may occur with compounds that do not penetrate through tissues or bioconcentrate at the same rates in organisms as expected from the average molecule, because of unusual steric configurations, molecular weights, or solubilities [*12*].

Organization of Data and Chemical Groupings

Data from the literature for a total of 170 chemicals that were suitable for a correlation study between the four major parameters (water solubility, K_{oc}, K_{ow}, and BCF) are presented in Table 4. Because of space limitations and the need for a single value for correlation purposes, average values were used. The literature sources used to calculate each average value are referenced in Table 4.

K_{oc} values were obtained or calculated for many different kinds of soils. When values for percent of organic carbon in the soil were not available, they were estimated by dividing the percent of soil organic matter by 1.724. The sorption coefficient for each chemical is the average of sorption coefficients gleaned from the literature for widely varying numbers of soils.

K_{ow} values obtained by the radiolabeled method [89] often varied considerably from those obtained by the gas-liquid chromatography method of analysis. Since relatively few K_{ow} values were obtained by radiolabeled determination, they are not used for correlative purposes and are not given in Table 4. In addition, K_{ow} values calculated by the method of Hansch et al [11], Fujita et al [9], Leo et al [10], and Leo [93] are indicated separately from experimental values in Table 4.

Bioconcentration factor test methods vary considerably between the flowing water, static water, and terrestrial-aquatic ecosystems, as shown in Table 1. Because of this, BCF numbers from the three systems were separated for statistical purposes. Since there are too few observations on the static water systems, only the flowing water (or intermittent) BCF(f) and terrestrial-aquatic ecosystem BCF(t) values are listed in Table 4.

BCF values are taken from several different species of fish. Also, some of the BCF values are from whole fish and some from just muscle tissues. These values were used without adjustment to a uniform tissue basis. Without the use of such data, there would not be enough data for correlation purposes. Obviously, the use of identical species and BCF test methods would provide data that would probably give a much better correlation than was obtained in these studies.

Fish are the main aquatic organism used in bioconcentration tests. This use is somewhat arbitrary and is based on the obvious economic importance of fish as human food. The species that are used vary considerably and may include the fathead minnow, bluegill, rainbow trout, brook trout, and mosquito fish. Other species of animals, such as arthropods, have also been used for bioconcentration tests. *Daphnia* has been most frequently used, and, therefore, comparative bioconcentration values for fish and *Daphnia* are shown in Table 9. The limited BCF data available for *Daphnia* required the use of data from all types of water testing systems.

Despite the variability of the data base, we have been able to obtain significant correlations between parameters and have examined the usefulness of water solubiltiy and *n*-octanol partition coefficients for predicting distribution of chemicals in soil and biota.

For purposes of examining possible relationships between chemical

TABLE 4—*Water solubility, soil adsorption coefficient, octanol-water partition coefficient, and BCF data.*

Chemical	Water Solubility, ppm	Soil Adsorption Coefficient, K_{oc}	Octanol-Water Partition Coefficient, K_{ow}	Bioconcentration Factor	
				Flowing Water, BCF(f)	Static Water, BCF(t)[a]
A. Halogenated Hydrocarbon Insecticides					
Aldrin	0.013 [48]	410 [4]			3 140 [46]
Chlordane	0.056 [49]			11 400 [121-123]	8 260 [17]
DDD	0.005 [48]		1 047 000 [97]		63 830 [46, 112]
DDE	0.010 [48]		583 000 [19, 97]		27 400 [46]
DDT	0.0017 [48]	238 000 [4]	960 000 [19, 23, 97]	61 600 [124-126]	84 500 [68]
Dieldrin	0.022 [48]			5 800 [103, 109]	4 420 [17, 46]
Endrin	0.024 [48]		218 000 [22, 97]	4 050 [127]	1 360 [46]
Heptachlor	0.030 [48]			17 400 [128, 129]	2 150 [17, 18]
Lindane	0.150 [48]	911 [4, 25, 130, 131]		325 [132, 133]	560 [46]
Methoxychlor	0.003 [48]	80 000 [21]	47 500 [21, 97]	185 [134]	1 550 [46]
Toxaphene	0.40 [49]			26 400 [115, 135, 136]	4 250 [49]
Kepone	3 [137]			8 400 [98, 138]	
Mirex	0.6 [137]				220 [46]
B. Substituted Benzenes and Halobenzenes					
Bromobenzene	446 [19]		900 [10, 97]		
Chlorobenzene	448 [19]		690 [10]	12 [139]	
p-Dichlorobenzene	79 [140]		2 450 [10]	215 [22]	
Hexachlorobenzene	0.035 [141]	3 914 [4]	168 000 [22, 142, 143]	8 600 [21, 24, 129]	290 [46]
Pentachlorobenzene	0.135 [141]		154 000 [142, 143]	~5 000 [139]	
1,2,4,5-Tetrachlorobenzene	6 [144]		47 000 [142, 143]	4 500 [145-148]	
1,2,4-Trichlorobenzene	30 [149-151]		15 000 [142, 143]	491 [98, 139]	
Aniline	36 600 [89]		7 [89]		6 [89]
Chloroneb	8 [47]	1 159 [4]			
Chlorthiamid	950 [47]	107 [4]			

Dichlobenil	18 [47]	235 [4,130, 152]			55 [21]
Diethylaniline	670 [89]		9 [89]		120 [89]
Methazole	1.5 [47]	2 620 [59]			
Nitrobenzene	1 780 [89]		62 [89]		29 [89]
Norfluorazon	28 [47]	1 914 [59]			
Oxadiazon	0.7 [47]	3 241 [59]			
Phthalic anhydride	6 200 [89]		0.24 [89]		0 [89]
Bifenox	0.35 [47]				200 [17]
Captan	<0.5 [47]		224 [10]		0 [153]
C. Halogenated Biphenyls and Diphenyl Oxides					
4-Chlorobiphenyl	1.65 [154]		79 400 [154]	590^b [149]	
4,4′-Dichlorobiphenyl	0.062 [19]		380 000 [19]	215 [155]	
2,4,4′- and 2,2′,5-trichlorobiphenyl (Aroclor 1016, 1242)	0.085 [154]		380 200 [97]	48 980 [156-158]	6 400 [159]
2,2′,4,4′- and 2,2′,5,5′-tetrachlorobiphenyl (Aroclor 1248)	0.017 [19, 154]		1 288 000 [19,97]	72 950 [99,149,156]	11 800 [159]
→ 2,2′,4,5,5′-Pentachlorobiphenyl (Aroclor 1254)	0.01 [19]	42 500 [66]	2 017 000 [19]	45 600 [100,102, 104,160,161]	12 150 [159]
2,2′,4,4′,5,5′-Hexachlorobiphenyl	0.001 [19]	1 200 000 [21]	3 700 000 [19,21]	46 000^b [149]	
Diphenyloxide	21 [154]		15 800^c [11,162]	196 [145,149, 163]	
4-Chlorodiphenyloxide	3 [154]		12 000 [154,164]	736 [145,147, 165-167]	
x-sec-Butyl-4-chlorodiphenyloxide	0.14 [154]		16 000 [154,155]	298 [147,155, 165,167]	400 [149]
x-Hexyl-x′-chlorodiphenyloxide	0.076 [154]		4 500 [165]	18 000 [154]	200 [149]
x-Dodeca-x′-chlorodiphenyloxide	0.052 [165]		1 780 [165]	12 [154]	2 [149]
D. Aromatic Hydrocarbons					
Anthracene	0.073 [21]	26 000 [21]	22 000 [10,21,97]		
✓ Benzene	1 780 [21]	83 [21]	135 [10]		
Biphenyl	7.5 [21]		7 540 [10,22,97]	340 [24,164]	
9-Methylanthracene	0.261 [168]	65 000 [21]	117 000 [21]		

TABLE 4—*Continued.*

Chemical	Water Solubility, ppm	Soil Adsorption Coefficient, K_{oc}	Octanol-Water Partition Coefficient, K_{ow}	Bioconcentration Factor	
				Flowing Water, BCF(f)	Static Water, BCF(t)^a
2-Methylnaphthalene	25.4 [*21*]	8 500 [*21*]	13 000 [*10*]		
Naphthalene	31.7 [*21*]	1 300 [*21*]	2 040 [*10, 21, 97*]		
Phenanthrene	1.29 [*21*]	23 000 [*21*]	32 900 [*10, 21*]		
Pyrene	0.135 [*21*]	84 000 [*21*]	150 000 [*21*]		
Tetracene	0.0005 [*21*]	650 000 [*21*]	800 000 [*21*]		
		E. Fumigants			
cis-1,3-Dichloropropene	2 700 [*2*]	23 [*4, 169*]			
trans-1,3-Dichloropropene	2 800 [*2*]	26 [*4, 169*]			
DBCP	1 230 [*2*]	129 [*1, 170*]			
Ethylene dibromide	3 370 [*2*]	44 [*4, 170, 171*]			
Methyl isothiocyanate	7 600 [*2*]	6 [*38, 172*]			
Carbon tetrachloride	800 [*45*]		436^c [*137*]	18 [*22*]	
Tetrachloroethylene	200 [*45*]		758^c [*137*]	39 [*22*]	
		F. Phosphorus-Containing Insecticides			
Crotoxyphos	1 000 [*47*]	170 [*4*]			
Disulfoton	25 [*47*]	1 780 [*4*]			
Malathion	145 [*47*]		780 [*19*]		0^d [*17*]
Phorate	50 [*47*]	3 200 [*4*]			
Trichlorfon	154 000 [*47*]		3 [*173*]		
Terbufos	12 [*47*]				535 [*17*]
Dimethoate	25 000 [*47*]		0.51 [*76*]		
Dichlorovos	10 000 [*47*]		25 [*10, 173*]		
Acephate	650 000 [*47*]				0^d [*17*]
Diamidaphos	50 000 [*47*]	32 [*4*]		1 [*174*]	
Crufomate	200 [*175*]		2 780^c [*115*]		

Carbophenothion	0.34 [*45*]	45 400 [*4*]			
Chlorpyrifos	0.3 [*175*]	13 600 [*173*]	97 700 [*13, 19*]	450 [*176*]	320 [*46, 153*]
Chloropyrifos-methyl	4.0 [*47*]	3 300 [*173*]	14 750 [*13, 19*]		95 [*46*]
Ethion	2 [*46*]	15 400 [*4*]			
Leptophos	2.4 [*47*]	9 300 [*59*]	2 020 000 [*19*]	750 [*98*]	1 440 [*153*]
Methyl parathion	57 [*47*]	9 800 [*4, 50, 130*]	82 [*153*]		95 [*46*]
Parathion	24 [*47*]	4 800 [*177, 178*]	6 400 [*19*]		335 [*17*]
Ronnel	6.0 [*175*]		46 400 [*19*]		
Diazinon	40 [*47*]			35 [*179*]	
Fenitrothion	30 [*76*]		2 400 [*19*]		10 [*10*]
Phosmet	25 [*47*]		677 [*19*]		11 [*150*]
Thionazin	903 [*2*]				0 [*17*]
Phosalone	10 [*47*]		20 100 [*19*]		
Dichlofenthion	0.245 [*47*]		137 000 [*19*]		
Dialifor	0.18 [*19, 76*]		49 300 [*19*]		
G. Carbamates, Thiocarbamates, and Carbamoyl Oximes					
Carbaryl	40 [*47*]	230 [*81, 177*]	230 [*153*]		$<1^{d}$ [*17, 153*]
Carbofuran	415 [*41*]		40 [*173*]		0 [*153, 181*]
Propoxur	2 000 [*47*]		33^{c} [*10, 182*]		146 [*17*]
Mexacarbate	120 [*175*]		1 370 [*175*]		
Formetanate	<1 000 [*47*]				0^{d} [*17*]
Metalkamate	<50 [*47*]				0 [*17*]
Chlorpropham	88 [*41*]	590 [*4, 130, 183*]			
Propham	250 [*41*]	51 [*4*]			
Cycloate	85 [*41*]	345 [*4*]			
Diallate	14 [*41*]	1 900 [*184*]			
EPTC	365 [*47*]	240 [*4*]			
Pebulate	60 [*41*]	630 [*4*]			
Triallate	4 [*41*]	2 220 [*20, 184*]			
Aldicarb	7 800 [*2*]				42 [*17*]
Methomyl	10 000 [*2*]	160 [*185*]	2 [*173*]		

TABLE 4—*Continued.*

Chemical	Water Solubility, ppm	Soil Adsorption Coefficient, K_{oc}	Octanol-Water Partition Coefficient, K_{ow}	Bioconcentration Factor	
				Flowing Water, BCF(f)	Static Water, BCF(t)^a
		H. Carboxylic Acids and Esters			
Chloramben	700 [*41*]	21 [*71, 130*]			
Chloramben, methyl ester	120 [*43*]	507 [*4*]			
6-Chloropicolinic acid	3 400 [*186*]	9 [*173*]	0.02 [*186*]		0.05 [*174*]
2,4-D acid	900 [*47*]	20^c [*4, 71, 130, 183, 187, 188*]	37^c [*19*]		0^d [*17*]
Dalapon	502 000 [*47*]		6 [*23*]		3 [*189*]
Dicamba	4 500 [*47*]	0.4^e [*4, 59*]			0 [*17*]
3,6-Dichloropicolinic acid	1 000 [*47*]	2 [*35*]			
Picloram	430 [*47*]	17 [*4, 29, 190*]	2 [*23*]		0.02 [*174, 191–193*]
Silvex (fenoprop)	140 [*47*]	2 600 [*4*]			
2,4,5-T (trichlorophenoxy acetic acid)	238 [*47*]	53 [*4, 34*]	4^f [*143, 194*]		25 [*195*]
Triclopyr (triethylamine salt)	2 100 000 [*142*]		3^f [*142*]		
Triclopyr (butoxyethyl ester)	23 [*196*]		12 300 [*196*]		
Triclopyr	430 [*47*]	27 [*173*]	3^f [*145*]		0.02 [*174, 191, 192*]
Endothall	100 000 [*47*]				0 [*197*]
Di-2-ethylhexyl phthalate	0.6 [*198*]		9 500 [*149*]	380 [*98, 199*]	130 [*46*]
		I. Dinitroanilines			
Benefin	< 1 [*41*]	10 700 [*65*]			
Butralin	1 [*41*]	8 200 [*59, 65*]			
Dinitramine	1.1 [*47*]	4 000 [*65*]			
Fluchloralin	<1 [*41*]	3 600 [*65*]			
Isopropalin	0.11 [*41*]	75 250 [*65*]			
Nitralin	0.6 [*41*]	960 [*4, 65*]			

Profluralin	0.1 [41]	8 600 [59,65]			
Trifluralin	0.6 [41]	13 700 [24,65, 173,184]	220 000 [24]	4 570 [122,128]	926 [17]
J. Ureas and Uracils					
Chlorbromuron	50 [41]	460 [4,200]			
Chloroxuron	2.7 [41]	3 200 [4]			
Diflubenzuron	0.2 [47]	6 790 [59]			
Diuron	42 [47]	400 [4,31,72, 130]	94 [119]		
Fenuron	3 850 [47]	27 [4]	10 [10]		
Fluometuron	90 [41]	175 [37,59,68, 86,190]	22 [119]		
Linuron	75 [41]	820 [4]	154 [119]		
Metobromuron	330 [47]	60 [4]			
Monolinuron	580 [47]	200 [4]	40 [119]		
Monuron	230 [47]	100 [4]	29 [119]		
Neburon	4.8 [47]	2 300 [4]			
Tebuthiuron	2 300 [41]	620 [27]			
Urea	1 000 000 [201]	14 [4]	0.001 [182]		
Bromacil	8.5 [41]	72 [4,169, 202]			
Isocil	2 150 [45]	130 [202]			
Terbacil	710 [47]	51 [67]			
K. Symmetrical Triazines					
Ametryn	185 [41]	392 [4]			
Atrazine	33 [1]	149 [4,24,28, 63,64,130, 183,203]	476 [24]	0 [204]	11 [17]
Cyanazine	171 [41]	200 [24]	150 [24]		0.4 [17]
Dipropetryn	16 [47]	1 170 [33]			
sec-Bumeton	620 [47]	350 [28]			
Ipazine	40 [45]	1 660 [4,24]	2 900 [24]		
Prometon	750 [41]	350 [4]			

TABLE 4—*Continued.*

Chemical	Water Solubility, ppm	Soil Adsorption Coefficient, K_{oc}	Octanol-Water Partition Coefficient, K_{ow}	Bioconcentration Factor Flowing Water, BCF(f)	 Static Water, BCF(t)^{a}
Prometryn	48 [*41*]	810 [*4, 33, 52, 59, 190*]			
Propazine	8.6 [*47*]	160 [*4, 24*]	785 [*24*]		
Simazine	3.5 [*41*]	135 [*4, 24*]	155 [*24*]	1 [*205*]	
Terbutryn	25 [*41*]	700 [*28, 70*]			
Trietazine	20 [*47*]	600 [*24*]	2 200 [*24*]		
		L. Miscellaneous Nitrogen Heterocyclics			
2-Methoxy-3,5,6-trichloropyridine	20.9 [*173*]	920 [*173*]	18 500^{g} [*173*]		
Nitrapyrin	40 [*1*]	420 [*173*]	2 590 [*186*]		
Pyroxychlor	11.3 [*173*]	3 000 [*173*]			239 [*186*]
3,5,6-Trichloro-2-pyridinol	220 [*206*]	130 [*173*]	1 620 [*207*]	3 [*176*]	16 [*89*]
Metribuzin	1 220 [*41*]	95 [*36, 53*]			
Pyrazon	400 [*41*]	120 [*32, 39, 61*]			
Thiabendazole	< 50 [*47*]	1 720 [*60*]			
Paraquat	1 000 000 [*41*]	15 473^{h} [*4, 75, 130*]			
		M. Miscellaneous			
Dinoseb	50 [*1*]	124 [*173*]	4 900^{e} [*208*]		
Pentachlorophenol	14 [*1*]	900 [*4*]	102 000^{e,h} [*10*]	16 [*122*]	130 [*17*]
Phenol	82 000 [*47*]	27 [*4*]			
Glyphosate	12 000 [*41*]	2 640^{h} [*31, 73, 74*]			

DSMA	254 000 [*47*]	770^b [*4*]		
Alachlor	242 [*44*]	190 [*20, 173*]	830 [*10*]	0^d [*17*]
Napropamide	73 [*47*]	680 [*40*]		
Propachlor	580 [*47*]	265 [*20, 173*]	560 [*10*]	< 1^d [*191–193, 209*]
Pronamide	15 [*47*]	200 [*26, 84, 169*]		
Asulam	5 000 [*47*]	300 [*59*]		
Bentazon	500 [*47*]	0 [*77*]	220 [*10*]	0^d [*17*]

[a] Metcalf et al [*101*] terrestrial-aquatic ecosystem data.
[b] Estimated.
[c] Calculated.
[d] Compound decomposed during exposure.
[e] Value includes salts.
[f] pH dependent, K_{om} always below 10.
[g] Measured by radioassay.
[h] Data not used in equations.

structure and WS, K_{oc}, K_{ow}, and BCF values, the 170 chemicals were broken down into 13 major groups, as follows: halogenated hydrocarbon insecticides; substituted benzenes and halobenzenes; halogenated biphenyls and diphenyl oxides; aromatic hydrocarbons; fumigants; phosphorus-containing insecticides; carbamates, thiocarbamates, and carbamoyl oximes; carboxylic acids and esters; dinitroanilines; ureas and uracils; symmetrical triazines; miscellaneous nitrogen heterocyclics; and miscellaneous.

The statistical correlations were performed with logarithms of the numerical values for each parameter. Binary regressions were developed for prediction of each parameter from known values for every other parameter. The significance of the correlations is expressed in terms of the (±) number of orders of magnitude (= log) from the designated value and by correlation coefficients. Confidence limits are slightly larger for values of x near the extremes (large or small).

Results and Discussion

Data on water solubility, K_{oc}, K_{ow}, BCF(f), and BCF(t) for the 170 chemicals are shown in Table 4.

The number of values, the geometric mean, minimum, and maximum values for each of the variables, and the standard deviations summarized from all of the data are shown in Table 5. The largest range of values was for *n*-octanol-water coefficients and the smallest range for bioconcentration factors.

The 20 possible equations are shown in Table 6. Negative slope values for correlations with water solubility indicate an inverse relationship to the other parameters.

The correlation coefficients were all significant at the 1 percent level of probability. Soil sorption coefficient values appear to correlate best with the other four parameters. Bioconcentration in flowing water correlated

TABLE 5—*Statistical averages, minimum and maximum values, and standard deviation of data summarized from Table 1..*

Value	Number of Values	Geometric Mean	Standard Deviation	Range of Values	
				Minimum	Maximum
Water solubility,					
WS (ppm)	170	32	91	0.0001	2 100 000
K_{oc}	109	695	14	0	1 200 000
K_{ow}	90	1 253	81	0.0001	3 700 000
Bioconcentration factor					
Flowing water, BCF(f)	36	660	29	0	61 600
Terrestrial-aquatic, BCF(t)	50	55	47	0	84 500

Note: All WS values are in "ppm"

TABLE 6—*Binary correlations between water solubility, soil partition coefficients, octanol-water partition coefficients, and bioconcentration factors.*

Correlation	Regression Equation	± Order of Magnitude (95% Confidence Limits) from Calculated Value	Correlation Coefficient[a] (r)	Number of Examples (n)
WS-K_{oc}	log WS = 5.09 − 1.28(log K_{oc})	1.94	−0.84	106
WS-K_{ow}	log WS = 4.184 − 0.922(log K_{ow})	2.11	−0.86	90
WS-BCF(f)	log WS = 2.531 − 0.916[log BCF(f)]	2.54	−0.72	36
WS-BCF(t)	log WS = 1.903 − 0.690[log BCF(t)]	3.19	−0.66	50
K_{oc}-WS	log K_{oc} = 3.64 − 0.55(log WS)	1.23	−0.84	106
K_{oc}-K_{ow}	log K_{oc} = 1.377 + 0.544(log K_{ow})	1.37	+0.86	45
K_{oc}-BCF(f)	log K_{oc} = 1.963 + 0.681[log BCF(f)]	1.52	+0.87	13
K_{oc}-BCF(t)	log K_{oc} = 1.886 + 0.681[log BCF(t)]	1.14	+0.91	22
K_{ow}-WS	log K_{ow} = 4.158 − 0.800(log WS)	1.96	−0.86	90
K_{ow}-K_{oc}	log K_{ow} = −1.070 + 1.358(log K_{oc})	2.17	+0.86	45
K_{ow}-BCF(f)	log K_{ow} = 2.312 + 0.809[log BCF(f)]	1.27	+0.87	26
K_{ow}-BCF(t)	log K_{ow} = 2.070 + 0.731[log BCF(t)]	2.81	+0.76	36
BCF(f)-WS	log BCF(f) = 2.791 − 0.564(log WS)	1.99	−0.72	36
BCF(f)-K_{oc}	log BCF(f) = −1.579 + 1.119(log K_{oc})	1.95	+0.87	13
BCF(f)-K_{ow}	log BCF(f) = −1.495 + 0.935(log K_{ow})	1.35	+0.87	26
BCF(f)-BCF(t)	log BCF(f) = 0.024 + 1.074[log BCF(t)]	1.39	+0.87	20
BCF(t)-WS	log BCF(t) = 2.183 − 0.629(log WS)	3.05	−0.66	50
BCF(t)-K_{oc}	log BCF(t) = −2.024 + 1.225(log K_{oc})	1.53	+0.91	22
BCF(t)-K_{ow}	log BCF(t) = −0.973 + 0.767(log K_{ow})	2.85	+0.76	36
BCF(t)-BCF(f)	log BCF(t) = 0.717 + 0.703[log BCF(f)]	1.13	+0.87	20

[a] Correlation coefficients all significant at less than the 1 percent level.

well with bioconcentration in terrestrial-aquatic ecosystems. The average BCF values for flowing water are several-fold greater than for the terrestrial-aquatic ecosystems. Among the four major parameters, the approximate 95 percent confidence limits for range of variation in orders of magnitude from the predicted values were quite large (±1.13 to 2.85 orders of magnitude). This result was expected because of the nonuniformity of the data sources and the large variety of chemical structures. As much as a 13-fold variation in bioconcentration has been noted for different species and life stages using *one* compound under uniform test conditions. Other measured parameters can be equally variable.

There was no unique correlation of chemical structure with the four major parameters found in regression equations determined for the 13 chemical groupings, and, therefore, the equations are not given here.

The type of chemical structure can limit the validity of expressing soil adsorption coefficients on the basis of soil organic carbon. When the soil sorption data on compounds such as paraquat, which is a strong cation, and glyphosate and arsenate, which are anions that tend to react strongly with iron and aluminum, were excluded from the 112 compounds in the water solubility-soil sorption correlation, the correlation coefficient improved from 0.75 to 0.84. Water solubility for the weakly cationic triazines correlates rather poorly with soil sorption coefficients based on organic carbon. Alternatively, the nonionic, lipophilic aromatic hydrocarbons showed the best correlations between the various parameters.

The largest factor affecting the correlation of K_{ow} with experimental values of BCF is the persistence of the molecule in biological systems. Hexachlorobenzene, for example, when applied once, as is customarily done in a terrestrial-aquatic ecosystem, could volatilize and not have time to reach a concentration plateau in fish. This would result in a low BCF(t). In the flowing water system, fish exposed for a long time to a constantly replenished source of hexachlorobenzene would show a high BCF(f). In the case of chlorpyrifos, continuous application to the flowering water system resulted in a relatively high BCF(f), but in the static water system, degradation and metabolism caused a much lower BCF(t). Phenolic materials tend to form water-soluble salts and conjugates in natural waters and in animal organisms such as fish. Pentachlorophenol has a high K_{ow} value, but in a BCF test, it is transformed quickly to these water-soluble forms, ultimately giving a lower BCF than would be predicted from the K_{ow} value.

Water solubility is usually the value most commonly available from the literature and can be used to estimate partitioning tendency or bioconcentration. Estimates of soil sorption coefficients, octanol-water coefficients, and bioconcentration factors for a wide range of water solubilities are illustrated in Table 7. A millionfold range in water solubility predicts approximately a 2000-fold range in soil sorption coefficients, a 500-fold

TABLE 7—*Use of water solubility equations*[a] *to derive* K_{oc}, K_{ow} *and BCF(f) values from arbitrarily assigned water solubilities.*

WS Assigned, ppm	Predicted Value K_{oc}	 K_{ow}	 BCF(f)
0.001	195 000	301 000	29 700
0.01	55 000	109 000	8 300
0.1	15 500	40 000	2 270
1.0	4 400	14 400	618
10	1 230	5 200	169
100	346	1 900	46
1000	98 ✓	690	13

[a] From Table 6.

range in octanol-water coefficients, and a 2000-fold range in bioconcentration factors. A tenfold increase in water solubility results in about a fourfold decrease in soil sorption coefficient and bioconcentration factor and a sixfold decrease in octanol-water partition coefficient.

Four benchmark chemicals (DDT, chlorpyrifos, trifluralin, and simazine) were chosen for their wide range in water solubility, and used to compare the calculated with actual values for K_{oc}, K_{ow}, and BCF, as shown in Table 8. The variation of calculated values from experimental values was as much as one or two orders of magnitude. Nevertheless, such a degree of variation does not invalidate calculated values for these parameters as useful tools for preliminary potential *hazard assessment.* When data on soil adsorption coefficients and octanol-water partition coefficients are available, in addition to water solubility, the estimation of bioconcentration values is likely to be considerably more accurate.

Comparison of 15 bioconcentration factor values for *Daphnia* and several species of fish indicates that there is not a precise relationship between bioconcentration in fish and arthropods. However, the bioconcentration values for fish and *Daphnia* shown in Table 9 are mostly within one order of magnitude of each other. The correlation coefficients and regression equations for BCF in various species of fish and *Daphnia* are as follows:

$$\log \text{fish BCF} = 0.0431 + 1.001(\log \textit{Daphnia} \text{ BCF})$$

±1.55 orders of magnitude, 95 percent confidence limit, $r = 0.825$, $n = 17$.

$$\log \textit{Daphnia} \text{ BCF} = 0.987 + 0.679(\log \text{fish BCF})$$

±1.28 orders of magnitude, 95 percent confidence limit.

These correlation coefficients were significant at the 1 percent level.

TABLE 8—*Comparison of experimental values with values calculated from equations .*

Parameter Studied	Experimental Value (see Table 1)	Calculated Value	Equation Value Used for Calculations
		DDT	
WS	0.0017	0.046	K_{ow}
WS	0.0017	0.0016	K_{oc}
K_{oc}	238 000	146 000	WS
K_{oc}	238 000	43 000	K_{ow}
K_{oc}	238 000	167 900	BCF(f)
K_{ow}	960 000	2 366 000	WS
BCF(f)	61 600	22 500	WS
BCF(f)	61 600	12 536	K_{ow}
BCF(f)	61 600	27 400	K_{oc}
		Chlorpyrifos	
WS	0.3	2.6	K_{ow}
WS	0.3	1.6	K_{oc}
K_{oc}	13 600	2 250	WS
K_{oc}	13 600	12 350	K_{ow}
K_{oc}	13 600	5 900	BCF(f)
K_{ow}	97 700	5 500	WS
BCF(f)	451	1 219	WS
BCF(f)	451	1 481	K_{ow}
BCF(f)	451	1 114	K_{oc}
		Trifluralin	
WS	0.6	0.18	K_{ow}
WS	0.6	0.62	K_{oc}
K_{oc}	13 700	5 800	WS
K_{oc}	13 700	19 000	K_{ow}
K_{oc}	13 700	29 000	BCF(f)
K_{ow}	220 000	9 550	WS
BCF(f)	4 750	820	WS
BCF(f)	4 750	3 160	K_{ow}
BCF(f)	4 750	1 120	K_{oc}
		Simazine	
WS	3.5	146	K_{ow}
WS	3.5	231	K_{oc}
K_{oc}	135	2 190	WS
K_{oc}	135	370	K_{ow}
K_{oc}	135	92	BCF(f)
K_{ow}	155	5 280	WS
BCF(f)	1	30	WS
BCF(f)	1	3.6	K_{ow}
BCF(f)	1	6.4	K_{oc}

TABLE 9—*Bioconcentration factors in* Daphnia *in comparison with fish under various test conditions*

Compound	BCF	Time of Exposure	Water Movement	Reference	BCF in Fish from Exposure of Chemical Under Similar Conditions to *Daphnia* Exposure
DDT	16 000 to 23 000	26 h	static	*[210]*	16 950
DDT	14 000[a]	3 days	flowing	*[211]*	129 000
DDE	954 to 1 570	2 days	static	*[112]*	
Lindane	810	3 days	static	*[112]*	
	173	30 days (?)	Metcalf ecosystem	*[159]*	560
Dieldrin	3 488[a]	6 days	static	*[109]*	
	2 535	30 days (?)	Metcalf ecosystem	*[159]*	2 700 to 6 145
Aldrin	35 250[a]	3 days	flowing	*[211]*	
	9 118	2 days	static	*[112]*	1 312
Endrin	2 600	1 day	static	*[112]*	
Chlordane	6 887 to 26 740[a] (wet wt)	16 days	limited renewal	*[121]*	8 500 to 22 000
Heptachlor	1 322 to 3 950[a]	16 days	limited renewal	*[128]*	7 400 to 23 814
Mirex	4 900	1 day	static	*[112]*	
Toxaphene	4 000	7 days	flowing	*[212]*	3 100 to 69 000
Pentachlorophenol	165	30 days (?)	Metcalf ecosystem	*[17]*	297
	205	3 days	static	*[89]*	
Chlorobenzene	2 789	3 days	static	*[89]*	650
1,2,4-Trichlorobenzene	142	8 h	static	*[98]*	
Hexachlorobenzene	1 130	30 days (?)	Metcalf ecosystem	*[17]*	287
	200	1 day	static	*[89]*	1 166
Aroclor 1254 (Cl_5 fraction)	3 800	4 days	flowing	*[100]*	56 370 to 61 190
3,5,6-Trichloro-2-pyridinol	22	3 days	static	*[99]*	16
2,4,5-T	180	31 days	Metcalf ecosystem	*[195]*	25
Di-*n*-butyl phthalate	5 000	14 days	intermittent flow	*[213]*	. . .
Diethylhexyl phthalate	5 200	7 days	intermittent flow	*[213]*	155 to 886
	518	24 h	intermittent flow	*[98]*	.
Di-*n*-octyl phthalate	2 611	30 days (?)	Metcalf ecosystem	*[159]*	9 400
Phosmet	5 to 6	24 to 48 h	static	*[180]*	10 to 12
Leptophos	653	24 h	static	*[98]*	. . .
3-trifluoromethyl-	53 to 57[b]	24 to 120 h	flowing	*[214]*	104
4-nitrophenol	5[c]	24 to 96 h	flowing	*[215]*	. . .

[a] Corrected from dry weight to wet weight by a factor of 0.25.
[b] First instar.
[c] Mature.

Discussion and Conclusions

Utilizing data gleaned from the literature for 170 chemicals, correlations were obtained between the logarithms of the average values for water solubility, *n*-octanol-water partition coefficients, soil sorption coefficients based on soil organic carbon, and bioconcentration factors in fish that were significant below the 1 percent level. The regression equations between soil sorption coefficients and bioconcentration factors developed in this paper are new to the literature.

Measured average values for any of the four parameters could be used to predict the other three parameters. Water solubilities or octanol-water partition coefficients should be useful for predicting the bioconcentration potential of compounds in fish and sorption of compounds by soil where experimental values are not available. Soil sorption coefficients seem to be the best measured parameter for predicting values for the other three parameters. However, water solubility is usually the most available measured parameter and probably the most practical for early assessment of potential bioconcentration hazard. Octanol-water partition coefficients are easily calculated and can also be used for prediction of bioconcentration in fish and soil sorption.

Bioconcentration factors and soil sorption coefficients are key indicators for the behavior of chemicals in the environment. The correlation of the four major indicators makes estimation of these values much easier and quicker than dependence on experimental values for all of the measurements.

Bioconcentration factors for *Daphnia* appear to be as valid for correlation purposes as those for fish.

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Background concentrations of 20 elements in soils with special regard for New York State.

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Introduction

The main source of elements in soils is from the parent material from which they were derived. Usually this material is weathered bedrock or overburden transported by wind, water or glaciation (Thornton, 1979). Climatic and biological factors as well as agricultural and industrial operations have a major effect on the concentration of elements in soils (Shacklette et al, 1971). Developed and developing countries have an ever increasing production and demand for elements. This increases the probability of their dispersal and contact in the environment. An element may be dispersed into the environment from the time it is mined until it becomes usuable as a finished product or ingredient of a product (Adriano, 1986). The long agricultural and industrial history of this country may have altered the "natural" background of some elements in some materials. The widespread atmospheric effects of leaded gasoline may have altered the lead content of soils far from any pollution sources. Likewise for any element entering the atmosphere from agricultural or industrial sources (Conncr and Shacklette, 1974).

A natural background level for 20 elements: aluminum, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, sodium, vanadium and zinc is being established for New York State. A wide range of literature has been reviewed to obtain soil values of these elements from areas thought to be uncontaminated, undisturbed or areas far from pollution sources. All values are in ppm dry weight.

Aluminum

Jackson (1964) stated that aluminum makes up 2-12% (20,000 - 120,000 ppm) of soils. Vinogradov (1959) gave 71,300 ppm as the average for the concentration of aluminum in world soils. A cultivated soil profile 0-30 cm, from Eastham, MA, averaged 34,000 ppm aluminum (Laul, 1983). Holmes et al (1938) conducted a study on the chemical composition of soils and colloids of the Norfolk and related soil series. All of the soils that they studied were within a 15 mile radius of Kingston, NC. In a soil profile of the Orangeburg series, mostly consisting of sandy loams and loamy sands, the aluminum content from the A horizon was 9,800 ppm, from the B horizon 95,600 ppm and 51,200 ppm for the C. A soil profile from the Dunbar soil series, a sandy loam, from a heavily forested area revealed an aluminum concentration of 8,300 ppm in the A_1 horizon, 14,000 ppm in the A_2 horizon, 27,900 ppm for the B_1 and and 34,500 ppm for the B_2 horizon. A highly acidic, pH 4.3, fine sandy loam of the Coxville soil series provided a profile that contained 25,400 ppm aluminum in the A horizon, 54,600 in the B horizon and 69,700 ppm in the C.

Shacklette (1984) compiled samples of surficial material, that were unaltered or very little altered from their natural condition, of the United States to give estimates of the range of elemental abundance, with a total of 1,318 sampling sites. All samples were taken at a depth of 24 cm. Although many sites were within 100 m of roads, the roads contained only light vehicular traffic or were newly introduced interstates. The geometric mean of 450 samples of soils and other surficial materials lying east of the 97th meridian was 33,000 ppm aluminum, with a range of 7,000-100,000 ppm.

Arsenic

The average amount of arsenic found in soils is 5 ppm (Vinogradov, 1959; Reay, 1972; Peterson and Alloway, 1979; Miesch and Claude, 1972; Woolson, 1983). No clearly defined relationship exists between the arsenic content of soils and the parent material or the climate conditions under which the soils were formed. Walsh et al (1977) stated that arsenic in uncontaminated soils is usually found in the range of 0.2 - 40 ppm. For 195 U.S. soil samples the arsenic content ranged from 0.1 - 42 ppm (Vinogradov, 1959). From erosion experiment stations widely scattered throughout the midwest and south, covering 5 major soil types, the arsenic content fell in the range of 1 - 20 ppm (Mitchell, 1964). Greaves (1934) found arsenic in western virgin soils to the extent of 4 ppm. A study of virgin soils of Colorado in 1910 found arsenic in amounts of 2.5 - 5.0 ppm.

Frank et al (1976) sampled 296 agricultral fields throughout Ontario, Canada. For 207 samples from soils with no history of arsenic use, the arsenic concentration ranged from 1.1 - 16.7 ppm with an average of 6.27 ppm. The arsenic content of uncontaminated soils was slightly increased with increased clay content. Sandy soils averaged 5.84 ppm arsenic and 6.43 ppm was the average arsenic content for clay soils.

A profile from a Muskingum silt loam - a gray-brown podzolic soil, with an immature profile, from Zanesville, Ohio revealed 10 ppm arsenic in the 0 - 17.5 cm zone, 16 ppm in the 17.5 - 32.5 cm zone, 10 ppm in the 32.5 - 60 cm zone (Slater et al, 1937).

Chattopadhyay et al (1974) determined the mean arsenic content from a crop growing organic soil profile from a Holland marsh area near Toranto, Ontario to be 1.5 ppm.

In the Harrison Experiment Forest, near Saucier, Mississippi, having a strongly acidic, poarch fine sandy loam soil, the arsenic content for the 0 - 75 cm profile ranged from 0.6 - 1.4 ppm (DeGroot, 1979). In a sandy loam control plot the arsenic concentration averaged 7 ppm for 0 - 30 cm (Hiltbolt, 1975).

Walsh et al (1975) gave a range of 3 - 12 ppm for the arsenic content in uncontaminated New York State soils. The geometric mean content of arsenic in the surficial materials of the eastern United States was found to be 4.8 ppm, with a range of <0.1 - 73 ppm by Shacklette and Boerngen (1984).

Barium

Vinogradov (1959) quoted 500 ppm as the average amount of barium in world soils. For 40 various soil samples from the U.S. the barium content ranged from 10 - 3,000 ppm. In another study of 100 U.S. soil samples the barium level ranged from 60 - 800 ppm. Bowen (1979) stated 500 ppm as the average barium content in soils, with a range of

100 - 3,000 ppm. In 1910 the great plains soils were found to contain between 100 - 1,100 ppm barium (Slater et al, 1937).

The average barium content of a cultivated soil profile, 0 - 30 cm, from Eastham, MA was 180 ppm, with a range of 140 - 250 ppm (Laul, 1983).

From an organic crop growing soil profile from the Holland Marsh area near Toranto, Ontario the barium level in the surface$_1$ was found to be 285 ppm, in surface$_2$ it was 270 ppm. For a depth of 0 - 7.5 cm the barium content was 252 ppm, for 7.5 - 15 cm it was 293 ppm and 300 ppm for 15 - 22.5 cm (Chattopadhyay et al, 1974).

Shacklette and Boerngen (1984) found the geometric mean for 541 samples east of the 97th meridian in the U.S. to be 290 ppm, with a range of 10 - 1,500 ppm.

Beryllium

Beryllium is estimated to have a crustal abundance of 2 ppm (Tepper, 1980). Mitchell (1964) gave 0.3 - 10 ppm as the common range for beryllium in soils. Bowen (1979) gave 0.3 ppm as the average level of beryllium in soils with a range of 0.01 - 40 ppm. Adriano (1986) gave the range of 0.1 - 0.89 ppm for the concentration of beryllium in Canadian surface soils. Shacklette and Boerngen (1984) determined the geometric mean of beryllium in 169 soil samples of th eastern U.S. to be 0.55 ppm with a range of <1-7 ppm. The arithmetic mean was 0.85 ppm.

Cadmium

Vinogradov (1959) gave 0.5 ppm as the average amount of cadmiu in world soils. Mitchell (1964) quoted 0.2 ppm as the average crustal abundance for cadmium. Peterson and Alloway (1979) stated that cadmium had an estimated crustal abundance of 0.15 - 0.20 ppm. Bowen (1979) gave an average of 0.35 ppm for world soil cadmium concentration, with a range of 0.01 - 2 ppm. Eisler (1985) stated that for soils of nonvolcanic origin the cadmium content ranged from 0.01 - 1.0 ppm and for soils of volcanic origin the cadmium concentration could be as high as 0.45 ppm. Based on the cadmium level found in common rocks it can be concluded that, on the average, soils derived from igneous rocks would contain the lowest total cadmium concentration, soils from metamorphic rocks intermediate and those derived from sedimentary rocks would contain the largest amounts of cadmium. Soils derived from igneous rocks range in cadmium concentration from 0.1 - [illegible].3 ppm, metamorphic soils 0.1 - 1.0 ppm and sedimentary soils 0.3- 11 ppm (Page and Bingham, 1973).

For 173 agricultural soils from New York State, removed from mobile and point source contamination, the mean cadmium content was 0.45 ppm. For 40 West Virginia agricultural soils the mean cadmium level was 0.32 ppm, for 81 crop growing soils from Ohio 0.38 ppm, for

57 Maryland farms 0.08 ppm, 0.17 ppm cadmium for 4 agricultural soils of Delaware, 0.17 ppm for 31 farms from Maine, and 0.21 ppm for 45 agricultural soils from Pennsylvania (Sommers, 1987).

Page et al (1987) gave a range of 0.1 - 1.0 ppm for non-contaminated agricultural soils of the U.S., except for a number of soils derived from parent materials high in cadmium. Organic soils (Histosols) tend to contain the highest total cadmium concentrations and highly weathered soils (Ultisols and Alfisols) contain the lowest cadmium levels.

An extensive study of 3,305 soil samples from crop-producing areas in 36 states, took great care to insure that these areas were free from any known source of contamination. The cadmium content from these soils ranged from 0.05 - 2.4 ppm with a mean and median values of 0.27 ppm and 0.20 ppm respectively. For 293 samples from the northeast, including 5 states, the Cd content ranged from 0.08 - 0.21 ppm with an average of 0.17 ppm.

Adriano (1986) reported that normal Canadian soils contain from 0.01 - 0.10 ppm total Cd with a mean of 0.07 ppm. Normal glacial tills and other glacial materials had a Cd concentration of 0.01 - 0.70 ppm with an average of 0.07 ppm.

Pierce et al (1982) sampled 16 Minnesota soils from 7 major materials to obtain a baseline for 6 metals. The average cadmium concentration, from a depth of 0 - 15 cm, was 0.39 ppm and ranged from 0.24 - 0.68 ppm. The highest Cd content was found in calcareous soils developed in the lacustrine sediment and DesMoines Lobe Till (prairie) and generally in surface soils and soils with free carbonates. The association of Cd with carbonates reflects it's ability to substitute for Cd^{+2} in the crystal lattice of calcite, due to similarities in ionic radii 1.03A and 1.06A respectively.

Luce (1985) quoted a range of 0.01 - 0.7 ppm and an average of 0.06 ppm for the cadmium content of soils. For 98 New York mineral soils used in the production of commercial fruits and vegetables the cadmium content averaged 0.21 ppm, with a maximum value of 0.67 ppm. For 63 New York State organic soils the average Cd content was 0.74, with a maximum value of 1.80 ppm.

A regional study of 15 benchmark or major soils of the Northeast containing 6 soils with a coarse - loamy texture had an average total Cd level of 0.22 ppm, the other 9 had a fine loamy to clayey texture contained 0.56 ppm cadmium on the average. The total Cd content of 26 Massachusetts surface soils (Ap or A horizons) averaged 0.2 ppm and ranged from 0.01 - 0.88 ppm.

Calcium

Mitchell (1964) stated that calcium makes up 3.6% (36,000 ppm) of the earth's crust by weight and 1.48% (14,800 ppm) by volume. Vinogradov (1959) gave 13,700 ppm as the average content of calcium in soils. Calcium makes up approximately 1% (10,000 ppm) of soils (Jackson, 1964). Bowen (1979) gave 15,000 ppm as the average amount of calcium to be found in soils.

In three experimental fields, in Illinois, the calcium content ranged from 450 - 2,170 ppm, for the profile of 0 - 72" (Snider, 1943). From a study by Holmes et al (1938) of Norfolk and related soil series, within a 15 mile radius of Kingston, NC, the A horizon of an Orangeburg fine sandy loam soil contained 6,100 ppm Ca, the B horizon 280 ppm Ca and the C 500 ppm Ca. A profile of a Dunbar fine sandy loam horizons; A_1, A_2, B_1 and B_2, all contained 70 ppm Ca. A profile of a Coxville fine sandy loam contained 640 ppm calcium in the A horizon, 357 ppm in the B and 100 ppm in the C. A profile of a Bladen loam soil contained 500 ppm Ca in A, B and C horizons.

Seventy residential soil samples from Grand Rapids, Michigan, taken from low density population areas and areas with substantial amounts of unimproved woodlands, averaged 2,300 ppm calcium. All samples were taken 30 - 50' from any road and usually taken from an established grassy area. Ninety one agricultural samples in the area contained 1,400 ppm calcium (Klein, 1972).

In 1979 approximately 20,000 field crop samples from approximately 200,000 acres were sampled from New York. The calcium content ranged from 778 - 3,532 ppm and averaged 1,651 ppm for 127 samples (Klausner and Reid, 1981). Shacklette and Boerngen (1984) gave the geometric mean of 3,400 ppm for the eastern U.S. with a range of 100 - 280,000 ppm.

Chromium

Chromium has an estimated crustal abundance of 100 ppm and an estimated mean soil content of 100 ppm (Peterson and Alloway, 1979). Vinogradov (1959) gave 20 ppm as the average chromium content of world soils. A study of 50 American soils by Slater, Holmes and Byers in 1937 gave a range of 2 - 270 ppm chromium. Cary (1982) gave an average of 43 ppm chromium for Canadian soils.

A profile of crop growing organic soils from the Holland Marsh area near Toronto, Ontario had an average of 24.6 ppm chromium (Chattopadhyay et al, 1974). For 12 organic soils from farmlands from throughout Ontario, Canada the average chromium content was 14.6 ppm, with a range of 4.1 - 39.0 ppm, 125 sandy soils had a mean chromium content of 10.0 ppm and ranged from 2.6 - 33.5 ppm, 98 loam soils ranged from 3.9 - 46.2 ppm and averaged 14.7 ppm, 60 clay soils had a range of 10.2 - 45.8 ppm chromium and a mean of 22.3 ppm. Samples having a chromium content over 35 ppm were mainly located on the Canadian shield or were soils high in clay content (Frank et al, 1976). Mills and Zwarich (1975) gave an average chromium content 23 ppm for the A horizon of 16 agricultural soils from Manitoba, Canada and a mean of 16 ppm for the C horizon. The average chromium for 6 noncultivated fields was 22 ppm. Adriano (1986) reported a range of 20 - 125 ppm in Canadian soils and stated that the majority of U.S. soils contain between 20 - 75 ppm chromium.

A Rubicon sand from Muskegon Co., Michigan, sampled from the top 5-10 cm, contained <0.1 ppm chromium. The total chromium concentration from a Morley clay loam from Ionia Co., Michigan was 16 ppm (Grove and Ellis, 1980). Sixteen Minnesota soils derived from 7 major parent materials, from throughout the state, were tested to determine a baseline for 6 metals. The chromium content averaged 39 ppm for a depth of 0 - 75 cm and ranged 14 - 104 ppm. The three high concentrations of 104, 106 and 111 ppm were from a Rainy Lobe Till. If the Rainy Lobe Till values are excluded the range in chromium content would be 14 - 50 ppm (Pierce et al, 1982). A muskingum silt loam, a gray-brown podzolic soil with an immature profile from Zanesville, Ohio, had a mean chromium concentration of 3 ppm for the depth of 0 - 72", ranging from 2-4 ppm (Slater et al, 1937).

For 70 residential soil samples from Grand Rapids, Michigan the mean chromium level was 3.2 ppm and for 91 agricultural samples the mean was 4.6 ppm (Klein, 1972). Prince (1957) gave a range of 20-75 ppm chromium and an average of 38.5 ppm for 10 major agricultural soils from throughout New Jersey. The range in chromium concentration, in a poarch fine sandy loam of high acidity, from the Harrison Experiment Forest near Saucier, Mississippi was 3.8 - 9.2 ppm, for the depth of 0-62 cm (DeGroot et al, 1979).

Chromium extracted by 1M HCl, from a recent survey of Vermont soils, ranged from 0.1 - 18 ppm. Higher levels were associated with spodic horizons (Bartlette and Kimble, 1976). A cultivated soil profile from Eastham, MA contained an average of 120 ppm chromium, with a range of 90 - 140 ppm, for the depth of 0 - 30 cm (Laul, 1983). Luce (1985) quoted an average of 100 ppm for the chromium content in soils. For 6 major coarse loamy textured soils of the northeast the average total chromium concentration was 72 ppm. Nine other benchmark soils, loams to clays, averaged 93 ppm chromium. Uncultivated Elkton silt loam surface soils of Delaware average 65 ppm chromium.

Shacklette and Boerngen (1984) gave 33 ppm as the geometric mean content of chromium in 541 soils east of the 97th meridian, in the U.S., and a range of 1 - 1,000 ppm.

Cobalt

Vinogradov (1959) gave an average of 8 ppm for the concentration of cobalt in world soils. The cobalt content of 49 U.S. soils ranged from 0.1 - 2.4 ppm. Bowen (1979) also gave 8 ppm as the average content of cobalt in soils and a range of 0.05 - 65 ppm.

Virgin profiles of four major soil groups from eastern Canada had a range of 1.4 - 10.3 ppm for a podzol soil profile, 7.5 - 18.2 ppm for a brown podzol profile, 5.9 - 11.7 ppm for a gray-brown podzol and 7.3 - 11.3 ppm for a brown forest soil type (Wright et al, 1955). Agricultural soils from 296 farms from throughout Ontario had a range of 1.0 - 16.7 ppm cobalt and a mean of 4.4 ppm (Frank et al, 1976).

Ten important agricultural soil types from throughout New Jersey were sampled and ranged from 2 ppm - 18 ppm cobalt (Prince, 1957). For 70 residential soil samples, from the Grand Rapids, Michigan area, the cobalt level averaged 2.3 ppm and for 91 agricultural samples the cobalt content had a mean of 2.7 ppm (Klein, 1972). From a cultivated soil profile from Eastham, MA, 0 - 30 cm, the average cobalt content was 2.2 ppm with a range of 1.7 - 2.5 ppm (Laul, 1983).

Shacklette and Boerngen (1984) gave 5.9 ppm as the geometric mean for 403 samples from the eastern United States, with a range of <0.3 - 70 ppm.

Copper

Goldschmidt (1958) stated that copper in virgin soils, under humid conditions, usually ranges from 1-10 ppm and rarely exceeds 20 ppm. In arid regions 50 ppm copper have been reported. Vinogradov (1959) gives an average copper content in soils of 20 ppm. For 51 various U.S. soils sampled the copper content ranged from 1 - 34 ppm. Adriano (1986) gave a mean value of 25 ppm for the copper concentration in U.S. soils with a range of 5 - 50 ppm for Canadian soils with an average of 22 ppm.

Pierce et al (1982) sampled 16 Minnesota soils from 7 major parent materials to obtain baselines for 6 metals. The average copper content of surface soils was 23 ppm and ranged from 16 - 28 ppm. For 70 residential soil samples from the Grand Rapids, Michigan area the average copper content was 8.0. Ninety one agricultural soils had a mean copper content of 8.8 ppm (Klein, 1972).

Seven Atlantic Coastal Plain soil profiles, from within 15 miles of Kingston, NC all formed from essentially the same parent material and developed under similar climatic conditions were sampled. All 7 of these soil groups are severely weathered and leached. The average copper content was 16 ppm, through the varying depths, and ranged from 5 - 27 ppm. The copper concentration of alluvial soils, of eastern tributaries to the Mississippi River, ranged from 19-28 ppm with an average of 23 ppm. A Brasau sandy loam from Groton, NH developed from granitic and gneissic till ranged 13-28 ppm copper for a depth of 0-19". A Hermon sandy loam from Canaan, NH, developed from granitic and other coarse-grained gneissic materials, for a depth of 0-32" ranged 17-28 ppm copper (Holmes, 1943).

For 15 unimproved agricultural fields, from Ontario, Canada, the copper content averaged 23 ppm and ranged 7.3 - 36.7 ppm (Frank et al, 1976). Wright et al (1955) studied virgin profiles from four great soil groups of eastern Canada. The range in copper content for the brown forest soil type was 5 - 19 ppm, the brown podzolic ranged 4-23 ppm copper and 5-21 ppm was the range for the podzolic soil type.

For a Muskingum silt loam, a gray-brown podzolic soil, with an immature profile that grades into the weathered parent shale, from Zanesville, Ohio contained 18 ppm copper in the 0-7" zone, 27 ppm for 8-13", 28 ppm for 14-24", and 34 ppm copper from 25-46" (Slater et al, 1937). Prince (1957) studied 10 major agricultural soils throughout New Jersey, the copper content ranged from 9-61 ppm, with an average of 23 ppm.

For 173 agricultural soils, removed from mobile and point source contamination, from New York the copper content averaged 74.8 ppm. From 81 farms in Ohio the copper content averaged 28.1 ppm, for 57 agricultural soils from Maryland the mean copper concentration was 8.1 ppm, for 47 samples from Virginia 9.4 ppm copper were found, for 4 farms in Delaware the average copper content was 5.0 ppm, for 31 agricultural soils of Maine 0.7 ppm was the mean copper content and 5.3 ppm was the mean copper content for 45 agricultural soils from Pennsylvania (Sommers et al, 1987).

Luce (1985) stated that for 54 U.S. samples the average copper level was 24 ppm with a range of 9 - 57 ppm. Seven sandy soils from the Atlantic coastal plain ranged from 9 - 25 ppm in their copper content and averaged 16 ppm. Two virgin spodosols from NH contained 24 ppm copper in the surface mineral horizon. The range for 26 Mass. soils was 5 - 38 ppm copper and averaged 16 ppm. Uncultivated surface soils of Connecticut, formed from glacial sediments from gneiss and schist, averaged 13 ppm in their copper concentration and ranged 6 - 20 ppm. The average for surface soils formed in glacial sediment derived from trap rock was 9 ppm and ranged 5-21 ppm. Glacial sediment derived from arkose sandstone averaged 6 ppm with a range of 5-8 ppm. The A horizon of 13 NJ soils from the Appalachian Province averaged 26 ppm copper and ranged from 13 - 61 ppm. The B horizon of these soils ranged from 12 - 32 ppm in copper concentration with an average of 20 ppm. Seven surface soils from coastal plains province of NJ averaged 9 ppm copper with a range of 2 -19 ppm. Fifteen major soils of the northeast averaged 59 ppm copper.

Shacklette and Boerngen (1984) found the geometric average copper content of eastern United States soils to be 13 ppm with a range of <1-700, and an estimated arithmetic mean of 22 ppm.

Iron

Jackson (1964) stated that iron makes up 1-6% (10,000 - 60,000 ppm) of soils. Kraushopf (1972) gave 10,000 - 100,000 ppm for the range of iron concentration in soils. Bowen (1979) and Vinogradov (1959) gave 40,000 ppm and 38,000 ppm respectively as the average amount of iron to be found in soils.

For 296 farms throughout Ontario, Canada the iron content ranged from 2,560 - 38,900 ppm with a mean of 14,470 ppm. Sandy soils contained the lowest iron and the clays the highest. From 13 organic soil samples the iron content averaged 13,480 ppm with a range of 2,660 - 24,800 ppm. For the 125 sandy soils the iron content was 9,030 ppm and ranged from 2,650 - 25,300 ppm, 98 loam samples averaged 16,440 ppm iron and ranged 5,400 - 32,300 ppm, the 60 clay samples averaged 22,770 and ranged 9,900 - 38,900 ppm (Frank et al, 1976).

The iron content of a poarch fine sandy loam, a strongly acidic soil from the Harrison Experiment Forest of Saucier, Miss. ranged from 4,000 - 11,000 ppm in a 0-52" profile (DeGroot et al, 1979). For 70 residential soil samples from the Grand Rapids, Michigan area the iron concentration average 2,200 ppm and from 91 agricultural samples the iron content average was 2,600 (Klein, 1972).

Holmes et al (1938) studied the Norfolk and related soils all within a 15 mile radius of Kingston, NC. A profile of a Dunbar fine sandy loam contained 3,070 ppm iron in the A_1 horizon, 3,870 ppm in the A_2 horizon, 8,020 ppm in the B_1 and 54,700 ppm in the B_2 horizon. A profile from the Coxville fine sandy loam contained 5,760 ppm in the A horizon, 20,180 ppm in the B and 18,900 in the C horizon. A profile of the Bladen loam contained 3,870 ppm iron in the A horizon, 11,700 ppm in the B and 11,200 in the C horizon. The iron content of a cultivated soil profile from Eastham, MA ranged from 11,000 - 14,000 ppm with a mean of 13,000 ppm (Laul, 1983).

Shacklette and Boerngen (1984) determined the geometric mean content of iron of soils east of the 97th meridian in the continental U.S. to be 14,000 ppm with a range of 100 - 100,000 ppm for 539 samples, the estimated arithmetic mean was 25,000 ppm.

<u>Lead</u>

Miesch and Claude (1972) stated that the average concentration of lead in uncontaminated soils was 16 ppm and that 95% of soils in the U.S. contain between 4 and 61 ppm lead. Soils outside but adjacent to Helena Valley, Montana contained 15 ppm lead and surface soils remote from Helena Valley contaned 15 ppm lead. Peterson and Alloway (1979) and Vinogradov (1969) stated the average concentration of lead in soil was 10 ppm, with a range between 2-200 ppm. Bowen (1979) gave 12 ppm as the average soil content of lead. Nriagu (1978) gave a range of 10-37 ppm for lead in normal soils and an average of 20 ppm.

Mills and Zwarich (1975) studied the agricultural soils of southern and western Manitoba, Canada. The parent material of most mineral soils in the agricultural areas of Manitoba are Late-Wisconsin glacial deposits. The components of which are derived from the shales of the western uplands, the carbonate rocks of the lowlands and the igneous rocks of the Canadian shield. The A and C horizon of summer fallow fields, including a range of textures and parent material were sampled. The mean lead concentration for 16 agricultural soils of the A horizon was 17 ppm and 19 ppm for the C horizon. For 6 samples from uncultivated soils (pasture or hayland adjacent to cultivated fields) averaged 16 ppm lead.

For 15 unimproved soils from Ontario, Canada the average lead concentration was 12.5 ppm and ranged from 3.2 - 33.7 ppm (Frank et al, 1976).

The lead content of two virgin profiles of four major soil groups of eastern Canada was determined by Wright et al (1955). The brown forest soil type contained between [illegible] ppm lead, the gray-brown podzol 16-33 ppm, the brown podzolic 13-30 ppm and the podzolic 9-15 ppm.

Pierce et al (1982), in establishing baseline levels of 6 metals for 16 soil series in Minnesota, stated that the total lead for all soils was low, in all cases below the detectable limit of 25 ppm.

Adriano (1986) gave an average of 5-25 ppm as an average amount of lead in soils far from human activity. Background levels of lead in 173 samples from 53 soils widely dispersed in Canada averaged 20 ppm.

For 173 ~~New York State~~ agricultural soil samples, from sites removed from mobile and point source contamination, the mean lead content was ~~18 ppm,~~ for 81 Ohio farm samples the average lead concentration was 19 ppm, for 57 agricultural soils from Maryland 11 ppm was the mean lead level, for 4 agricultural soils from Delaware 10 ppm was the average lead content, from 31 Maine farms 10 ppm was the mean lead concentration, and for 45 Pennsylvania agricultural sites the average lead content was 24 ppm (Sommers, 1987).

For 98 mineral soils from New York State, utilized in the production of commerical fruits and vegetables, contained 15 ppm lead, on the average, with a maximum value of 30 ppm. For 63 organic soils the lead content averaged 20 ppm, with a maximum of 36 ppm (Luce, 1985).

Shacklette and Boerngen (1984) determined the ~~geometric mean~~ for the lead content of soils found in the eastern U.S. to th[redacted] and ranged from <10-300 ppm, for 422 samples.

Magnesium

Vinogradov (1959) stated the average content of magnesium in soils was 6,300 ppm. Bowen (1979) gave 5,000 ppm as the average content of magnesium in soils, with a range of 400-9,000 ppm.

Crop growing organic soils from the Holland Marsh area near Toronto, Ontario were found to contain 780 ppm and 765 ppm magnesium in two surface soil samples. A soil profile from 0 - 7.5 cm was found to contain 640 ppm, the depth 7.5 - 15 cm contained 420 ppm and from 15 - 22.5 cm 400 ppm magnesium were found (Chattopadhyay, 1974).

Holmes et al (1938) determined the chemical composition of soils and colloids of Norfolk and related soil series. For a Fuston fine sandy loam the magnesium content in the A horizon was 241 ppm in the B horizon 723 ppm and 543 ppm in the C horizon. The Dunbar fine sand loam profile revealed a magnesium content of 60 ppm in the A_1 horizon, 60 ppm in the A_2 horizon, 600 ppm in the B_1 horizon, and 180 ppm in the B_2. The chemical analysis of the Coxville fine sandy loam revealed 543 ppm magnesium in the A horizon, 663 ppm in the B and 543 ppm in the C.

Shacklette and Boerngen (1984) determined the geometric mean content of magnesium in soils and surficial materials to be 2,100 ppm in the eastern U.S. with a range of 50-50,000 ppm, for 528 samples.

Manganese

Vinogradov (1959) gave 850 ppm as the average amount of manganese to be found in soils. In 162 samples of New Jersey soils the manganese concentration ranged from 100-2,000 ppm. Bowen (1979) stated 1,000 ppm as the average amount of manganese to be found in soils. Goldschmidt (1958) stated that the manganese content in soils varies from 200-5,000 ppm. Adriano (1986) gives 850 ppm as the average manganese content of soils, with a range of 100-4,000 ppm.

Two virgin profiles were taken from four great soil types of eastern Canada. The manganese content ranged from 328-667 ppm in the podzol profile, 508-1,329 ppm in the brown podzolic, 358-1,088 ppm in the gray-brown podzolic and 406-1,380 ppm in the brown forest soil type (Wright et al, 1955). For 15 unimproved agricultural soils from throughout Ontario the average amount of manganese found was 490 ppm with a range of 91-1,190. For 13 organic agricultural soils the mean manganese content was 338 ppm, with a range of 240-540 ppm, for 125 sandy soils the average manganese content was 428 ppm with a range of 90 - 1,790 ppm, for 98 loam soils 606 ppm was the average manganese content with a range of 138-2,010 ppm, for 60 clay samples 662 ppm was the mean manganese content with a range of 140-3,000 ppm. For all 296 agricultural samples 530 ppm was the mean manganese content with a range of 90 - 3,000 ppm (Frank et al, 1976).

Blair and Prince (1936) determined the manganese content of virgin soils from Burlington, Co., New Jersey to be 46.5 ppm. In fields with no fertilizer treatment the manganese content ranged from 101-302 ppm. From some uncultivated soils of New Jersey the manganese content was found to range from 264-736 ppm. For ten major agricultural soils from throughout New Jersey the manganese content was found to be 130-1,560 ppm, with an average of 789 ppm (Prince, 1957). A control plot at Oklahoma State University contained 268 ppm manganese (Mortvedt, 1987). For a cultivated soil profile from Eastham, MA, 0-30 cm, the manganese content ranged from 340-350 ppm (Laul, 1983).

For 173 samples from 53 Canadian soils the manganese content ranged from 100-1,200 ppm with a mean of 520 ppm. The mean manganese content of Ontario soils was 530 ppm and ranged from 90-3,000 ppm (Adriano, 1986).

Shacklette and Boerngen (1984) gave the mean content of manganese in soils in the eastern U.S. to be 260 ppm with a range of <2 - 7,000 ppm for 537 samples.

Mercury

The average concentration of mercury in soil, according to Vinogradov (1959), is 0.01 ppm. Bowen (1979) gave 0.06 ppm as the average content of mercury in soils, with a range of 0.01 - 0.5 ppm. Dewey (1983) quoted 0.05 ppm as the average concentration of mercury in soils and rocks. Organic matter in soils may contain up to 1.0 p mercury. The upper limit of the mercury concentration in soils of the northeastern U.S. is 0.04 ppm.

Adriano (1986) gave 0.161 ppm as the average content of mercury in the A horizon of soils, with a range of 0.06 - 0.2 ppm. An average of 0.089 ppm for the B horizon ranging between 0.03 - 0.14 ppm and 0.096 ppm for the C horizon ranging between 0.025 - 0.15 ppm. A mean content of 0.013 ppm was given by Anderson (1979) for the mercury amount found in the sand fraction of soil, 0.029 ppm for silt and 0.094 ppm for clay. This indicates that the mercury concentration increases with increased surface area and increased alteration from the parent material.

For 17 samples of cultivated U.S. soils the average mercury content was 0.06 ppm, forest soils from the A_o horizon of Norway contained 0.02-0.15 ppm mercury, cultivated and uncultivated A horizon soils from Canada had a range of 0.005 - 0.036 ppm mercury for 27 samples, for 65 virgin Canadian soil samples the range in mercury concentration was <0.005 - 0.66 ppm with an average of 0.06 ppm (Anderson, 1979).

MacLean et (1973) stated that normal soils contain 0.07 ppm mercury. Sites on the Central Experiment Farm Ottawa, Ontario contained 0.05 ppm mercury. The average mercury level of 65 virgin soils of Canada 234 samples from various layers, was found to be 0.C81 ppm by McKeague and Kloosterman (1974). Gracey and Stewart (1974) found a range of 0.005 - 0.057 ppm mercury in 9 uncultivated soil profiles, 3-6 samples were taken from each profile, from settled areas of Saskatchewan, Canada. For 15 samples from unimproved fields of Ontario the mercury content ranged from 0.03 - 0.49 ppm, with an average of 0.08 ppm (Frank et al, 1976).

Fifty agricultural soils from four areas throughout N. Dakota revealed a mean of 0.03 ppm mercury (Sell et al, 1975). A survey of farm soils from 16 major wheat-growing states of the U.S. revealed a geometric mean mercury concentration of 0.105 ppm, with a range of 0.05 - 0.36 ppm, for 24 samples. Agricultural surface soils from 29 eastern U.S. states gave a mean mercury content of 0.08 ppm for 275 samples and 0.07 ppm for 104 noncropland samples (Adriano, 1986).

Shacklette and Boerngen (1984) gave 0.081 ppm as the geometric mean for 534 samples from the eastern U.S., with a range of 0.01 - 3.4 ppm.

Nickel

Peterson and Alloway (1979) gave 40 ppm as the average content of nickel in soils, with a range of 10 - 1,000 ppm. Bowen (1979) gave 50 ppm for a mean value of nickel in soils and a range of 2 - 750 ppm. An average of 40 ppm was given by Vinogradov (1959). In 49 soils sampled in the U.S. the nickel concentration ranged from 0.5 - 23 ppm. The average nickel content for U.S. soils is 20 ppm and ranges from 5 - 50 ppm for Canadian soils (Adriano, 1986).

Sixteen agricultural soils from Manitoba on the average contained 42 ppm nickel in the A horizon, 39 ppm in the C horizon. For 6 noncultivated soil samples the nickel content averaged 39 ppm (Mills and Zwarich, 1975). Two surface soil samples, from crop growing organic soils from the Holland Marsh area near Toronto, Ontario, averaged 7.98 ppm nickel. From 0-7.5 cm the nickel concentration was 6.21 ppm, 6.64 ppm for 7.5 - 15 cm and for 15 - 22.5 cm it was 5.23 ppm (Chattopadhay et al, 1974).

For 17 organic agricultural soils from Ontario the nickel content averaged 28.6 ppm and ranged 6.6 - 119 ppm, for 125 sandy soils the nickel concentration averaged 7.6 ppm with a range of 1.3 - 34.2 ppm, for 97 loam samples the mean was 17.9 ppm, ranging from 3.0-97.5 ppm, 60 clay samples averaged 27.8 ppm, ranging 8.0 - 88.0 ppm. For all 293 agricultural samples the mean nickel level was 15.9 ppm and ranged from 1.3 - 119.0 ppm (Frank et al, 1976).

Sixteen Minnesota soils from 7 major parent materials were analyzed to obtain a baseline for 6 metals. The average nickel concentration from surface soils from throughout the state was 18 ppm, ranging from 7 - 39 ppm (Pierce et al, 1982). From 10 major agricultural soils from throughout New Jersey the nickel level ranged from 14 - 61 ppm with a mean of 27.3 ppm (Prince, 1957). A muskingum silt loam, a gray-brown podzolic soil from Zanesville, Ohio, had an average nickel content of 26 ppm from 0 - 72" (Slater et al, 1937).

For 26 Massachusetts soils the nickel content ranged from 6 - 41 ppm. With an average of 26 ppm. Thirteen surface soils (A or Ap horizon), of the Appalachian Province of N.J., ranged from 11 - 40 ppm in their nickel content with a mean of 20 ppm. The B horizon had on average of 22 ppm with a range of 14 - 41 ppm. Fifteen benchmark soils from the northeast averaged 37 ppm in their nickel content, these soils were found in Connecticut River Valley alluvium. An average nickel content of 23 ppm was determined for the Ap horizon of four Hadley Silt loam pedons sampled from Connecticut, the range was from 20 - 27 ppm (Luce, 1985).

The mean nickel content for 173 New York State agricultural soils sampled away from mobile and point source contamination was 19.5 ppm. For 40 W. Virginia agricultural samples the mean nickel concentration was 23.3 ppm, for 81 Ohio farm 28.2 ppm, for 57 Maryland agricultural soils 12.4 ppm, for 46 Virginia farms 22.3 ppm, for 31 Maine samples 41.5 ppm and for 45 Pennsylvania farms the mean nickel content was 10.4 ppm (Sommers et al, 1987).

Shacklette and Boerngen (1984) determined the geometric mean nickel content for 443 samples from the eastern U.S. to be 11 ppm, with a range of <5 - 700 ppm.

Potassium

Vinogradov (1959) gave 13,600 ppm as the average amount of potassium in soils. Bowen (1979) gave 14,000 ppm as the mean content of potassium in soils with a range of 80 - 37,000 ppm. Jackson (1964) stated that potassium made up 0.05-3.5% (500-35,000 ppm) of mineral soils and that agricultural soils of the U.S. contain between 1-2% (10,000 - 20,000 ppm) potassium.

Holmes et al (1938) studied the chemical composition of the Norfolk and related soil series. The potassium content in an Orangeburg fine sandy loam was 249 ppm in the A horizon, 995 ppm in the B and 912 ppm in the C horizon. A profile from the Dunbar fine sandy loam revealed a potassium content of 83 ppm in the A_1 horizon, 83 ppm in the A_2, 497 ppm in the B_1 and 249 ppm in the B_2. In the Coxville fine sand loam 1,244 ppm potassium were found in the A horizon, and 2,736 ppm in both the B and C horizons.

From a cultivated soil sample from Eastham, MA, 0-30 cm, the potassium concentration averaged 11,000 ppm (Laul, 1983).

In 1979 Klausner and Reid (1981) compiled 20,000 field samples covering roughly 200,000 acres of New York State. The potassium ranged from 47.5 - 117.5 ppm for 127 samples with an average of 79.6 ppm.

Shacklette and Boerngen (1984) gave the geometric mean of the potassium level in soils of the eastern U.S. to be 12,000 ppm for 537 samples with a range of 50 - 37,000 ppm.

Selenium

Peterson and Alloway (1979) stated that 0.05 ppm was the average crustal abundance of selenium. The estimated average soil concentration of selenium was 0.2 ppm with a range of 0.01 - 2 ppm. Eisler (1985) gave 0.2 ppm as the average soil content of selenium. Vinogradov (1959) stated that 0.01 ppm was the mean selenium content of soils. From a study conducted in 1936 of 1,406 plains soil samples the selenium content ranged from 0.2 - 140 ppm. Bowen (1979) gave 0.4 ppm as the average content of selenium in soils with a range of 0.01 - 12 ppm.

Levesque (1974) obtained 54 soil samples from 4 soil types and 6 horizon layers from the northwest territories of Canada, chosen for remoteness. The selenium concentration ranged from 0.073 - 2.090 ppm. Two surface soil samples from crop growing organic soils, from the Holland Marsh area near Toronto, Ontario, contained 1.10 and 1.43 ppm selenium. A profile of this soil contined 1.22 ppm from 0-7.5 cm, 0.81 ppm from 7.5 - 15.0 cm and 0.62 ppm selenium from 15 - 22.5 cm and 0.62 ppm selenium from 15 - 22.5 cm (Chattopadhyay et al, 1974).

A cultivated soil profile, 0 - 30 cm, from Eastham, MA had a range in selenium content from 2.4 - 5.1 with an average of 3.5 ppm (Laul, 1983). A soil profile, 0.72", was taken from a muskingum silt loam, a gray-brown podzolic soil, from Zanesville, Ohio had an average selenium content of 0.25 ppm with a range of 0.02 - 0.5 ppm (Slater et al, 1937).

Shacklette and Boerngen (1984) found the geometric mean content of selenium in soils of the eastern U.S. to be 0.3 ppm with a range of <0.1 - 3.9 ppm for 449 samples.

Sodium

Vinogradov (1959) gave 6,300 ppm as the average concentration of sodium in soils. Jackson (1964) stated that sodium makes up between 0.1 - 1% (1,000 - 10,000 ppm) of soils. Bowen (1979) quoted 5,000 ppm as the mean concentration of sodium in soil with a range of 150 - 25,000 ppm.

Holmes et al (1938) studied the chemical make up of the Norfolk and related soils. The B horizon of the Orangeburg fine sandy loam contained 223 ppm sodium and the C horizon 74 ppm sodium. A profile of the Ruston fine sandy loam revealed 1,261 ppm sodium in the A horizon, 223 ppm in the B and 445 ppm in the C. A profile of the Dunbar fine sandy loam contained 816 ppm sodium in the A_1 horizon, 74 ppm in the A_2, 446 ppm in the B_1 and 74 ppm in the B_2.

A profile from a cultivated soil sample from Eastham, MA from 0-30 cm, on the average contained 4,300 ppm sodium and ranged from 3,900 - 4,800 ppm (Laul, 1983).

Shacklette and Boerngen (1984) determined the geometric mean for 363 soil samples from the eastern U.S. to be 2,500 ppm, with a range of 500 - 50,000 ppm.

Vanadium

Vinogradov (1959) gave 100 ppm as the average content of vanadium in soils. For 50 various U.S. soils the vanadium concentration ranged from 2 - 270 ppm. Bowen (1979) gave 90 ppm as the mean concentration of vanadium in soils.

Adriano (1986) stated that the vanadium content in igneous rocks, shale, sandstone and limestone of the U.S. was 135 ppm, 130 ppm, 20 ppm and 20 ppm respectively. Soils from sandstone and limestone contain lower amounts of vanadium than soils developed from shales and igneous rocks.

Prince (1957) found the vanadium content of 10 major agricultural soils from throughout New Jersey to range from 11-119 ppm with an average of 53.6 ppm. A profile of a crop growing organic soil from the Holland Marsh area near Toronto, Ontario revealed a vanadium content of 11.0 ppm in the surface, 15.2 ppm 0-7.5 cm, 21.4 ppm 7.5-15.0 cm, and 26.1 ppm from 15-22.5 cm (Chattopadhyay et al, 1974).

A soil profile of a muskingum silt loam, a gray-brown podzolic soil from Zanesville, Ohio, had a mean vanadium content of 72 ppm for 0-72", with a range of 20-96 ppm (Slater et al, 1937).

The geometric mean content of vanadium in the superficial materials of the eastern U.S. was found to be 43 ppm by Shacklette and Boerngen (1984) with a range of <7-300 ppm for 516 samples.

Zinc

The average concentration of zinc in soils is 50 ppm (Vinogradov, 1959; Peterson and Alloway, 1979; Schroeder, 1967). Miesch and Claude (1972) gave 44 ppm as the average zinc content in soils. The zinc content of soils often ranges from 10 - 300 ppm (Peterson and Alloway, 1979; Schroeder et al, 1967).

Four great soil groups, all developed on glacial till and all well drained, from eastern Canada had two virgin profiles analyzed. The range in zinc content for the podzolic profile, 0-30", the zinc range was from 53-150 ppm, for the gray-brown podzolic 62-87 ppm and for the brown forest soil 36-74 ppm (Wright et al, 1955). For 15 unimproved fields in Ontario the average zinc content was 48.5 ppm, ranging from 5.3 - 116 ppm (Frank et al, 1976). The mean zinc concentration from the A horizon of 16 agricultural soils of Manitoba, Canada was 116 ppm, and 66 ppm for the C horizon of these soils. For 6 noncultivated soil samples the average zinc content was 119 ppm (Mills and Zwarich, 1975).

Various soils and horizons from the U.S. Erosion Experiment Stations revealed a range of 3-147 ppm for acid soluble zinc (Goldschmidt, 1958). Sixteen Minnesota soils from 7 major parent materials zinc concentration ranged from 40-74 ppm for 0-15 cm, with an average of 60 ppm (Pierce et al, 1982). For 70 residential soil samples the mean zinc content was 21.1 ppm from the Grand Rapids, Michigan area. And for 91 agricultural samples from this area revealed a mean zinc content of 22.1 ppm (Klein, 1972).

Holmes (1943) gave a range of 59-97 ppm zinc, from a depth of 0-12", for the eastern tributaries to the Mississippi River. A Brasau sandy loam from Groton, NH, from 0-20", had a zinc content of 27-42 ppm. A Hermon sandy loam from Canaan Ctr. NH, from 0-32", had a range in zinc content from 26-40 ppm.

The mean zinc content for a soil profile from a muskingum silt loam a gray-brown podzolic soil, from Zanesville, Ohio was 7 ppm for 0-72" (Slater et al, 1937). For ten agricultural soils from throughout NJ the zinc concentration ranged from 21-180 ppm with an average of 82.7 ppm (Prince, 1957). A soil profile, 0-30 cm, from Eastham, MA had an average zinc concentration of 33 ppm with a range of 30-40 ppm (Laul, 1983).

From 173 agricultural soils from New York State, removed from mobile and point source contamination, the zinc content averaged 64 ppm. For 40 agricultural soils from W. Virginia the zinc content averaged 84 ppm, for 81 Ohio farms the zinc mean concentration was 89 ppm, for 57 Maryland agricultural soils 31 ppm, for 4 Delaware farms 25 ppm, 46 Virginia soils 56 ppm, for 31 Maine agricultural soils 74 ppm and 45 Pennsylvania farms the zinc content averaged 30 ppm (Sommers et al, 1987).

Two virgin spodzols from NH contained 28 ppm zinc. For 6 coarse-loamy textured soils of the northeast the mean zinc content was 53 ppm, while 9 fine-loamy to clayey soils averaged 86 ppm zinc.

Twenty five Mass. soils ranged from 15 - 104 ppm zinc and averaged 62 ppm (Luce, 1985).

Shacklette and Boerngen (1984) have determined the geometric mean of 473 samples from the eastern U.S. to be 40 ppm, with a range of <5-2,900 ppm.

AVERAGES AND RANGES OF THE CONCENTRATION OF SOME ELEMENTS IN UNCONTAMINATED SOILS

All values in ppm, dry weight

	Average Conc. of Element Found in Uncontaminated Soils	References for Averages	Conc. Range of Element Found in Uncontaminated Soils	References for Ranges
Aluminum	Eastern U.S.* 33,000	8, 43	Albany, NY Area 1,000 - 25,000	8, 43
	Agricultural Soil 0 - 30 cm Eastham, MA 34,000	24		
Arsenic	5	5, 8, 16, 29, 36, 40, 43, 44, 50, 53	U.S. Range 0.1 - 45	1, 5, 29, 36, 50, 52 53
			NYS 3-12	52
			Albany Area <0.1-6.5	43
Barium	Average abundance in earth's crust 430	31	NYS 15-600	43, 44
	Eastern U.S.* 290	8, 43	Albany Area 250-350	43
	Eastham, MA Soil 180	24		
Beryllium	All Soils 0.3	5	All Soils 0.1-10	31, 50
	Eastern U.S.* 0.6	8, 43, 44	Canadian Surface Soils 0.1 - 0.89	1
			NYS 0 - 1.75 (except for 1 sample 1.75-7)	43, 44
			Albany Area 0 - 0.9	43, 44
Cadmium	Average abundance in earths crust 0.15-0.2	31, 36	0.01 - 2	5
	26 MA soils and 15 northeastern soils 0.2	13, 26	0.0001 - 1.0	26, 35, 36, 41, 47
			soils of nonvolcanic origin 0.01-1.0	11
	0.35	5	soils of volcanic origin up to 0.45	11
	98 NYS mineral agricultural soils 0.21	26	26 MA soils 0.01 - 0.88	26

	Average Conc. of Element Found in Uncontaminated Soils	References for Averages	Conc. Range of Element Found in Uncontaminated Soils	Refere for Ra
Calcium	Eastern U.S.* 3,400	8, 23	Eastern U.S.* 100-28,000	43
	70 Residential Soils, Mich. 2,300	22	Eastern U.S.* 100-16,000	8
	91 Agricultural Soils, Mich. 1,400	22	NYS 130-35,000	43
	127 NYS Agricultural Soils 1,651	21	Albany Area 150-5,000	44
			Albany Area 2,900-6,500	43
Chromium	Canadian soils 43	6	Most U.S. soils 25-85	1
	World soils 20	50	Eastern U.S.* 1-100	8
	Eastern U.S.* 33	8,43	10 NJ soils 20-75	39
			NYS 1.5-40	9
			Albany Area 1.5-25	8, 43
Cobalt	All soils 7	5, 8, 31, 36, 50	0.1-40	14, 5
	Eastern U.S.* 5.9	43	NJ Agr. Soils 2-18	39
			NYS 2.5-60	8, 43
			Albany Area 2.5-6	43
Copper	All soils 30	26	2-250	5, 36
	All soils 20	36, 43, 50	10-80	23
	10 NJ Agr. Soils 23	39	1-10 under humid conditions	14
	Eastern U.S.* 13	8.43	up to 50 in arid conditions	14
			26 MA Soils 5-38	26
			Albany Area <1-15	8, 43

	Average Conc. of Element Found in Uncontaminated Soils	References for Averages	Conc. Range of Element Found in Uncontaminated Soils	References for Ranges
Iron	Eastern U.S.* 14,000	8, 43	2,000 - 550,000	5
	Eastham MA Agr. Soil 13,000	24	700 - 100,000	23, 43
			Eastham, MA 11,000-14,000	24
			Albany Area 17,500 - 25,000	8, 43
Lead	All soils 10	5, 36, 50	Range in "normal" soils 10-37	1, 33
	Eastern U.S.* 14	8, 29, 33, 43	95% of U.S. soils 4-61	29
	98 NJ agr. soils mineral 15 organic 20	26	Albany Area 1 - 12.5	8, 43
	173 NY agr. soils 17	47		
Magnesium	All soils 6,300	50	400 - 9,000	5
	Eastern U.S.* 2,300 2,100	8 43	100 - 5,000	8, 43
			Albany Area 2,500 - 6,000 1,700 - 4,000	8 43
Manganese	All soils 850	1, 50	100 - 4,000	1
	Eastern U.S.* 285 260	8 43	10 Agr. NJ soils 130-1,560	39
	10 Agr. NJ Soils 789	38	NJ Cultivated Soils 264-736	4
	Eastham, MA Agr. Soil 345	24	NYS 50-5,000	8, 43
			Albany Area 400-600	8, 43
Mercury	All Soils 0.06	1, 2, 5	0.001 - 0.2	2, 13, 28, 50
	Eastern U.S.* 0.081	43	Albany Area 0.042 - 0.066	43

	Average Conc. of Element Found in Uncontaminated Soils	References for Averages	Conc. Range of Element Found in Uncontaminated Soils	References for Rang
Mercury (cont.)	234 samples Sackatchewan, Canada 0.081	15		
	Northeastern U.S. upper limit 0.04	10		
Nickel	All Soils 40	5, 26, 36, 50	0.5 - 60	26, 39,
	All Soils 20	1	26 MA Agr. Soils 6-41	26
	173 NY Agr. Soils 19.5	47	NYS 0.5-25	8
	Eastern U.S. 12	8.43	Albany Area 6-12.5	8, 43
Potassium	U.S. Average 12,000	5, 8, 20, 24, 50	All Soils 100-37,000	5, 8, 2
	Eastern U.S.* 7,400 12,000	8 43	NYS 8,500-43,000	43
			Albany Area 12,500 - 17,500	42, 43
Selenium	0.2	12, 36	0.01 - 12	5, 36
	Eastern U.S.* 0.3	43	Eastern U.S. <0.1-3.9	43
	Eastham, MA 3.5	24	Albany Area <0.1-0.125	43
Sodium	All Soils 6,300	50	Eastern U.S.* <500-50,000 150-15,000	 43 8
	Eastern U.S.* 2,500	8, 43	Albany Area 6,000 - 8,000	43
Vanadium	All Soils 100	5, 50	Eastern U.S.* 1-300	8, 43
	Eastern U.S.* 43	8, 43	10 NJ Agr. Soils 11-119	50
	10 NJ Agr. Soils 53.6	39	50 U.S. Soils 2-270	39
			Albany Area 25-60	

	Average Conc. of Element Found in Uncontaminated Soils	References for Averages	Conc. Range of Element Found in Uncontaminated Soils	References for Ranges
Zinc	50	26, 36, 41, 50	All Soils 10-300	26, 36, 41
	Eastern U.S.* 40	8, 24, 29, 43	9-50	31
	173 NY Agr. Soils 64	47	Albany Area 37-60	43

* Eastern U.S. Soil values are the geometric mean element concentration from a depth of 24 cm, in soils east of the 97th meridian.

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Sediment Criteria - December 1989

Used as Guidance by the Bureau of Environmental Protection, Division of Fish and Wildlife, New York State Department of Environmental Conservation

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Note: This document is used as guidance by the Division of Fish and Wildlife. It is neither a standard nor a policy of the Department.

TABLE OF CONTENTS

I. Introduction and Overview of Sediment Criteria Methodology

On February 2 and 3, 1989, the USEPA presented to its Science Advisory Board (SAB) a methodology for deriving sediment criteria for non-polar (or non-ionic) organic chemicals. It is known as the equilibrium partitioning (EP) approach. A briefing document was given to the SAB which summarized the theoretical basis for the EP methodology and supporting lab and field data, and included the first list of interim criteria derived by the method (EPA 1989).

The methodology has been discussed in the scientific community for several years. It is based on the theory that toxics in sediments will exert their effect, either toxicity or bioaccumulation, to the extent that the chemical becomes freely bioavailable in the sediment interstitial (pore) water. It has been determined that the best sediment parameter with which to make predictions of bioavailability of non-polar organics in sediments is the fraction of organic carbon in the sediment. For sediments which exceed 0.5% total organic carbon the concentration of the chemical in the pore water can be predicted dividing the bulk sediment concentration by the product of the sediment/organic carbon partition coefficient (K_{oc}) and the fraction organic carbon. Few K_{oc} are accurately known, however it has been determined that K_{ow} (octanol/water partition coefficient) is very nearly equal to K_{oc} and may be substituted for K_{oc} in this calculation. By setting the pore water concentration equal to the water quality standard or criterion for the chemical a sediment criterion can be calculated by solving for the bulk sediment concentration. The sediment criterion algorithm normalized for organic carbon (OC) follows:

$$\text{Sediment Criterion, ug/gOC} = (\text{AWQS/GV, ug/l}) \times (K_{ow},\ \text{l/kg}) \times \frac{1\ \text{Kg}}{1.000\text{gOC}}$$

where AWQS/GV is the ambient water quality standard or guidance value for a chemical

K_{ow} is the octanol/water partition coefficient for the chemical; units are those for K_{oc}.

and $\frac{1\ \text{Kg}}{1.000\ \text{gOC}}$ is a unit conversion factor.

To derive a sediment criterion for a specific sediment, the OC normalized value is multiplied by the OC concentration in the sediment. For example, table 1 contains a carbon normalized sediment criterion for PCB of 1.4 ug/g which is derived as follows:

$$\text{PCB Sediment Criterion} = 0.001\ \text{ug/l} \times 10^{\overset{6.14}{\cancel{5.2}}} \underset{\times \frac{1\,\text{Kg}}{1{,}000\,\text{g OC}}}{} = 1.4\ \text{ug/gOC}$$

To obtain a site-specific criterion for a sediment with 3% total OC multipl the OC normalized criterion by the fraction of organic carbon:

$$\text{Site-specific criterion} = 1.4\ \text{ug/gOC} \times 30\ \text{gOC/Kg} = 42\ \text{ug/kg}$$

Sediment with contaminants in excess of the criteria would be predicted to contain interstitial water in excess of the AWQS/GV. The PCB AWQS that is the basis for the sediment criterion of 1.4 g/gOC is designed to protect wildlife which consume other biota. Therefore, exceedance of the sediment criterion would be predicted to cause accumulation of PCB in surface water biota to levels that would be harmful to wildlife consumers of the biota.

Table 1 contains sediment criteria for a number of non-polar organic chemicals. For many of the chemicals, there is more than one criterion, reflecting the varied environmental protection objectives of the AWQS/GV/C used to calculate the criteria. Exceedance of the aquatic toxicity based criterion for a chemical would be predicted to cause toxicity to benthic or epibenthic life. Exceedance of the human health residue based criterion would be predicted to cause accumulation of the chemicals in aquatic animals to levels that would exceed a human health tolerance, action level or cancer risk dose (depending on the basis of the AWQS/GV/C). Exceedance of the wildlife residue based criterion for a chemical would be predicted to cause accumulation of the chemical in aquatic animals to levels that would be harmful to wildlife consumers of the animals.

There are a number of sediment criteria in Table 1 whose AWQS/GV/C is followed by the footnote "+". The human health based water quality criteria followed by this footnote are 1 X 10^{-6} cancer risk AWQC derived by the method for calculating water quality standards and guidance values in 6NYCRR 701.12. The wildlife based water quality criteria followed by this footnote are derived by dividing fish flesh criteria from Newell et al. (1987) by bioaccumulation factors.

Table 2 provides sediment criteria for five substances in 1% OC and 3% OC sediments. There are differences between sediment criteria derived using current TOGS values and proposed Division of Fish and Wildlife (DFW) values because DFW has proposed use of low cancer risk based criteria in the case of human health and somewhat more protection for wildlife resulting from revised wildlife risk assessments. The EPA criteria for PCB are considerably higher because the water quality criteria upon which the sediment criteria are based were derived using bioaccumulation factors that are known to be too low and higher fish flesh criteria for wildlife than is prudent.

Although the methodology described above is intended for non-polar organics, there are phenolics in Table 1. Phenolics are generally considered polar or ionic chemicals. However, at pH around neutrality phenolics do not ionize, and they act like non-ionic chemicals. Sorption of phenolics to sediments is known to be an important environmental fate process. Phenolics are also a major environmental contaminant. Therefore, sediment criteria were calculated for the phenolics by the non-polar formula.

For non-polar chemicals with log K_{ow} less than about 2.0 the sediment criteria for typical sediments of 0.5-5% total OC is always less than the AWQS/GV/C that was used to derive the criterion. This can be interpreted to mean that virtually all of the chemical in the sediment is bioavailable. It would not appear to make sense to actually implement sediment criteria that are less than the AWQS/GV/C. Therefore, for non-polar organic chemicals with K_{ow} <2 the sediment criterion should be considered to be the same as the AWQS/GV/C.

Until the non-polar method receives SAB approval and subsequent public review, there will likely be controversy about its use. If its use at a particular site is questioned, then the criteria should be used in conjunction with sediment toxicity and bioaccumulation tests. A limited number of such tests should be conducted to site-specifically calibrate the criteria.

For polar organics (except for phenols) and metals there are no algorithms to calculate sediment criteria in order to account for variable sediment characteristics which may affect metals toxicity. However, following the logic above, in order to ensure compliance with water quality standards, interstitial (pore) water should not exceed AWQS/GV/C for polar organics in TOGS 1.1.1. This application of AWQS/GV/C is complicated by the fact that dissolved organic carbon (DOC) in pore water is generally quite a bit higher than in the water column. DOC tends to reduce toxicity and bioaccumulation of chemicals. Since water column DOC is usually low AWQS/GV/C are not modified by DOC known to occur in specific waters. If partitioning between DOC and a chemical is known, then the effect of DOC on toxicity or bioaccumulation may be accounted for, and AWQS/GV/C may be applied to pore water. K_{DOC} is known for many chemicals. Also, chemicals with low K_{oc} do not show uptake suppressed by DOC. Appended are some methods for collecting interstitial water, along with references.

For metals, the primary concern in sediments is toxicity to benthic (bottom) organisms. The Ontario Ministry of the Environment reviewed a number of methods to derive sediment criteria, each with a somewhat different level of benthos protection, and calculated metals criteria for each as data was available (MOE 1988). Persaud (1989) derived from MOE (1988) no-effect levels and lowest effect levels for metals (Persaud 1989 is a personal communication which is expected as a formal document in late 1989). Table 4 presents the geometric mean of these two values. Calculation of the geometric mean of a no-effect and lowest effect level is one method used for deriving water quality criteria. It is also appropriate for calculating sediment criteria. The methods used to derive these criteria do not account for variability of bioavailability of metals in sediments with differing organic content, particle size distribution or iron and manganese oxide content. Implementation of these metals sediment criteria is discussed below.

Although there currently is no algorithm for metals to calculate sediment criteria, EPA is working on the problem. Recently, a finding was made that may lead to such an algorithm. A paper by D.M. Di Toro et al was presented at the November 1989 meeting of the Society of Environmental Toxicology and Chemistry in Toronto which indicates that bioavailability of cadmium (and probably other heavy metals) in sediments is largely determined by the amount of acid volatile sulfide (AVS) in sediments that is available to bind with cadmium. While confirming studies have not been completed, there is sufficient promise to this approach to warrant advising users of sediment criteria to include quantification of AVS among the measurements of each sediment sample taken where metals are of concern. It appears to be important to avoid contact of sediment samples with air to minimize oxidatic of iron and manganese sulfide, and it would be useful to measure AVS at several depths of sediment cores. At this time, interpretation of this data will be site-specific but by 1991, it may be possible to use this data to calculate sediment criteria for the metals. Therefore, it is worthwhile to begin AVS measurement now.

bioaccumulation and toxicity, and based on quantity of exceedance would impacts be expected to be isolated or widespread through the ecosystem of concern.

2. Compare sediment concentrations with unimpacted, local background concentrations; consider significance of criteria exceedances in light of background concentrations, in particular, for naturally occurring substances such as metals.

3. If sediment concentrations are less than criteria, remediation is not necessary to ensure compliance with standards.

4. If sediments exceed criteria, and especially if exceedance is widespread in the ecosystem of concern, a number of steps can be taken to verify the need for remediation.

   a. For non-polar organic chemicals with K_{ow} <3.0, further remedial investigation or sediment remediation is not necessary if it can be demonstrated that the source of sediment contamination will be eliminated and the sediment will cleanse itself within one year. For these chemicals the greatest value of sediment criteria may be for documentation of a significant release.

   b. For sediments exceeding aquatic toxicity based criteria, including metals:

      i. conduct assessments of ecological communities to estimate degree of impairment: correlate sample specific ecological results with sediment concentrations.

ii. collect sediment samples and conduct acute and chronic toxicity tests with fish and benthic invertebrates: correlate with toxicity test results with sediment contaminant concentrations.

iii. For organics, exceedance of aquatic toxicity based criteria i Table 1 by 100 times in significant portions of the ecosystem indicates the likelihood that biota are impaired and remediation should be considered necessary.

iv. For metals, Table 4 contains "limits of tolerance". If ther values are exceeded in significant portions of the ecosystem of concern, it is highly likely that biota are impaired and remediation should be considered necessary.

c. For sediments exceeding human health bioaccumulation based criteria:

i. collect data on residues in edible biota and compare with tolerances/action levels/guidance and/or 1 X 10^{-6} cancer risk levels, or

ii. collect sediment samples, test with representative edible biota, measure residue.

For the measurement technique DiToro et al cited Morse (1987). Appendix 2 is a procedure used by DiToro et al which presumably is derived from Morse et al (1987).

There is concern that use of bioaccumulation based sediment criteria derived by the EP method may not be appropriate if the surface water impairment of concern is an elevated residue in pelagic fish. The SAB is addressing this question. It seems to be well accepted that residues in benthic animals are accurately modeled by the EP method, but for low K_{ow} chemicals (less than about 10^5), residues in pelagic fish may not be clearly related to pore water concentrations. However, for high K_{ow} chemicals (greater than about 10^5) biomagnification through the aquatic food chain is known to occur, and EP criteria may actually be underprotective. For these chemicals, there may be an alternative approach to derive sediment criteria. Recent studies with PCB and 2,3,7,8-TCDD indicate that residues in fish can be predicted by sediment to fish bioaccumulation factors. Accumulation in edible fillet with 3% lipid from sediment with 3% OC is about 0.1-1 times the sediment concentration for 2,3,7,8-TCDD and about 1-10 times the sediment concentration for PCB. Using these sediment to fish accumulation factors, sediment criteria can be back calculated from fish residue levels of concern. Table 3 presents some of these criteria. Complete documentation for this approach can be provided in the near future.

Sediment criteria derived by this sediment-to-fish approach are comparable to those derived by the EP method. For PCB the EP criterion in Table 2 of 0.24 ug/kg may be compared to the criterion in Table 3 of 0.6 - 0.06 ug/kg because they are both 1 x 10^{-5} cancer risk based; as can be seen the former falls within the range of the latter. Similarly the PCB wildlife based criterion in Table 2 of 18 ug/kg falls within the range of the PCB wildlife based criteria in Table 3 of 100-10 ug/kg. For 2.3.7.8-TCDD the cancer risk based criterion from Table 2 of 6 x 10^{-5} ug/kg falls within the range of the cance risk criteria range in Table 3 of 1.4 x 10^{-5} to 1.4 x 10^{-4} ug/kg. The 2.3.7.8-TCDD wildlife based criterion from Table 2 of 0.006 ug/kg falls within the wildlife criteria range in Table 3 of 0.03 - 0.003 ug/kg. The good agreement between these two methods supports the scientific validity of the resultant sediment criteria.

This sediment criteria report will be amended upon completion and review of the EPA Science Advisory Board Report on the EP method for deriving sediment criteria..

II. Use of Sediment Criteria in Risk Management Decisions

As is indicated above, exceedance of sediment criteria can be expected to result in some specific adverse effects. The volume and location of sediment exceeding the criterion, the magnitude of the effect expected, the length c time sediments will be contaminated, and the certainty that the effect will occur, will all play a role in making decisions about how much sediment to clean up in order to eliminate or minimize the adverse effects. The effect of these factors on risk management decisions is discussed below.

Where the volume of sediment exceeding criteria is small and the sediment is fairly accessible, the pragmatic solution may be to remediate all the sediment. Where volumes are large and/or difficult to remediate (either because of accessibility or sensitivity of the impaired habitat), it may be practical to sort out and proceed with remediation of those sediments whos remediation is practicable and feasible. For the sediments which cannot feasibly be treated or removed, further risk management evaluations may be warranted.

The magnitude of the effect caused by a contaminated sediment will depend on the magnitude of the exceedance of the criterion. Where the criterion is based on direct toxicity to aquatic life or indirect toxicity to wildlife via consumption of contaminated fish, a slight exceedance of a criterion would be expected to cause only a slight adverse effect. Increases in the magnitude of exceedance will cause increases in the magnitude of the effects. It may be useful to attempt to quantify the magnitude of predicted adverse impacts where remediation of sediments is expected to be difficult or costly to accomplish. This may be accomplished by desk-top investigation into the basis for a criterion, or site-specific sediment criterion and/or bioaccumulation tests. Decisions about the volume of sediment to remediate may then be made considering predicted residual effects from any unremediated sediments. Where the sediment criterion is based on human exposure to a carcinogen in fish, shellfish or other edible biota, exceedance of the sediment criterion would be predicted to cause a greater than 10^{-6} incremental cancer risk for humans. The actual risk that society is willing to accept may be factored into cleanup decisions. Presumably, once it is predicted that an FDA or EPA tolerance or action level would be exceeded, then cleanup would have to be made to the associated sediment concentration. As with the fish and wildlife toxicity based sediment criteria, site-specific bioaccumulation tests could be conducted to verify that sediments cause the predicted level of biota residues.

Once the source of contaminants to sediments is cut off, the length of time a particular area of sediments will contain unacceptable levels of contaminant will depend on the persistence of the chemicals and the site-specific dynamics of the sediment which control sedimentation, resuspension, biological and chemical degradation and other fate processes. If a chemical is not persistent (e.g. sediment levels would be expected to fall to acceptable levels within six months) then sediment remediation may not be necessary. Even for a persistent chemical, it may not be necessary to remediate the sediments if the contaminated area is a deposition zone, if burying of the contaminated sediments would be expected to occur within a short time, and if resuspension was unlikely.

The confidence in the EP sediment criteria for non-polar organics depends on a number of factors: that exceedance of a water quality standard or criterion in sediment interstitial water will cause an adverse effect, that no other factors other than OC affect bioavailability and that the K_{ow} or K_{oc} used is accurate. It is difficult to place uncertainty bounds on water quality standards and criteria. Methods to derive them have been developed and fine-tuned for a number of years. It is assumed that they have no uncertainty. Currently, EPA also makes this assumption about its sediment criteria approach. Regarding other factors, at this time EPA (1989) has concluded that all other factors contribute a minor amount to bioavailability of contaminants.

For the uncertainty of K_{ow}, EPA has used the correlation between K_{oc} and K_{ow} to place 95% uncertainty bounds about their proposed interim sediment criteria of about (in general) one order of magnitude in either direction. This may be interpreted to mean that there is a high degree of confidence that exceedance of a criterion by about ten times will be associated with onset of impacts. For sediment criteria based on bioaccumulation this would mean that there is a high degree of confidence that at ten times the criteria aquatic animals exposed to the sediments would accumulate contaminants to levels that would exceed human health or wildlife related tolerances, action levels, fish flesh criteria etc. For sediment criteria based on toxicity to aquatic life this would mean that there is a high degree of confidence that sediments with contaminants at ten times the criteria would exhibit chronic toxicity to benthic animals. Onset of chronic toxicity may be difficult to detect in natural systems. Since water quality criteria to prevent acute toxicity are generally about ten times the chronic criteria, it may be generalized that for sediments with contaminants at 100 times (factors of 10 for uncertainty and acute:chronic ratios, respectively) toxicity based criteria there is a high degree of confidence that there will be onset of acute toxicity to benthic animals. Such effects would likely be evident as an impacted or depauperate benthic community.

It must also be noted that due to uncertainty about actual partitioning of a chemical between water and sediments there is the possibility that the sediment criteria are somewhat underprotective rather than overprotective.

Uncertainty of the metals criteria can not be characterized so simply. The criteria are based on empirical evidence from both lab and field studies without an attempt to normalize for any toxicity controlling factors in the sediment. Variability of toxicity of metals in any given sediment is evident from Table 4 which provides criteria, all of which are lower than the upper 95% confidence limit of pre-industrial metal concentrations in Great Lake sediments. This is interpreted to mean that in some sediments relatively low levels of metals, even below "high" background, are toxic, whereas in other sediments fairly high levels, i.e. up to and possibly even above "high" background, may not be toxic. However, for all metals, except iron, the "Limit of Tolerance" exceeds "high" background by a considerable amount, and at these levels significant and noticeable toxicity would be expected in all sediments. Site-specific tests could be conducted to determine the magnitude of effects caused by contaminants in sediments. Such tests could be used to determine whether onset of effects occurs at sediment concentrations somewhat above or below the sediment criterion.

Where contaminated sediments are not remediated, sediment criteria will be useful in quantifying residual damages for preparation of a natural resour damage claim.

Interpretation and application of sediment criteria should be conducted in coordination with the Division of Fish and Wildlife.

Much of the above implementation guidance can be outlined in a strategy for use of the sediment criteria and actions to take when criteria are exceede.

1. Compare sediment concentrations with sediment criteria.

   a. quantify the area or volume of sediment in excess of the criteria.

   b. describe the significance of exceedances in terms of the basis o the criteria: e.g. would only bioaccumulation be expected or both

d. For sediments exceeding wildlife risk bioaccumulation based criteria:

i. identify biota which consume aquatic life and study them to determine whether they have been impaired by contaminants in their food supply.

ii. collect sediment samples, test with wildlife food supply and measure residues; compare with residue levels known to be toxic to wildlife.

5. When sediment concentrations and criteria are less than detection, ecological assessments are necessary to directly measure toxicity of sediments or residues in biota if it is suspected that sediments were contaminated by releases.

a. generally, it is expected that low level impacts would be associated with presence of contaminants in sediments below detection.

b. however, if impacts are found to be of unacceptable magnitude, then iterative ecological assessments may be necessary to quantify the volume of sediments to remediate.

III. Division of Fish and Wildlife sediment criteria contact is Arthur J. Newell, Room 530, 50 Wolf Road, Albany, New York 12233-4756, 518/457-1769.

IV. Detailed Criteria for Contaminants, see tables and appendix.

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Table 1 (continued)

Substance	Log K_{ow}	Freshwater or Marine F or M	Aquatic Toxicity Basis AWQS/GV/C* ug/l	Aquatic Toxicity Basis Sediment Criterion ug/gOC	Human Health Residue Basis AWQS/GV/C ug/l	Human Health Residue Basis Sediment Criterion ug/gOC	Wildlife Residue Basis AWQS/GV/C ug/l	Wildlife Residue Basis Sediment Criterion ug/gOC
Endosulfan	3.55	F	0.009++	0.03				
		M	0.001++	0.004				
Endrin	5.6	F&M	0.002++	0.8			0.0019+	0.8
		F		1.04**		0.0532**		
		M		0.215**		0.0532**		
Ethyl Parathion	2.1	F		0.081**				
Heptachlor & Heptachlor epoxide	4.4	F&M	0.001++	0.03	0.00003+	0.0008	0.0038+	0.1
		F				0.11**		
		M				0.104**		
Hexachlorobenzene	6.18	F&M	<5+	<7568	0.0001+	0.15	0.008+	12
Hexachloro-butadiene	3.74	F&M			0.06+	0.3	0.07+	0.4
		F	1++	5.4				
		M	0.3++	1.6				
Hexachloro-cyclohexanes	3.8	F		0.157**				
		F	0.01++	0.06				
		M	0.004++	0.03				
		F&M			0.009+	0.05	0.23+	1.5
Hexachlorocyclo-pentadiene	3.99	F	0.45++	4.4				
		M	0.07++	0.7				
Isodecyldiphenyl phosphate	5.4	F	1.73++	434				

Table 1 (continued)

Substance	Log K_{ow}	Freshwater or Marine F or M	Aquatic Toxicity Basis AWQS/GV/C* ug/l	Aquatic Toxicity Basis Sediment Criterion ug/gOC	Human Health Residue Basis AWQS/GV/C ug/l	Human Health Residue Basis Sediment Criterion ug/gOC	Wildlife Residue Basis AWQS/GV/C ug/l	Wildlife Residue Basis Sediment Criterion ug/gOC
Linear alkyl-benzene sulfonates	3.97 (Sodium dodecyl-benzene sulfonate)	F	40++	373				
Malathion	2.2	F&M	0.1++	0.02				
Methoxychlor	4.3	F&M	0.03++	0.6				
Mirex	5.83	F&M			0.001++	0.7	0.0055+	3.7
		F&M			0.0001+	0.07		
Octachloro-styrene	About 6.0						0.0005+	0.5
Parathion & methyl parathion	2.5	F	0.008++	0.003				
Pentachlorophenol	5.0	F	0.4++	40				
Phenanthrene	4.45	F		139**				
		M		102**				
Phenols, total	2.75	F	1++	0.6				
Phenols, total unchlorinated	2.0	F	5++	0.5				
PCB	6.14	F&M	<0.2+	<276	0.000006+	0.008	0.001++	1.4
		F&M					0.0004+	0.6
		F						19.5**
								1.8**

TABLE 1

Sediment Criteria, Derived for a Variety of Environmental Protection Objectives. (Sediment criteria are normalized to organic carbon (OC) content as ug/gOC; to obtain criteria for bulk sediments in ug/Kg multiply criteria by fraction OC;i.e. for 1% multiply by 10, for 2% OC by 20, etc.)

			Aquatic Toxicity Basis		Human Health Residue Basis		Wildlife Residue Basis	
Substance	Log K_{ow}	Freshwater or Marine F or M	AWQS/GV/C* ug/l	Sediment Criterion ug/gOC	AWQS/GV/C ug/l	Sediment Criterion ug/gOC	AWQS/GV/C ug/l	Sediment Criterion ug/gOC
Acenapthene	4.33	F		730**				
Anilene		F		0.0662**				
		M		0.248**				
Aldrin and Dieldrin	5.0	F&M			0.001++	0.1		
		F&M	0.084+	8.4	0.00001+	0.001	0.0077+	0.77
Azinphosmethyl	2.4	F	0.005++	0.001				
		M	0.01++	0.003				
Azobenzene	3.82	F&M			0.07+	0.5		
Benzene	2.0	F&M			6++	0.6		
Benzo(a)pyrene and some other PAHs♦	6.04	F			0.0012++	1.3		
		M			0.0006++	0.7		
Benzidene	1.4	F	0.1++	0.003				
Bis(2-chloroethyl) ether	1.73	F&M			0.2+	0.01		
Bis(2-ethylhexyl) phthalate	5.3	F	0.6++	119.7				
[illegible]	[illegible]	F	1++	0.2				

Table 1 (continued)

ance	Log K_{ow}	Freshwater or Marine F or M	Aquatic Toxicity Basis AWQS/GV/C* ug/l	Aquatic Toxicity Basis Sediment Criterion ug/gOC	Human Health Residue Basis AWQS/GV/C ug/l	Human Health Residue Basis Sediment Criterion ug/gOC	Wildlife Residue Basis AWQS/GV/C ug/l	Wildlife Residue Basis Sediment Criterion ug/gOC
n tetra- oride	2.64	F&M			1.3+	0.6		
rdane	2.78	F&M			0.002++	0.001		
		F&M	0.01+	0.006	0.00008+	$8X10^{-8}$	0.01+	0.006
obenzene	2.84	F&M	5++	3.5				
o-o- uidine	about 2.0	F&M			6.5+	0.65		
pyrifos	5.11	F		3.22**				
		M		0.44**				
DDD & DDE	6.0	F&M					0.001++	1
		F&M						0.828**
		F&M	≤0.05+	≤50	0.00001+	0.01		
drin	5.0	F		19.5**		0.13**		
		M		5.77**		0.13**		
inon	1.92	F	0.08++	0.007				
lorobenzenes	3.38	F&M	5++	12				
Dichloroethane	1.48	F&M			24+	0.7		
Dichloro- nylene	1.48	F&M			0.8+	0.02		
Dinitrotoluene	2.05	F&M			1+	0.1		
					.1+	0.1		

TABLE 3

Sediment Criteria Derived by the Sediment-to-fish Bioaccumulation Method

	PCB		2,3,7,8-TCDD	
	Fish Residue ug/kg	Sediment Criterion*, ug/kg	Fish Residue ug/kg	Sediment Criterion,* ug/kg
Tolerance or Advisory	2000	2000-200	0.01	0.1-0.01
10^{-6} Cancer Risk @ ½ lb/week fish consumption	0.6	0.6-0.06	1.4×10^{-5}	1.4×10^{-4}-1.4×10^{-5}
Wildlife Fish Flesh Criterion	100	100-10	0.003	0.03-0.003

* For PCB and 2,3,7,8-TCDD, the ranges result from dividing the Fish Residue by a fish to sediment accumulation factor of 1-10 and 0.1-1, respectively.

e 4. Sediment criteria for metals, ug/g (ppm) except iron which is in percent.

	Background*	Criteria**	Limit of Tolerance***
nic	12	5 (4.0- 5.5)	33
ium	2.5	0.8(0.6- 1.0)	10
nium	75	26 (22 - 31)	111
er	65	19 (15 - 25)	114
(%)	5.9	2.4 (2 - 3)	4
	55	27 (23 - 31)	250
nese	1200	428 (400 -457)	1100
ry	0.6	0.11(0.1- 0.12)	2
l	75	22 (15 - 31)	90
	145	85 (65 -110)	800

rom MOE (1988); upper 95% confidence limit of pre-industrial concentrations in
reat Lakes sediments.

alues in parentheses are "no-effect" and "lowest-effect" levels, respectively, from Persaud
1989).

oncentration which would be detrimental to the majority of species, potentially eliminating
ost. (Persaud 1989)

Table 1 (continued)

			Aquatic Toxicity Basis		Human Health Residue Basis		Wildlife Residue Basis	
stance	Log K_{ow}	Freshwater or Marine F or M	AWQS/GV/C* ug/l	Sediment Criterion ug/gOC	AWQS/GV/C ug/l	Sediment Criterion ug/gOC	AWQS/GV/C ug/l	Sediment Criterion ug/gOC
,7,8-Tetra-hlorodibenzo-ioxin	7.0	F&M F&M	<0.001+	<10	$1X10^{-6}$++ $2X10^{-10}$+	0.01 $2X10^{-6}$	$2X10^{-8}$+	0.0002
,22-Tetrachloro-thane	2.56	F&M			0.7+	0.3		
rachloro-hylene	2.88	F&M			1++	0.8		
oluidine	1.4	F&M			18+	0.45		
aphene	3.3	F&M	0.005	0.01	0.009+	0.02		
chlorobenzenes	4.26	F&M	5++	91				
,2-Trichloro-thane	2.17	F&M			4+	0.59		
chloroethylene	2.29	F&M			11++	2		
phenyl phosphate	4.59	F	4++	156				
yl chloride	0.6	F&M			18+	0.07		

WQS/GV/C = Ambient water quality standard or guidance value in TOGS 1.1.1 or other water quality criterion.
WQGV proposed by Division of Fish and Wildlife.
Current NYS AWQS or GV in TOGS 1.1.1.
EPA proposed interim sediment criteria; taken from an EPA briefing document for the EPA Science Advisory Board.
The sediment criterion for benzo(a)pyrene also applies to benz(a)anthracene, benzo(b)fluoranthene, benzo-[illegible]thene, chrysene, indeno(1,2,3-cd)pyrene, and, methylbenz(a)anthracenes. These PAH have the same

TABLE 2

Sediment Criteria for Five Non-polar Substances in 1% and 3% Organic Carbon Content Sediment

		Sediment Criteria, ug/kg		
bstance	F or M	Aquatic Toxicity Basis	Human Health Residue Basis	Wildlife Residue Basis
nzo(a)pyrene				
1% OC	F		13*	
	M		7*	
3% OC	F		39*	
	M		21*	
chlorobenzenes				
1% OC	F&M	120*		
3% OC	F&M	360*		
rex				
1% OC	F&M		7*	37
	F&M		0.7+	
3% OC	F&M		21*	111
	F&M		2.1+	
B				
1% OC	F&M		0.08+	14*
	F&M			6+
	F,M			195,418#
3% OC	F&M		0.24+	42*
	F&M			18+
	F,M			585,1254#
3,7,8-TCDD				
1% OC	F&M	100+	0.1*	0.002+
	F&M		2×10^{-5}+	
3% OC	F&M	300+	0.3*	0.006+
	F&M		6×10^{-5}+	

---

d o rre NYS AWQS or GV in TOGS 1.1.1.

[illegible] hum heal bas [illegible] 10^{-6} can[illegible]

TABLE 1 (continued)

NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES

Date of Revision: November 1991

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER		TYPE	BASIS CODE
		STANDARD	GUIDANCE VALUE		
Cadmium	A, A-S, AA, AA-S	10		H(WS)	G
(Not Applicable)	GA	10		H(WS)	F
	A, A-S, AA, AA-S, B, C	*		A	N
	D	**		A	Q
	SA, SB, SC, I	7.7		A	N
	SD	21		A	Q
	SA, SB, SC, I, SD		2.7	H(B)	K

Remarks: * exp(0.7852 [ln (ppm hardness)] - 3.490)
** exp(1.128 [ln (ppm hardness)] - 3.828)
Aquatic standards and guidance values apply to acid-soluble form.

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD	GUIDANCE VALUE	TYPE	BASIS CODE
§	GA	18		H(WS)	F
Captan					
(133-06-2)					
§	GA	29		H(WS)	F
Carbaryl					
(63-25-2)					
§	A, A-S, AA, AA-S	15		H(WS)	B
Carbofuran	GA		15	H(WS)	B
(1563-66-2)	A, A-S, AA, AA-S, B, C	1.0		A	N
	D	10		A	Q
§	A, A-S, AA, AA-S		0.4	H(WS)	A
Carbon tetrachloride	GA	5		H(WS)	F
(56-23-5)					
§	A, A-S, AA, AA-S		50	H(WS)	Z
Carboxin	GA	50		H(WS)	J
(5234-68-4)					
§	A, A-S, AA, AA-S		50	H(WS)	Z
Chloramben	GA	50		H(WS)	J
(Not Applicable)					

Remarks: Includes: related forms that convert to the organic acid upon acidification to a pH of 2 or less; and esters of the organic acid.

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD	GUIDANCE VALUE	TYPE	BASIS CODE
§	A, A-S, AA, AA-S		0.02	H(WS)	A
Chlordane	GA	0.1		H(WS)	F
(57-74-9)	A, A-S, AA, AA-S, B, C, D		0.002	H(B)	K
	SA, SB, SC, I, SD		0.002	H(B)	K
Chloride	A, A-S, AA, AA-S	250,000		H(WS)	H
(Not Applicable)	GA	250,000		H(WS)	F

TABLE 1 (continued)

NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES

Date of Revision: November 1991

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	BASIS CODE
Chlorine, Total Residual (Not Applicable)	A, A-S, AA, AA-S, B, C	5		A	N
	D	19		A	Q
	SA, SB, SC, I	7.5		A	N
	SD	13		A	Q

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	BASIS CODE
§ Chlorinated dibenzo-p-dioxins and Chlorinated dibenzofurans (Not Applicable)	A, A-S, AA, AA-S		*	H(WS)	
	GA	0.000035♦	*	H(WS)	
	A, A-S, AA, AA-S, B, C	0.000001♣		H(B)	K
	D	0.000001♣		H(B)	K

Remarks: * Guidance value for the total of the chlorinated dibenzo-p-dioxins and chlorinated dibenzofurans that are listed in the table below is 0.0000002 ug/L equivalents of 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD). The 2,3,7,8-TCDD equivalent for a congener is obtained by multiplying the concentration of that congener by its toxicity equivalence factor (TEF) from the table below. The guidance value for Class GA waters does not include the congener 2,3,7,8-TCDD.

The Basis Code for the guidance value for 2,3,7,8-TCDD is A; for all other congeners it is Basis Code A,E.

♦ Applies only to 2,3,7,8-TCDD. The Basis Code for the standard is F.

♣ Applies only to 2,3,7,8-TCDD.

Human Health Toxicity Equivalence Factors (TEFs) for Individual Congeners

CONGENER	TEF
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1
Other tetrachlorodibenzo-p-dioxins	0.01
2,3,7,8-Pentachlorodibenzo-p-dioxin	0.5
Other pentachlorodibenzo-p-dioxins	0.005
2,3,7,8-Hexachlorodibenzo-p-dioxins	0.05
Other hexachlorodibenzo-p-dioxins	0.0005
2,3,7,8-Heptachlorodibenzo-p-dioxin	0.005
Other heptachlorodibenzo-p-dioxins	0.00005
Octachlorodibenzo-p-dioxin	0.005
2,3,7,8-Tetrachlorodibenzofuran	0.1
Other tetrachlorodibenzofurans	0.001
2,3,4,7,8-Pentachlorodibenzofuran	0.5
1,2,3,7,8-Pentachlorodibenzofuran	0.05
Other pentachlorodibenzofurans	0.005
2,3,7,8-Hexachlorodibenzofurans	0.1
Other hexachlorodibenzofurans	0.001
2,3,7,8-Heptachlorodibenzofurans	0.005
Other heptachlorodibenzofurans	0.00005
Octachlorodibenzofuran	0.005

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	BASIS CODE
§ Chlorobenzene (108-90-7)	A, A-S, AA, AA-S	20		H(WS)	D
	GA	5		H(WS)	J
	A, A-S, AA, AA-S, B, C	5		A	N
	D	50		A	R
	SA, SB, SC, I		5	A	N
	SD		50	A	R

Appendix F

Gradient Corporation

Becker Phase I Usability Report

January 1992

Gradient Corporation

January 29, 1992

Mr. Errol Kitt
Metcalf & Eddy, Inc.
303 South Broadway
Suite 318N
Tarrytown, NY 10591

Re: Becker RI Phase I Data Usability Report

Dear Errol:

Gradient Corporation has completed a review of the laboratory data associated with the Becker Remedial Investigation (RI). The analyses were performed by Pace, Inc. Data validation was initially performed by Nytest Environmental, Inc. (Nytest), with subsequent validation performed by Gradient. This report serves as a critique of the analyses performed and assesses data usability. A compilation of the resultant data, with appropriate qualifiers, is provided in the attached tables. The analytical program was complex due to various problems encountered by the laboratory. Therefore, I begin this report with a chronology of the project in order to provide a clear understanding of which data is being assessed.

Chronology

During the period of time from November 7, 1991 to December 27, 1991, a field sampling program was conducted by Metcalf & Eddy (M&E) in support of a Phase I RI/FS for the Becker Electronics site in Durham, New York. Sample analysis was subsequently performed by Pace Laboratories in Wappinger Falls, New York, and the data validated by Nytest Environmental in Port Washington, New York. A total of 158 samples were collected and analyzed, consisting of potable waters, groundwaters, surface waters, surface soils and sediments, soil borings, sludges, and associated QA samples. Gradient was contracted by M&E in March 1991 to assess data usability. Gradient received the data validation results from Nytest (via M&E) on March 27, 1991.

Gradient's initial usability report, dated April 2, 1991, indicated that Pace's work had serious deficiencies, thus jeopardizing the success of the investigation. A meeting was convened on April 4, 1991 with M&E, Gradient, Nytest, and Pace to understand the scope of the deficiencies and discuss the implications. It was determined that a resampling effort would be required on a sizable subset of the original samples. It addition, it was decided that the metals data package lacked enough information to ascertain data quality. Therefore, Pace was instructed to resubmit all metals data and any potentially acceptable organic data in proper NYSDEC ASP format. The resampling was conducted by Metcalf & Eddy, with the assistance of Pace, from April 24, 1991 to May 8, 1991. All samples were submitted to Pace for analysis. During the resampling program, Gradient audited Pace's laboratory (April 30, 1991) to determine Pace's capabilities to perform NYSDEC ASP analyses properly. This visit resulted in extensive discussions with Pace regarding resystematizing their operations for ASP work. Gradient revisited Pace on May 20, 1991 to review their progress in restructuring their laboratory and found numerous improvements in their operation. Test results for the resampling program were received at Gradient during May and June. In addition, revised data reports for the original metal testing were received by Gradient in June. Gradient examined the data reports for completeness and submitted a series of requests to Pace for additional information. Gradient was in final receipt of all information by August and completed data validation for the resampling by September 1991. Gradient also reperformed data validation on the original set of data, which was completed in October 1991.

Synopsis

Data usability was based upon an evaluation of the representativeness, precision, and accuracy of a sample or analyte following a review of laboratory quality control (QC) samples, matrix QC samples, field and laboratory blanks, holding times, and calibrations as delineated in the data validation reports. The following briefly describes the major non-compliant laboratory practices that occurred throughout this program.

With regard to the metals data, the ICP was not calibrated in compliance with NYSDEC ASP (9/89) protocols which requires daily calibration of all instruments (9/89, vol. 8, E-104). The laboratory performed a daily update of a previously determined calibration curve. This impropriety adds uncertainty to the ICP quantitations. ICP data showed consistent, unexplained, significantly long time lags between QC samples. One can infer that the ICP analyst was running QC standards repetitively until they met control limits and then printed the data. This is a major abuse of standard NYSDEC ASP operating procedures and again adds uncertainty to the ICP analyte quantitations. All internal calibrations met criteria for % recovery; however, there is still uncertainty in the internal calibrations based on these non-compliant practices.

Quarterly verification of Instrument Detection Limits (IDLs) and Linear Ranges were not performed within the quarter corresponding to the lab analyses. NYSDEC ASP specifically requires that the laboratory "shall perform and report quarterly verification of instrument detection limits and linear range by methods specified in Exhibit E for each instrument used under this protocol," and "Quarterly Verification of instrument parameters forms for the current quarter shall be submitted <u>in each Sample Delivery Group data package.</u>" (9/89, vol. 1, B-76). This impropriety adds additional uncertainty to the ICP data reported.

Analyses of the interference check samples (ICSA and ICSAB) consistently showed significant levels of analytes that should not be in the interference solutions. The discrepancies imply that the Interelement Correction Factors (IECs) and/or the background correction factors for the ICP instrument were not properly determined. Analyses of the CRDL solution consistently showed poor recoveries for a majority of the ICA analytes (at > 120% or < 80%) including antimony, beryllium, cadmium, chromium, copper, manganese, nickel, silver, vanadium, and zinc.

The laboratory performed a matrix spike duplicate (MSD) rather than a matrix duplicate (MD) for this program. For metals, performance of an MS/MSD pair instead of a sample/MD pair is non-compliant. Interpretation of usability based on the precision criteria of Relative Percent Difference (RPD) compared to the CRDL cannot be applied to MS/MSD as it is normally applied to sample/MD data (Reference EPA Region II Functional Guidelines for Evaluation of Metals Data for the Contract Laboratory Program Form VI Lab Duplicates review and NYSDEC ASP 9/89, vol.8, E-114,115). Since the samples are both spiked, the quality control criteria for RPD is more easily met and therefore this is not an acceptable evaluation of matrix effects on duplicate precision. For this reason, the MS/MSD pairs could not be used to evaluate precision as an indicator of data usability.

The cumulative effect of the non-compliance issues lead to the technical decision to qualify all analyses performed by inductively coupled plasma spectroscopy (ICP) as estimated. ICP analytes are aluminum, antimony, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, magnesium, manganese, nickel, potassium, silver, sodium, vanadium, and zinc. In terms of data usability, these ICP results are usable but non-compliant: caution is advised in cases where the analyte concentration is near the NYSDEC guidance criteria. In those cases, it cannot be determined whether the value reported actually exceeds or is less than the NYSDEC criteria due to the uncertainty in the quantitation protocols. All antimony and silver values are unusable based on conflicting effects of consistently poor recoveries (< 50%) on analyte quantitation in both the Contract Required Detection Limit (CRDL) solution and the matrix spikes, and false positive readings in the interference check solutions (ICSA, ICSAB). Poor matrix spike recoveries and other discrepancies found in the evaluation of the lead analyses make a significant proportion of lead data unusable. For the most part, mercury, arsenic, selenium, and thallium analyses gave usable, though estimated, results. Other metal analyses were rejected based on severe quality deficiencies outlined in the data validation reports or technical assessment of usability in cases where cumulative effects of QC deficiencies were observed. Individual analyte treatments in these cases are discussed in further detail in the individual review of each sampling event and are indicated as unusable data.

A total of 107 samples were analyzed for metals, inclusive of field blanks, and duplicates. A summary of the usability is listed in Table A.

The Becker Electronics Site QAPP defined criteria of 100% completeness as a goal for this program. A more technically prudent approach would be 90% - 95% completeness since effects other than laboratory or field discrepancies can cause data to be unusable (e.g. matrix effects). For this project 16 of 23 metals met the 95% completeness level and 13 of 23 met the 95% completeness level. At a minimum we recommend that all analytes with less than 90% completeness be considered for resampling as part of a Phase II RI field program.

The situation with the organics data (semivolatiles, volatiles, and pesticides) is more positive than for the metals. A compilation of acceptable data gleaned from the November-December, 1990 and May 1991 analytical programs provides for a rather comprehensive set of usable data. The only group of samples which experienced serious QC deficiencies were the volatile organic analyses for drinking water per EPA Method 524.2. Holding times were met for nearly all other samples, and GC/MS tuning criteria was strictly adhered to. Various minor initial and continuing calibration problems were noted. In almost all cases this affected compounds which were not detected in the samples of concern; therefore, only the detection limits for detected compounds had to be qualified. A few instances were noted where internal standard problems existed. These circumstances were usually explained as matrix effects. Most surrogate and matrix spike recoveries were acceptable. For some of the Sample Delivery Groups no matrix spike blanks were analyzed. Fortunately for the samples without matrix spike blanks the surrogate and matrix spike recoveries were good, therefore the lack of a matrix spike blank was not considered a critical defect.

Data Usability

Metals

1) Groundwater (Table 4)

Groundwater sampling comprised seven field samples at locations MW-2 through MS-6, one field duplicate sample, and four field equipment blanks. These were sampled from 11/12/90 through 12/27/90 and were therefore grouped into three Sample Delivery Groups (SDGs), each with its own associated laboratory QC. Table 4 lists the validated data for metals as compared to groundwater (NYSDEC) and drinking water (NYSDOH) standards.

For mercury, all holding times were met and all laboratory and matrix specific QC was in control. All mercury data are usable.

For the furnace metals, (arsenic, lead, selenium, and thallium) all laboratory specific QC met criteria and all these data are usable with the following exceptions. The matrix spike (MS) recovery for lead associated with sample MW-5 and MW-5-EQB was significantly outside the criteria such that these lead data are unusable. The MS recovery for lead associated with samples MW-2S, MW-4, MW-6 and MW-6 Dup were outside criteria but not significantly enough to reject the data. Lead values in these samples are usable, however the data must be considered estimated. This is of particular significance in sample MW-4 as the lead found (25.6 μg/l) is slightly above the NYSDEC groundwater standard value 25 μg/l) and the quantitation uncertainty is conservatively estimated at 25%.

For the ICP analytes, all antimony and silver data are unusable due to poor % recoveries of the CRDL check solution and the matrix spike samples. Aluminum data for samples MW-2 and MW-2-EQB sampled 11/12/90 are unusable due to very poor % recovery on the MS. Additionally for these samples, false positives as evidenced in the interference check solutions (ICSA) may have contributed to the quantitated value for beryllium, manganese and zinc. These analytes may be biased high: at a minimum, the uncertainty would be equal to the level of the CRDL for that analyte. Therefore, for beryllium the uncertainly would be 2 μg/l, for manganese it is 15 μg/l, and for zinc 20 μg/l.

Sodium showed low recovery in the laboratory control sample (LCS) associated with samples MW-2 (12/04/90), MW-2S, MW-4, MW-5, MW-6, and MW-6 DUP. The sodium values are all usable but should be considered as biased low by $\leq$ 20%, which is the LCS criteria.

Several iron datum were rejected due to poor MS% recovery of associated matrix QC samples. Iron values for MW-3 and MW-3-EQB are therefore unusable. As delineated below, all iron data are unusable for cumulative effects of various QA/QC checks not meeting criteria.

Table A. Summary of Metals Data Usability
Becker Electronics Site

Analyte	Total # Usable Data	Total # Unusable Data	% Usable
Aluminum	76	31	71
Antimony	0	107	0
Arsenic	98	9	92
Barium	106	1	99
Beryllium	106	1	99
Cadmium	106	1	99
Calcium	96	11	90
Chromium	106	1	99
Cobalt	106	1	99
Copper	105	2	98
Iron	88	19	82
Lead	56	51	52
Magnesium	101	6	94
Manganese	95	12	89
Mercury	104	3	97
Nickel	106	1	99
Potassium	106	1	99
Selenium	106	1	99
Silver	0	107	0
Sodium	106	1	99
Thallium	106	1	99
Vanadium	106	1	99
Zinc	87	20	81

Field duplicate precision for most analytes did not fall within the NYSDEC ASP (9/89) criteria. However, all but calcium and zinc met the more lenient criteria as stated in the Functional Guidelines for Data Validation, USEPA Region II. Calcium data are usable, but should be viewed as estimated due to poor precision. Zinc is discussed further below.

ICP serial dilution results indicate a matrix suppression of calcium, iron, manganese and zinc in several of the groundwater samples. Therefore, the reported results may be minimum values (biased low). Due to the conflicting effects of the ICP serial dilution and the field blank contamination for iron and zinc, the interference check for zinc, as well as the poor field duplicate precision for these analytes (iron = 38.7% RPD and zinc = 41.5% RPD) it is recommended that these wells be resampled and reanalyzed for iron and zinc. The reported data are unusable.

In summary, all antimony and arsenic data are unusable. All iron and zinc data are unusable. Aluminum values for MW-2 and MW-2-EQB are unusable. Data for lead are unusable in samples MW-5 and MW-5-EQB. All other data are usable but estimated values.

2) Fire Pond Water (Table 9)

Fire Pond Water Sampling comprised six samples at locations FP-1-SW through FP-3-SW and FP-1-BW through FP-3-BW, two field duplicates and two equipment blanks. All samples were obtained on 11/14/90 and comprised a single SDG. Table 9 lists the validated data compared to the NYSDEC Class C surface water standards.

All antimony and silver are unusable due to cumulative effects of major analytical discrepancies outlined in the general discussion and the data validation reports. All aluminum data are unusable due to very poor matrix spike recovery (<30%). It should be noted that all of the aluminum values exceeded the NYSDEC Class C Surface Water Standard even though the data are biased very low given the poor MS recovery.

Due to field blank contamination evident for lead and zinc in both equipment blanks associated with these samples, a majority of the lead and zinc data are unusable. For lead, the following samples are unusable: FP-1-SW, FP-2-SW, FP-2-SW-DUP, FP-2-BW-DUP, FP-3-SW, and FP-3-BW. The two higher concentration samples, FP-1-BW and FP-2-BW contained levels of lead > five times the level found in the field blank and are therefore usable, though estimated, data. For zinc, samples FP-2-BW, FP-2-BW-DUP, and FP-3-BW are unusable. Additionally, the following samples are unusable due to the cumulative effects of high field blank contamination (though it was slightly below the CRDL and therefore not rejected during the validation of the data) and false positives found in the ICP interference check standard analyses. These factors contribute a significant positive bias to the zinc data that renders them unusable: FP-1-SW, FP-2-SW, FP-2-SW-DUP, FP-3-SW. Sample FP-1-BW is usable for zinc as it contained a high level of zinc that would not be significantly affected by the contamination.

All mercury data are usable. All furnace data, except for lead as delineated above (samples FP-1-SW through FP-3-SW and FP-2-BW-DUP, FP-3-BW), are usable. All antimony and silver data are unusable. Zinc data are usable except for samples FP-1-SW through FP-3-SW. All remaining ICP

analytes are usable with the caution that they must all be considered estimated values due to the cumulative effects of non-compliant laboratory practices previously outlined.

3) Fire Pond Sediment (Table 13)

Fire Pond Sediment Sampling comprised three sediment samples at locations FP-1-SD through FP-3-SD, one field duplicate and one equipment blank. All samples were obtained on 11/14/90 and comprised a single SDG. Table 13 lists the validated data for metals as compared to the NYSDEC sediment criteria and tolerance levels.

All antimony and silver data are unusable due to cumulative effects of major analytical discrepancies outlined in the general discussion and the data validation reports including low matrix spike recoveries, extremely variable CRDL recoveries (Sb ranged from -9.2% to 148% and Ag ranged from -95.0% to 1255%) and false positives in the interference check solution on ICP.

All arsenic data are unusable for these sediment samples due to very high matrix spike recovery (> 125%) which indicates either a matrix enhancement effect for arsenic or a laboratory contamination.

The equipment blank was contaminated for aluminum, iron and zinc at levels exceeding the CRDL. These did not affect usability of associated data for the following reasons. Aluminum, iron and zinc levels in the associated sediment samples were all > five times the levels found in the equipment blank and therefore would not significantly bias the results. All sediment aluminum, iron, and zinc data are therefore usable. However, aluminum was rejected in the equipment blank sample due to very poor recovery of the associated matrix spike sample. The aluminum value is therefore unusable for sample FP-EQB-SD.

Note for iron that the field duplicate precision was 45% RPD. This indicates a sample heterogeneity that will add to the uncertainty of the quantitation that has already been flagged as estimated during validation.

All mercury data are usable. All furnace data (lead, selenium, thallium) except for arsenic as delineated above, are usable. All remaining ICP analytes, except for antimony and silver and the single aluminum value for FP-EQB, are usable with the caution that they must all be considered estimated values due to the cumulative effects of non-compliant laboratory practices outlined in the general discussion.

4) Drainage Ditch Water (Table 17)

Drainage Ditch water sampling consisted of nine field samples collected at locations DD-1-SW through DD-9-SW and two field duplicates. No field equipment blank was listed as associated with these samples, therefore field contamination could not be assessed. Samples were collected on 11/13/90, 11/15/90 and 11/16/90 and comprised two Sample Delivery Groups (SDGs). Table 17 lists the validated data for metals as compared to the NYSDEC Class C surface water standards and guidance values.

All antimony and silver are unusable due to cumulative effects of major analytical discrepancies outlined in the general discussion and the data validation reports including low matrix spike recoveries, extremely variable CRDL recoveries outside criteria (Sb ranged from 2.5% to 128% and Ag ranged from -5.0% to 140%) and false positives in the interference check solutions analyzed on ICP.

The matrix spike associated with the preparation and analysis of samples DD-4-SW and DD-9-SW for aluminum showed very low recovery (< 30%); therefore, these aluminum data are unusable. Lead recovered poorly in the matrix spike (<74%) but not poorly enough to render the data unusable. These lead data are biased low. Lead precision for the field duplicate pair DD-6-SW and DD-6-SW-DUP is very poor (180% RPD) and therefore these data points are unusable. This poor precision cannot be extrapolated to the entire data set as precision for the other duplicate pair, DD-8-SW and DD-8-SW-DUP, was compliant.

The laboratory failed to prepare a preparation blank (PB) for mercury at the required frequency. Additionally, though only one PB was prepared, two were analyzed. This creates uncertainty as to which PB was actually analyzed and which PB is truly associated with these data. Therefore, the possibility of laboratory contamination cannot be adequately disproved and the positive mercury value must be considered unusable (sample location DD-9-SW). All other mercury data, as undetected, are usable.

Poor duplicate precision was observed for zinc. Samples DD-8-SW and DD-8-SW-DUP are unusable for zinc due to poor field duplicate precision (65%). The other zinc data are usable.

All furnace analytes (arsenic, lead, selenium, and thallium), except lead for samples DD-6-SW and DD-6-SW-DUP, are usable. All remaining ICP analytes, except antimony and silver on all samples and aluminum for DD-4-SW and DD-9-SW, are usable with the caution that they must all be considered estimated values due to the cumulative effects of non-compliant laboratory practices outlined in the general discussion.

5) Drainage Ditch Sediment (Table 21)

Drainage Ditch sediment sampling consisted of nine field samples collected at locations DD-1-SD through DD-9-SD, two field duplicates and one equipment blank. Samples were collected on 11/13/90, 11/15/90 and 11/16/90 and comprised two Sample Delivery Groups (SDGs). Table 21 lists the validated data for metals as compared to the NYSDEC sediment criteria.

All antimony and silver are unusable due to cumulative effects of major analytical discrepancies outlined in the general discussion and the data validation reports including low matrix spike recoveries, extremely variable CRDL recoveries outside criteria (Sb ranged from 2.5% to 128% and Ag ranged from -5.0% to 140%) and false positives in the interference check solutions analyzed on ICP.

A majority of the lead and manganese data associated with these sediments was rejected due to poor matrix spike recoveries (-87.3% for lead and 236% for manganese). The remaining two data points (sample locations DD-4-SD and DD-9-SD) for both lead and manganese cannot be considered representative of the drainage ditch sediments as the average of the two values for each analyte is significantly different than the average of the majority of the data being rejected. (Average of rejected lead values is 32.5 mg/Kg whereas average of the two remaining values is 83.6 mg/Kg; average of rejected manganese values is 803 mg/Kg and average of the two remaining values is 480 mg/Kg.) Additionally, these remaining values for lead and manganese are uncertain due to poor matrix spike recoveries (flagged as estimated in the validation report). Given this cumulative evidence, all lead and manganese data must be considered unusable for these sediments.

The matrix spike recovery for arsenic for samples DD-1-SD, DD-2-SD, DD-3-SD, DD-5-SD, DD-6-SD, DD-6-SD-DUP, DD-7-SD, and DD-8-SD was low (< 74%); therefore, these data must be considered as biased low. Though the data are usable, it is recommended that resampling and reanalysis be performed to accurately quantitate the arsenic in these sediments because the estimated values cluster around the sediment criteria value of 5 mg/Kg. The remaining furnace analytes, selenium and thallium, are all usable.

The equipment blank (DD-SD-EQB) was contaminated for zinc at a level exceeding the CRDL. This did not affect the usability of associated sediment data since the analyte levels found in the samples were all > five times the levels found in the equipment blank and therefore would not significantly bias the results.

All mercury data are usable. All furnace data (arsenic, selenium, thallium), with the exception of lead, are usable. All remaining ICP analytes, except antimony, manganese, and silver, are usable with the caution that they must all be considered estimated values due to the cumulative effects of non-compliant laboratory practices outlined in the general discussion.

6) Catskill and Thorp Creeks Water (Table 25)

Catskill and Thorp Creeks water sampling consisted of four field samples collected at locations TC-1-SW, TC-2-SW and CC-1-SW, CC-2-SW, one field duplicate and one equipment blank. Samples were collected on 11/19/90 and comprised one Sample Delivery Group (SDG). Table 25 lists the validated data for metals as compared to the NYSDEC Class C surface water standards and guidance values.

All antimony and silver are unusable due to cumulative effects of major analytical discrepancies outlined in the general discussion and the data validation reports including extremely variable CRDL recoveries outside criteria (Sb ranged from 2.5% to 128% and Ag ranged from -5.0% to 140%) and false positives in the interference check solutions analyzed on ICP.

The equipment blank associated with this SDG (CC-EQB) was contaminated for aluminum, calcium, iron, manganese and silver at a levels exceeding the CRDLs. (CC-EQB data appears on Table 29 associated with the sediment samples from these creeks.) This contamination renders all positive values for these analytes unusable at levels between the instrument detection limit (IDL) and five times the field blank contamination value. Therefore, all iron data are unusable and all aluminum, calcium, and manganese data, with the exception of sample TC-2-SW, are unusable. This leaves only a single value (TC-2-SW) for aluminum, calcium and manganese for this set of data. Due to the uncertainty of the representativeness of this single value for all the creek waters, and the fact that the sample TC-2-SW was not detected though the field duplicate was high for all these analytes, this sample cannot be used as a valid result.

The furnace analytes, arsenic, lead, selenium and thallium, are usable. All mercury data are usable. All remaining ICP analytes, except aluminum, antimony, calcium, iron, manganese, and silver, are usable with the caution that they must all be considered estimated values due to the cumulative effects of non-compliant laboratory practices outlined in the general discussion.

7) Catskill and Thorp Creeks Sediments (Table 29)

Catskill and Thorp Creeks sediment sampling consisted of four field samples collected at locations TC-1-SD, TC-2-SD and CC-1-SD, CC-2-SD, one field duplicate and one equipment blank. Samples were collected on 11/19/90 and comprised one Sample Delivery Group (SDG). Table 29 lists the validated data for metals as compared to the NYSDEC sediment criteria.

All antimony and silver are unusable due to cumulative effects of major analytical discrepancies outlined in the general discussion and the data validation reports including low matrix spike recoveries, extremely variable CRDL recoveries outside criteria (Sb ranged from 2.5% to 128% and Ag ranged from -5.0% to 140%) and false positives in the interference check solutions analyzed on ICP.

All the lead data associated with these sediment samples are unusable due to the cumulative effects of quality control issues summarized as follows. The matrix spike associated with this SDG had <10% recovery. In fact, the lead recovered at -82.3%. Though NYSDEC ASP allows for analyte recoveries outside criteria if the analyte concentration in the sample is > 4 times the spike value (9/89, vol. 8, E-111), the lead value was only 4.1 times the spike value. Under these circumstances, one would expect only a slight deviation from the % recovery criteria. Such poor spike recovery indicates a severe matrix and/or laboratory problem in the lead quantitation. Incorrect laboratory protocol was employed in failing to use the lowest dilution possible to quantitate for lead in all these sediment samples. This discrepancy adds further uncertainty to the data. Additionally, the field duplicates showed very poor precision for lead; the relative percent difference (RPD) between the duplicates was 33.5%. This exceeds the NYSDEC ASP criteria for duplicate precision of 20%. Resampling is recommended as the rejected data indicate the presence of lead at levels near the NYSDEC sediments. The remaining furnace analytes, arsenic, selenium and thallium, are all usable.

The equipment blank (CC-EQB) was contaminated for aluminum, calcium, iron, manganese and silver at a levels exceeding the CRDLs. This did not affect the usability of associated sediment data for aluminum, iron, and manganese since the analyte levels found in the samples were all > five times the levels found in the equipment blank and therefore would not significantly bias the results. Calcium data are unusable due to this field contamination. Silver data were rejected for cumulative analytical discrepancies as previously indicated.

All mercury data are usable. All furnace data (arsenic, selenium, thallium), except for lead, are usable. All remaining ICP analytes, except for antimony, calcium, and silver, are usable with the caution that they must all be considered estimated values due to the cumulative effects of non-compliant laboratory practices outlined in the general discussion.

8) Surface Soil (Table 33)

Surface Soil sampling consisted of 19 field samples collected at locations SS-1 through SS-19, one field duplicate and one equipment blank. Samples were collected on 11/12/90 and 11/13/90 and comprised two Sample Delivery Groups (SDGs). Table 33 lists the validated data for metals as compared to the NYSDEC soil cleanup criteria.

All antimony and silver are unusable due to cumulative effects of major analytical discrepancies outlined in the general discussion and the data validation reports including low matrix spike recoveries, extremely variable CRDL recoveries outside criteria (Sb ranged from -9.2% to 104% and Ag ranged from -5.0% to 1255%) and false positives in the interference check solution on ICP.

All the lead data associated with the surface soil samples are unusable due to the cumulative effects of quality control issues summarized as follows. The matrix spike (MS) associated with SDG #1, which included samples SS-1, SS-2, SS-15, SS-16 and SS-18, had < 10% recovery. Such poor spike recovery indicates a severe matrix and/or laboratory problem in the lead quantitation. Incorrect laboratory protocol was employed in failing to use the lowest dilution possible to quantitate for lead values that were over-range on the furnace AA instrument. This discrepancy adds further uncertainty to the data for the samples affected (SS-8, SS-9, SS-11, SS-12, SS-13, SS-17). Additionally, the field duplicates showed very poor precision for lead; the relative percent difference (RPD) between the duplicates was 137%. This fact places a significant uncertainty of at least 100% on the precision of these lead data. Since 55% of the rejected data exceed the upper limit of the NYSDEC soil cleanup criteria, and 100% exceed the lower limit, there is significant reason to require resampling of the surface soils to obtain valid lead results.

The remaining furnace analytes, arsenic, selenium and thallium, are all usable with the caution that the arsenic data is estimated low as indicated by poor matrix spike recovery of arsenic (<75%). This poor recovery was not severe enough to render the data unusable.

The equipment blank (SS-EQB) was contaminated for zinc at a level exceeding the CRDL. This did not affect usability of associated data since the levels of zinc found in the samples were all > five times the level found in the equipment blank and therefore would not significantly bias the results. The aluminum value in the equipment blank is unusable due to poor MS recovery; however, this does not affect the usability of the soil aluminum data.

It should be noted that sample SS-3 contained lower % solids than any other sample associated with this set. The 43.8% solids determined for this sample has a major effect upon the dry weight quantitations of the analytes reported and may be part of the reason that this sample contained the highest levels of barium, cadmium, calcium, chromium, cobalt, lead and manganese.

All mercury data are usable. With the exception of lead, all furnace data (arsenic, selenium, thallium) are usable. All remaining ICP analytes, except for antimony and silver, are usable with the caution that they must all be considered estimated values due to the cumulative effects of non-compliant laboratory practices outlined in the general discussion.

9) Soil Boring (Table 37)

Soil Boring sampling comprised four soil samples at locations BL-1 through BL-4, one field duplicate and two equipment blanks. Samples were collected on 11/14/90, 11/15/90, 12/03/90 and 12/05/90 and therefore comprised two Sample Delivery Groups (SDGs). Table 37 lists the validated data for metals as compared to the NYSDEC soil cleanup criteria.

All antimony and silver data are unusable due to cumulative effects of major analytical discrepancies outlined in the general discussion and the data validation reports including low matrix spike (MS) recoveries, extremely variable CRDL recoveries (Sb ranged from -9.2% to 165% and Ag ranged from -95.0% to 1255%) and false positives in the interference check solutions analyzed by ICP.

Arsenic data are unusable for the soil samples BL-2, BL-3, BL-4 and BL-2-DUP due to very high matrix spike (MS) recovery (>125%) which indicates either a matrix enhancement effect for arsenic or a laboratory contamination. Conversely, low arsenic spike recoveries were observed for the MS associated with sample BL-1 which was part of a separate SDG. This arsenic value is usable with caution that it is biased low.

The equipment blank collected 11/15/90 (BL-EQB) was contaminated for iron and zinc at levels exceeding the CRDLs. The zinc value for sample BL-2-DUP is < five times the equipment blank contamination and therefore is unusable. All other zinc data and all iron data for the soil borings are usable since the concentrations found in the associated samples were all > five times the levels found in the equipment blank and therefore would not significantly bias the results. The equipment blank collected 12/05/90 (BL-1-EQB) was not contaminated.

Two additional analytes showed poor matrix spike recovery associated with the equipment blank analyses in these SDGs. Aluminum in BL-EQB and lead in BL-1-EQB are unusable due to extremely low MS recoveries.

Magnesium data are usable but may be biased high at approximately 20% due to the interference check on ICP recovering outside criteria (ICSAB > 120% recovery). The laboratory control sample for sodium did not meet criteria and may be biased approximately 20% low due to low recovery in this check sample (LCS < 80% recovery).

All mercury data are usable. Selenium and thallium furnace data are usable. All arsenic data are unusable except for BL-1. Furnace lead data, excepting the single equipment blank value (BL-1-EQB), are all usable with the caution that they were improperly quantitated by the laboratory which will add to the uncertainty of the value. Laboratory protocols for the furnace method of standard additions used to quantitate for lead was non-compliant, but did not deviate significantly enough from NYSDEC ASP to cause the data to be unusable. **All antimony and silver data are unusable. All remaining ICP analytes, except for zinc in BL-2-DUP and aluminum in BL-EQB, are usable with the caution that they must all be considered estimated values due to the cumulative effects of non-compliant laboratory practices outlined in the general discussion.**

10) Septic Tank Water (Table 41)

Septic Tank Water was collected on 11/07/90 and 11/08/90, and consisted of two field samples and two equipment blanks. These data comprised a single SDG. Table 41 lists the validated data for metals as compared to the NYSDEC Class GA groundwater standards and guidance values.

Antimony and silver were significantly outside acceptable % recovery criteria in the contract required detection limit sample (CRDL) and showed false positives in the interference check QC sample for ICP. Therefore, these data are unusable.

The equipment blank (ST-3-SW-EQB) associated with the samples ST-3-SW had levels of aluminum, copper, iron, and zinc at > CRDLs. Values reported for these analytes in ST-3-SW must be considered unusable because of the concurrent level found in the EQB. In fact, iron is above NYSDEC Groundwater Standards in the equipment blank. The representativeness of the single values left as usable data to characterize the septic tank water for these analytes (aluminum, copper, iron, and zinc) is questionable.

In summary, antimony and silver data are unusable. All other data are usable with the exception of aluminum, copper, iron, and zinc for ST-3-SW. Caution must be exercised in using ICP data as though the data are technically usable they are non-compliant and therefore estimated values.

11) Septic Tank Sediment/Sludge (Table 45)

Samples were collected on 11/07/90, 11/08/90 and 12/05/90. Therefore, the three field samples and two equipment blanks comprised two Sample Delivery Groups (SDGs). Table 45 lists the validated data for metals as compared to NYSDEC soil cleanup criteria.

The sludge sample ST-3-SD was prepared using methodology normally employed for a water sample rather than a sediment/soil. The laboratory is required to prove that the sludge sample contained < 1% solids in order to choose the water preparation method (NYSDEC ASP 9/89, vol. 1, B-141). The % solids test was not performed. Therefore, ST-3-SD data reported are unusable for comparison to NYSDEC soil cleanup criteria because of the high probability that the incorrect preparation procedure for the matrix was employed. The water preparation procedure is not as vigorous as the sediment/soil procedure; therefore the data obtained would be significantly biased low.

All antimony and silver data are unusable due to excessively poor recoveries in the CRDL check standard.

Lead for ST-1-SD and ST-2-SD exceeds NYSDEC soil criteria and though the data are technically usable quantitated values must be considered estimated due to poor matrix spike recoveries and improper analytical protocols non-compliant with NYSDEC ASP (9/89).

In summary, all antimony and silver data are unusable. All data associated with sample ST-3-SD are unusable. All other data are usable, with the caveat that non-compliant laboratory protocols render the data estimated.

12) Septic Tank Test Pit Soil (Table 49)

Septic Tank Test Pit soil sampling consisted of three field samples collected at locations ST-1-TP through ST-3-TP, one field duplicate and two equipment blanks. Samples were collected on 11/07/90, 11/08/90 and 12/05/90 and therefore spanned two Sample Delivery Groups (SDGs). Table 49 lists the validated data for metals as compared to the NYSDEC soil cleanup criteria.

All antimony and silver are unusable due to cumulative effects of major analytical discrepancies outlined in the general discussion and the data validation reports including low matrix spike recoveries, extremely variable CRDL recoveries outside criteria (Sb ranged from -92% to 165% and Ag ranged from -5.0% to 1255%) and false positives in the interference check solutions analyzed on ICP.

Several sample analytes were rejected due to poor matrix spike recoveries. Aluminum in the equipment blank ST-3-TP-EQB, lead in equipment blank ST-2-TP-EQB, and lead in soil samples ST-3-TP and ST-3-TP-DUP are all unusable due to extremely low matrix spike recoveries in field samples from this set associated with these samples (<30% recoveries for the equipment blanks and <10% for the soil lead). Such poor spike recoveries indicate a severe matrix and/or laboratory problem in the quantitation of these sample analytes and indicates a problem with accuracy for these data.

The field duplicate pair showed very poor precision for copper and zinc with RPDs of 65% and 82% respectively. Reviewing the data for copper and zinc shows no homogeneity among the three field samples. Therefore, as no obvious representative values for these analytes can be interpreted from these three field samples; however, the duplicates are not rejected because doing so may bias the average quantitation of these analytes to be used during the risk assessment. It is noted, however, that these discrepancies are an indication of poor precision for copper and zinc for this set of data.

The equipment blank ST-2-TP-EQB showed no contamination. The equipment blank ST-3-TP-EQB was contaminated for iron and zinc at levels exceeding the CRDLs for these analytes. This did not affect the usability of associated soil sample ST-2-TP since the analyte levels found in the field samples were >

five times the levels found in the equipment blank and therefore would not significantly bias the results.

Sodium failed criteria in the laboratory control sample and therefore may be biased 20% low. However, the percent recovery was not sufficiently low to render the data unusable. Magnesium failed criteria in the interference check sample (ICSAB) associated with these data. Again, it was not sufficiently low to render the data unusable but data may be 20% high. Beryllium and cadmium were found as false positives in the ICS solutions and considering the high amount of iron (a major interfering element) in these samples, caution must be exercised in interpretation of these results as they may be biased high approximately the level of the CRDL. This would be a bias of 1 mg/Kg for beryllium and 1 mg/Kg for cadmium. **The data are usable with this caveat. All remaining ICP analytes, except antimony and silver, are usable with the caution that they must all be considered estimated values due to the cumulative effects of non-compliant laboratory practices outlined in the general discussion. The remaining furnace analytes, arsenic, lead, selenium and thallium, are all usable, except for lead in samples ST-3-TP, ST-3-TP-DUP, and ST-2-TP-EQB. All mercury data are usable.**

13) Discharge Pipe Sediment (Table 53)

Discharge Pipe sediment sampling consisted of one field sample collected at location PP-1. No equipment blank was collected at this site, therefore, field contamination cannot be evaluated. Precision cannot be evaluated either as no field duplicate sample was supplied. The sample was collected on 11/19/90 and was part of a single Sample Delivery Group (SDG). Table 53 lists the validated data for metals as compared to the NYSDEC soil cleanup criteria.

The antimony and silver data are unusable due to cumulative effects of major analytical discrepancies outlined in the general discussion and the data validation reports including low matrix spike recoveries, extremely variable CRDL recoveries outside criteria (Sb ranged from 2.5% to 128% and Ag ranged from -5.0% to 140%) and false positives in the interference check solutions analyzed on ICP.

The lead data is unusable due to the cumulative effects of quality control issues summarized as follows. The matrix spike associated with this SDG had < 10% recovery for lead. In fact, the lead recovered at -82.3%. Though NYSDEC ASP allows for analyte recoveries outside criteria if the analyte concentration in the sample is > 4 times the spike value (9/89, vol. 8, E-111), The lead value was only 4.1 times the spike value. Under these circumstances, one would expect only a slight deviation from the % recovery criteria. Such poor spike recovery indicates a severe matrix and/or laboratory problem in the lead quantitation. Additionally, incorrect laboratory protocol was employed in failing to use the lowest dilution possible to quantitate for lead in this sample. This discrepancy adds further uncertainty to the data.

The remaining furnace analytes, arsenic, selenium and thallium, are all usable.

The laboratory failed to perform a preparation blank (PB) for mercury at the required frequency under NYSDEC ASP (9/89). Additionally, the mercury analysis of the PBs did not match the number of PBs prepared for the batch of samples that included this pipe sediment. Given these discrepancies in the PB protocol, laboratory contamination cannot be adequately evaluated. Therefore, the mercury value is unusable for this sample.

All furnace analytes, except lead, are usable. The mercury result is unusable. All remaining ICP analytes, except antimony and silver, are usable with the caution that they must all be considered estimated values due to the cumulative effects of non-compliant laboratory practices outlined in the general discussion.

14) SPDES Permit Sampling (Table 55)

SPDES Permit sampling consisted of two field samples collected at locations SPDES and SPDES-2. No field duplicates or equipment blanks were associated with this sampling event. Samples were collected on 5/02/91 and 5/07/91 and comprised one Sample Delivery Group (SDG). Table 55 lists the validated data for metals as compared to the SPDES discharge limits.

These samples were analyzed for a subset of TAL metals including the ICP elements aluminum, barium, chromium, copper, iron, magnesium, manganese, nickel and zinc and the furnace AA element, lead. No field blank was collected with these samples and therefore field contamination cannot be assessed. No field duplicate was collected and therefore, precision cannot be evaluated. **All data are usable with the following cautions.** The laboratory performed a matrix spike (MS) and matrix spike duplicate (MSD) on another client's sample batched with these samples during preparation and analysis. Though extrapolation of the percent recoveries of these matrix spikes to this set of data is questionable, caution should be exercised in using the barium data as it may be biased very low (MS/MSD recoveries for barium were 53% and 6.3%, respectively). Since the laboratory control sample (LCS) met criteria for barium, and without direct matrix QC available for comparison, the barium data are usable.

Though all the ICP data are usable, they must all be considered estimated values due to the cumulative effects of non-compliant laboratory practices outlined in the general discussion.

Semivolatile Organics

1) Groundwater (Table 2)

The only semivolatile organic compounds detected in any of the groundwater samples were low levels of bis(2-ethylhexyl)phthalate (BEHP). Low levels of BEHP were also detected in some of the field blanks, thus the detection limit for BEHP has been raised due to possible contamination. The NYSDEC Class GA Groundwater Standards for BEHP is 50 ppb. Elevated detection limits for BEHP did not exceed this standard, except for MW2, which had a detection limit of 51 ppb. It should therefore be reasonably safe to assume that if BEHP exists in the groundwater, its levels are well below the NYSDEC groundwater standards.

With regard to sample preparation and analysis, all holding times and MS tuning criteria were met. There were some violations of initial and continuing calibration criteria; however, these exceedances were not significant. Since there were no analytes detected in any of the samples, these violations do not affect data quality. Surrogate recoveries were good. **All groundwater semivolatile organic data are usable.**

2) Fire Pond Water (Table 7)

The basic functional QC criteria for the semivolatile organic analyses were met. All holding times were adhered to and MS tuning criteria is acceptable. However, isolated calibration problems jeopardized data quality for certain analytes. Detection limits for 3,3'-dichlorobenzidine for samples FP-2-BW, -3-SW, -3-BW, -4-SW, and -EB-BW are estimated due to poor calibration. Calibration problems for 4-chloroaniline required estimated detection limits for FP1-BW, FP2-SW, and FP2-SW. Poor internal standard response for d_{12}-perylene and d_{12}-chrysene for sample FP-3-SW required estimating detection limits for any analytes quantitated using those internal standards. With regard to sample preparation, N-nitroso-di-n-propylamine and 2,4-dinitrotoluene were not detected in the method blank spike, and thus data for those two compounds are rejected for samples FP2-BW, FP3-SW, FP3-BW, FP4-SW, and FP-EB-BW. Lastly, the detection limit for bis(2-ethylhexyl)phthalate for FP1-BW, FP1-SW, and FP2-SW has been raised due to possible contamination. **Except for the instances mentioned above, all fire pond water semivolatile organic data are usable except for N-nitroso-di-n-propylamine and 2,4-dinitrotoluene for samples FP2-BW, FP3-SW, FP3-BW, FP4-SW, and FP-EB-BW.**

3) Fire Pond Sediment (Table 11)

The initial analysis of FP-1-SED was analyzed outside of the 12 hour time period. Reanalysis of the same sample was conducted outside of the 40 day analysis holding time. Data for FP1-SED can be used only as a preliminary indicator of the presence of contaminants, but cannot be used for formal risk assessment or litigation. The analytical QC criteria for FP2-SED, FP3-SED, FP4-SED were acceptable. All holding times are MS tuning criteria were met. Surrogate and matrix spike recoveries were acceptable. The calibration of hexachlorocyclopentadiene for sample FP-2-SED was above criteria resulting in an estimated detection limit. However, this compound was not detected in this sample; thus, the data is acceptable. With regard to the blanks, detection limits for BEHP, diethylphthalate, and di-n-butylphthalate have been raised due to possible contamination. **Semivolatile organic data for FP1-SED is not usable, while data for FP2-SED, FP3-SED, and FP4-SED are usable.**

It is interesting to note that all of the FP sediment samples contained numerous additional non-TCL compounds. Although most of these compounds were not characterized, many of the compounds that were identified were adipates (hexanedioic acid esters). Typically adipates are associated with plasticizer materials. Since phthalates, which are also plasticizer compounds, are also likely constituents in the FP sediments, it is probable these sediments were contaminated with plasticizers. Estimated concentrations for the adipates in these sediments are in the low ppm concentrations range; hence, future risk assessments may need to consider exposure to these compounds.

4) Drainage Ditch Water (Table 15)

Except for the 14 ppb of bis(2-ethylhexyl)phthalate in sample PD-2-SW, there no semivolatile organics detected in any of the drainage ditch water samples. All holding times and MS tuning criteria were met.

Calibration problems in sample DD-2-SW for 3-nitroaniline required raising the detection limit. For samples DD-3-SW, DD-3-SW MS and MSD, DD-5-SW, and DD-6-SW the response to all six internal standards were outside of criteria (high). Samples DD-5-SW and DD-6-SW were reanalyzed and the internal standard responses were still too high. This is likely due to a spiking error. Since no compounds were detected in any of these samples, this is not considered a serious problem. Surrogate spike and matrix spike results were good. **All drainage ditch water semivolatile organic data are usable.**

5) Drainage Ditch Sediment (Table 19)

Many of the drainage ditch sediments are characterized with significant amounts of BEHP (DD-2-SED, DD-5-SED, DD-8-SED, and DD-11-SED), which appears to be indigenous to the sediments. In addition, sample DD-6-SED contains almost all of the polynuclear aromatic hydrocarbons on the TCL, indicating petroleum as a possible contaminant.

With regard to QC, all holding times and MS tuning criteria were met. Some problems were noted with the internal standards. Sample DD-11-SED had a low internal standard response for d_4-1,2-dichlorobenzene. The reanalysis of the sample had low internal standards response for d_{12}-chrysene and d_{12}-perylene. The concentration of the compounds associated with these internal standards has been estimated. Sample DD-2-SED also had a low internal standard response for d_{12}-perylene. Minor infractions of the calibration criteria were noted for compounds associated with samples DD-2-SED and DD-11-SED, however this had no effect on the data. Detection limits for BEHP had to be raised for DD-3-SED, DD-6-SED, DD-7-SED, and DD-10-SED due to possible blank contamination. Surrogate and matrix spike recoveries were very good. **Although the concentration for a number of analytes has been estimated, all drainage ditch semivolatile organic data are usable.**

As was the case with the fire pond sediments, numerous additional non-TCL compounds were detected in most of the drainage ditch sediments. Although a majority of the compounds were unidentified, many were either hydrocarbons or alcohol condensation products (extraction artifacts). Particularly apparent was di-n-octyl adipate. In general, the high adipate levels were found with high BEHP concentrations. This suggests the sediments have been contaminated with plasticizers.

6) Catskill and Thorp Creeks Water (Table 23)

No semivolatile organic compounds were detected in any of the creek water samples. Most analytical QC requirements for these analyses were acceptable. All holding times and MS tuning criteria were met. Non-compliant calibrations for benzoic acid and 2,4-dinitrophenol were noted for CC-2-SW, and for 3,3'-dichlorobenzidine for CC-1-SW, thus requiring the detection limits for these compounds to be estimated. Surrogate and matrix spike recoveries were generally good; however, there was no recovery of N-nitroso-di-n-propylamine and 2,4-dinitrotoluene in the matrix spike blank. Therefore, data for these two compounds is rejected for samples TC-1-SW and CC-1-SW. **All Catskill and Thorp Creek water semivolatile organic data are usable except for N-nitroso-di-n-propyl amine and 2,4-dinitrotoluene in samples TC-1-SW and CC-1-SW.**

7) Catskill and Thorp Creek Sediment (Table 27)

No semivolatile organics were detected in any of the creek sediment samples. All holding times and MS tuning criteria were met. Non-compliant calibrations for benzoic acid and 2,4-dinitrophenol were noted for TC-1-SD and TC-2-SD, and for 3,3'-dichlorobenzidine for CC-1-SED, CC-2-SED, TC-2-SED, and TC-3-SED, thus requiring the detection limits for these compounds to be estimated. Although there were some inconsistences in the surrogate and matrix spike recoveries, they were generally acceptable. However, as with the creek water samples, there was no recovery of N-nitroso-di-n-propylamine and 2,4-dinitrotoluene in the matrix spike blank. Therefore, data for these two compounds is rejected for samples TC-2-SED, TC-3-SED, CC-1-SED, and CC-2-SED. No contaminants were noted in the blanks. **All Catskill and Thorp Creek sediment semivolatile organic data are usable except for N-nitroso-di-n-propylamine and 2,4,-dinitrotoluene in samples TC-2-SED, TC-3-SED, CC-1-SED, and CC-2-SED.**

8) Surface Soil (Table 31)

Phthalates, bis(2-ethylhexyl) and/or di-n-octyl, were detected in significant quantities in 13 of 19 surface soil samples. For 6 of the 13 samples, phthalate concentrations exceeded NYSDEC soil cleanup criteria. Two soil samples (SS-2 and SS-15) also contained a suite of polynuclear aromatic hydrocarbons which may be indicative of petroleum contamination. Phenol was detected in one soil sample (SS-2) and 1,4-dichlorobenzene was found in two soil samples (SS-4 and SS-5).

All holding times and MS tuning criteria was met. Problems of compliance with calibration and internal standard criteria affected most of the reported data. Due to low internal standard response, concentrations of compounds associated with the following internal standards had to be estimated (J values): compounds quantitated versus d_{12}-perylene for SS-9, SS-18, SS-3, SS-7, and SS-19; compounds quantitated versus d_{12}-perylene and d_{12}-chrysene for SS-17; and compounds quantitated versus d_{12}-perylene, d_{12}-perylene, d_{12}-chrysene, and d_{10}-phenanthrene for SS-13 and SS-14. Reanalysis of these samples produced data which closely paralleled the original results, thus indicating the data is usable. With regard to continuing calibration non-compliancy, bis(2-ethylhexyl)phthalate concentrations needed to be estimated for S-18, and the detection limit for 2,4-dinitrophenol needed to be estimated for SS-7, SS-8, and SS-10.

Surrogate and matrix spike recoveries for the semivolatile organics were good. Detection limits had to be raised slightly for bis(2-ethylhexyl)phthalate and di-n-butylphthalate for samples SS-7, SS-8, SS-10, and SS-13; and for bis(2-ethylhexyl)phthalate for SS-5 and SS-18.

Two sets of field duplicates were processed for the surface soils (SS-19/SS-19-DUP and SS-2/SS-23). The comparative results are provided in Table B. Two problems are apparent between SS-19 and SS-19-DUP. First, there is a probable misidentification of either phenanthrene in SS-19 or anthracene in SS-19-DUP. As these compounds are isomers, their mass spectra are nearly identical, and their retention times are separated by less than 0.1 minute. These are likely to be the same compound, which is phenanthrene. The other problem involves the discrepancy in quantities of the phthalates found. Comparison of field soil duplicates is always difficult because of heterogeneity problems. This may well be the case here, as indicated by discrepancy in the soil moisture content between SS-19 (36%) and SS-19-DUP (12%). The situation is even more acute when comparing samples SS-2 and SS-23. SS-23 appears to contain many more polynuclear aromatic hydrocarbons (PAHs) than SS-2, yet on closer examination almost all of the additional PAHs in SS-23 were detected at levels below the detection limits in SS-2. Upon examining Metcalf & Eddy's soil sampling techniques, it was determined that neither SS-19/SS-19-DUP nor SS-2/SS-23 were "true" duplicates, but instead were collocated samples. Data discrepancies of the type just mentioned are not surprising for collocated samples, thus no definitive information can be excised from these samples.

Although the concentration of most analytes has been estimated, all surface soil semivolatile organic data are usable.

The surface soil samples contained a wide range of tentatively identified compounds. Most compounds detected were unknowns, hydrocarbons or aldol condensation products (extraction artifacts); however, most of these compounds could not be sufficiently characterized. Di-n-octyl phthalate was found in many of the samples. In general, the high adipate levels were found with high bis(2-ethylhexyl)phthalate concentrations, which is typical of plasticizer contamination.

9) **Soil Borings (Table 35)**

Bis(2-ethylhexyl)phthalate was detected in four of the five soil boring samples and butylbenzylphthalate was found in one of the samples. No other semivolatile organic compounds were detected in the soil boring samples. All holding times and MS tuning criteria were met. Surrogate recoveries for 2-fluorobiphenyl were slightly high for BL-1, BL-2, and BL-5, and there were only minor exceedances associated with the matrix spike samples. Due to problems with the calibrations, the detection limits for 3,3'-dichlorobenzidine has been qualified for samples BL-1, BL-2 (2-4), BL-2 (4-6), and BL-5; and the quantitation of bis(2-ethylhexyl)phthalate has been estimated for BL-5 because the concentration recorded was above the calibration range. The value recorded for BL-2 (a duplicate of BL-5) for bis(2-ethylhexyl)phthalate should be considered the true concentration of the sample. Detections limits for bis(2-ethylhexyl)phthalate, diethylphthalate, and di-n-butylphthalate had to be raised for BL-4 due to possible blank contamination. **All soil boring semivolatile organic data are usable.**

Table B. Surface Soil Field Duplicates - Semivolatile Organics

Compound	SS-19 (μg/kg)	SS-19-DUP (μg/kg)
2-Methylnaphthalene	420J	440J
Phenanthrene	350J	--
Anthracene	--	280J
Bis(2-ethylhexyl)phthalate	9600J	4700J
Di-n-octyl phthalate	6900J	1200J
Butyl benzyl phthalate	260J	-- (380U)

Compound	SS-2 (μg/kg)	SS-23 (μg/kg)
Phenol	54J	-- (480U)
Benzoic acid	-- (2400U)	540J
Naphthalene	-- (500U)	75J
2-Methylnaphthalene	-- (500U)	230J
Acenaphthene	-- (500U)	330J
Dibenzofuran	-- (550U)	250J
Fluorene	-- (500U)	240J
Phenanthrene	100J	1500
Anthracene	-- (500U)	190J
Fluoranthene	140J	1100
Pyrene	100J	890
Benzo(a)anthracene	-- (500U)	420J
Chrysene	68J	490
Bis(2-ethylhexyl)phthalate	4600	5600
Di-n-octylphthalate	-- (500U)	46J
Benzo(b)fluoranthene	130J	830
Benzo(a)pyrene	63J	440J
Indeno(1,2,3-cd)pyrene	-- (500U)	370J
Benzo(g,h,i)perylene	-- (500U)	400J

The soil boring samples contained unknowns of similar chemical identities to those found in the fire pond sediment, drainage ditch sediment, and soil boring samples.

10) Septic Tank Water (Table 39)

No semivolatile organics were detected in any of the septic tank water samples. All holding times and MS tuning criteria were met. Surrogate, matrix spike, and blank spike results were good. Minor problems were noted with the initial calibration for ST-3-SW which are inconsequential. The detection limit for bis(2-ethylhexyl)phthalate had to be raised slightly for all samples due to possible blank contamination. **All septic tank water semivolatile organic data are usable.**

11) Septic Tank Sediment (Table 43)

Two of the three septic tank sediment samples (ST-1-SED and ST-3-SED) contained numerous polynuclear aromatic hydrocarbons. 1,4-Dichlorobenzene was also found in these same two samples. Bis(2-ethylhexyl)phthalate was found in high quantities in all three samples, di-n-butyl phthalate and di-n-octyl phthalate in two of the sediments, and butyl benzyl phthalate in ST-1-SED. Benzoic acid and 2-methylnaphthalene were detected in ST-2-SED.

All holding times and MS tuning criteria were met for these samples. There were serious problems with internal standard responses and calibration, which resulted in almost all of the quantitative data being qualified. **The septic tank sediment semivolatile organic data can only be used to ascertain the presence or absence of contaminants and to determine an "order-of-magnitude" concentration. This data can not be used when accurate and precise data is required or for litigation.**

12) Septic Tank Test Pit Soil (Table 47)

Polynuclear aromatic hydrocarbons and benzoic acid were detected in one of the three septic tank test pit soil samples. In addition, two of the three samples contained bis(2-ethylhexyl)phthalate, and one sample contained di-n-octyl phthalate. All holding times and MS tuning criteria were met. The internal standard responses for ST-1-SL were poor, and the reanalysis of the sample produced a poor comparison of results (in ppb) between the two analyses.

	ST-1-SL	ST-1-SL Reanalysis
Benzoic acid	-- (2200UJ)	310J
2-Methylnaphthalene	-- (460UJ)	25J
Di-n-butyl phthalate	50J	47J
Flouranthene	-- (460UJ)	120J
Pyrene	110J	-- (920UJ)
Bis(2-ethylhexyl)phthalate	11,000J	8,400J
Di-n-octyl phthalate	-- (460UJ)	610J
Benzo(b)fluoranthene	-- (460UJ)	140J

Minor calibration problems resulted in estimated detection limits for benzoic acid for ST-4-SL and estimated detection limits for 3,3'-dichlorobenzidine for ST-3-SL and ST-2-SL. Surrogate recoveries were slightly high for 2-fluorobiphenyl for all samples. **Due to internal standard problems and poor precision and accuracy results for the reanalysis, data for ST-1-SL are not usable. All other septic tank test pit soil semivolatile organic data are usable.**

13) Discharge Pipe Sediment (Table 51)

Benzoic acid, 2-methylnaphthalene, di-n-butylphthalate, and bis(2-ethylhexyl)phthalate were detected in the discharge pipe sediment sample. All spike, MS tuning, and holding time criteria were met. Minor internal standard criteria problems required qualifying the quantitation of benzoic acid, 2-methylnaphthalene, and bis (2-ethylhexyl)phthalate. The detection limits for benzoic acid and 2,4-dinitrophenol were estimated due to calibration problems. **The discharge pipe sediment semivolatile organic data are usable.**

Volatile Organics

1) Groundwater (Table 1)

All groundwater samples contained some chlorinated ethane and ethylene compounds in varying concentrations. Most QC results for the volatile organic analyses were acceptable. All holding times and MS tuning criteria were met. All surrogate and matrix spike recoveries were acceptable. Although there was low level contamination of methylene chloride and acetone in some of the blanks, only the methylene chloride detection limit for MW-5 required being raised slightly (28 vs. 25 ppb). Due to a low relative response factor for 2-butanone (< 0.05), the 2-butanone data for MW-3 is not usable. **All groundwater volatile organic data, with the exception of 2-butanone for MW-3, are usable.**

2) Private (Drinking) Water (Table 5)

Significant QC problems permeate all private water analyzed for volatile organics by EPA Method 524.2. All analyses were performed after 7 days of Verified Time of Sample Receipt (VTSR), but usually within 14 days of sampling. ASP requires that all volatile organic analyses be completed within 7 days and that the sample remain unpreserved. Method 524.2 allows a 14-day holding time from sampling if the samples are preserved with 1:1 hydrochloric acid. The sample containers were provided to Metcalf & Eddy with preservative. The ASP preservation and holding time requirements were not met and the data are non-compliant. The BFB tuning information was reviewed and found to be acceptable. The laboratory re-tuned the instrumentation every 8 hours as per Method 524.2 (versus 12 hours for ASP). However, the tune on 5/15/91 was performed after the samples were analyzed. The non-detect results of associated samples (PW-6-F and PW-6-L) were rejected due to possible mis-identification of target analytes. Review of the mass spectra of identified compounds confirmed their presence.

The volatile calibration information was reviewed and found to be non-compliant with both ASP and EPA Method 524.2. According to ASP, a five-level initial calibration must be completed for any volatile organics analyses. The laboratory narrative states that Method 524.2 allows a three-level calibration;

however, the three levels must be over a 20-fold range. Pace calibrated the instruments with 5, 10 and 20 μg/L standards, or with a range with a factor of 4. The narrative states that the initial calibrations were performed with 2, 5, and 20 μg/L standards, which is only a factor 10 range, but this statement is incorrect. ASP requires that the percent relative standard deviation be less than or equal to 35%, while Method 524.2 requires a % RSD of 20%. The initial calibration on 5/13/91 (instrument 400A) had a single compound with a % RSD greater than 35%, dichlorodifluoromethane (35.5% RSD). The initial calibration on 5/14/91 (instrument 400C) had three non-compliant compounds, including vinyl chloride (36.6% RSD) which is a calibration check compound and subject to a %RSD criteria of less than 25%. Two other compounds, dichlorodifluoromethane and chloromethane, were not detected at all due to improperly timed mass spectrometer scanning. The results for these two compounds have been rejected in all associated samples. The laboratory detected 1,1-dichloroethane above 20 μg/L in several samples and 1,1,1-trichloroethane in sample PW-11-F. Due to holding time problems, the laboratory did not reanalyze the samples at a dilution. They attempted to correct this problem by analyzing a 30 μg/L standard on 5/15/91 to demonstrate linearity above the 20 μg/L concentration. The 1,1-dichloroethane calculated to 33 μg/L, which is within 10 of the true value. The 1,1,1-trichloroethane calculated to 24.8 μg/L (within 18%). This "linearity check" cannot be directly compared to the preceding initial calibration due to the time lapse and the change in internal standards responses. Continuing calibrations were performed at the 5 μg/L level, which is at the low point of the calibration rather than mid-level. The laboratory never demonstrated that the calibrations were in complete control, particularly for low concentrations (less than 5 μg/L).

For the most part, blank contaminants were insignificant. Detection limits for toluene were raised slightly for samples PW-2-M, PW-3, PW-7, and PW-11-L; and for methylene chloride, for samples PW-11-M. Surrogate recoveries were reasonable; however, no matrix spike or matrix spike duplicates were analyzed, although blank spike samples were analyzed. Field duplicate results (PW-1 and PW-5) were good.

The results for this set of data are consistent with historical data, and make sense from a hydrogeological perspective. However, from the standpoint of QC compliancy, this set of data fails; therefore, no validity can be attributed to the quantitated results. **The volatile organic data for the drinking water samples can only be used to ascertain the presence or absence of contaminants. This data is not usable for any exercise where accurate and precise measurements are required (e.g. risk assessment).**

3) Fire Pond Water (Table 6)

No volatile organics were found in any of the fire pond water samples. QC results for the volatile organics analyses were acceptable. All holding times and MS tuning criteria were met. All surrogate and matrix spike recoveries were acceptable. There was a minor exceedance in the calibration criteria for chloromethane for most of these samples, however it does not affect data quality since none of these samples contained any chlorinated organics. The laboratory method blanks contained low levels of acetone and methylene chloride, thus the detection limits for these two compounds have been raised for a few of the samples due to possible contamination. **All fire pond water volatile organic data are usable.**

4) Fire Pond Sediment (Table 10)

No volatile organics were found in any of the fire pond sediments. Low level contamination of methylene chloride and acetone in some of the blanks required the slightly raising the detection limit for these two compounds. Detection limits for methylene chloride in FP2-SD (18 ppb) and FP3-SD (13 ppb) are above the NYSDEC sediment criteria of 8 ppb. With regard to analytical QC, all holding times, MS tuning and calibration criteria were met. All surrogate and matrix spike recoveries were acceptable. **With the exception of methylene chloride in FP2-SD and FP3-SD, all fire pond sediment data are usable.**

5) Drainage Ditch Water (Table 14)

Low levels of 1,1,1-trichloroethane and other halogenated solvents were detected in the drainage ditch waters. Holding times for samples DD2-SW, DD3-SW, DD4-SW, DD5-SW, DD6-SW, and DD7-SW were met. However, holding times for DD1-SW and DD8-SW were missed by 1 day (8 days VTSR). These two samples were delivered to the laboratory within 24 hours of sampling. The NYSDEC ASP states that volatile organic samples must be analyzed within 7 days of VTSR, and allows up to 48 hours for delivery of the samples to the laboratory (totaling 9 days). EPA-CLP holding times for volatile organic analysis of water samples is 10 days VTSR. Although contractually these two samples are non-compliant, they should be considered scientifically acceptable, and thus usable.

MS tuning criteria for all analyses was met. With regard to calibration, minor problems were found in the continuing calibration for chloromethane, 1,2-dichloroethane, 1,1,1-trichloroethane, and carbon tetrachloride for samples DD2-SW, DD3-SW, DD5-SW, DD6-SW, and DD7-SW. This resulted in estimating 1,1,1-trichloroethane concentrations in most of these samples. The internal standard responses for DD6-SW were non-compliant; however, the reanalysis of the sample (admittedly outside of holding times) confirmed the original results. With regard to the blanks, detection limits for methylene chloride and acetone had to be raised for all samples due to possible contamination. Some problems were noted with surrogate and matrix spike results which seem attributable to matrix effect. No matrix spike blanks were analyzed for these samples. Field duplicate results were very good.

Sample	1,1-Dichloroethane µg/L	1,1,1-Trichloroethane µg/L
DD6-SW	5.	25.
DD6-SW RE	5.	30.
DD6-SW-DUP	5.	30.
DD8-SW	2.	10.
DD8-SW-DUP	2.	10.

The volatile organic results for the drainage ditch water samples should only be used as a preliminary screen to determine the presence or absence of contaminants. Because of the various calibration problems alluded to, particularly for 1,1,1-trichloroethene, which is a major contaminant of concern at the Site, volatile organic concentration values should be used with caution. It would behoove site investigators to reanalyze these samples to better delineate contaminant levels in drainage ditch water.

6) Drainage Ditch Sediment (Table 18)

Most drainage ditch sediment samples contained no volatile organics. Chloroethane and 1,1-dichloroethane were detected in DD-4-SD and 1,1,1-trichloroethane in DD-8-SD.

All holding times were initially met, but four of the soil samples (DD5-SD, DD1-SD, DD8-SD, and DD8-SD-DUP) had to be reanalyzed 10 to 11 days after sampling due to either poor surrogate recoveries and/or poor internal standard responses. All tuning criteria were met; however, system calibration for all soils was inadequate. The initial five-level calibration was actually a four level calibration. Upon examination it was found that the 100 µg/l standard was accidentally at a concentration of 50 µg/l. Remarkably, the calibration met all NYSDEC ASP criteria except for the %RSD for acetone, which was 60.3%. The continuing calibrations had many non-compliant percent differences, due in part to the improper four-level calibration average RRFs, with the exception of the ketones. Quantitation for all soil results have been estimated due to the non-compliant calibrations. In addition, non-compliant internal standard responses were noted for DD1-SD (and MS, MSD), DD6-SD, and DD-8-SD (and DUP). The reanalyses of sample DD6-SD and DD8-SD-DUP were compliant, although the internal standard response was still suppressed. This matrix effect was more apparent for DD1-SD and DD8-SD; thus, all values associated with the non-compliant internal standards are estimated.

The laboratory method blanks contained low levels of acetone and methylene chloride; thus, the detection limits for these two compounds have been raised for a few of the samples due to possible contamination. Some deficiencies were noted with some of the surrogates, especially with BFB in DD8-SD. This same effect was noted with the duplicate of that sample; therefore, matrix effects are likely the cause of the problem. No matrix spike blank was analyzed.

Due to the hodgepodge of problems associated with the volatile organic analysis of the drainage ditch sediments, the overall data quality for these samples is suspect. Data for these samples should

be used only to determine the general nature of contamination, but should not be used for risk assessment or litigation purposes. If possible, resampling of the drainage ditch sediments should be arranged.

7) Catskill and Thorp Creeks Water (Table 22)

For the most part the creek water samples did not contain volatile organic compounds. Trace levels (2 ppb) of 1,2-dichloroethane and 1,1,1-trichloroethane were found in CC-1-SW, and 10 ppb of 1,1,1-trichloroethane was detected in TC-2-SW.

Most QC results for these analyses were acceptable. All holding times and MS tuning criteria were met. Minor continuing calibration problems were noted with chloromethane and 1,2-dichloroethane, which are of little consequence. Detection limits for acetone levels had to be raised slightly due to possible contamination noted in the blank. Surrogate and matrix spike recoveries were good. With regard to field duplicates, TC-2-SW contained 10 ppb of trichloroethene, while the field duplicate (TC-2-SW-DUP) did not have any trichloroethene reported. Since the detect is near the detection limit, this is not completely surprising. However, it does introduce some uncertainty as to the precision of the measurement. **All Catskill and Thorp Creek water volatile organic data are usable.**

8) Catskill and Thorp Creeks Sediment (Table 26)

No volatile organic compounds were detected in any of the creek sediment samples. All QC results were acceptable. Holding times and MS tuning criteria were met for all samples. All surrogate and matrix spike recoveries were acceptable. Low level contamination of methylene chloride and acetone in all of the blanks necessitated raising the detection limit slightly for these two compounds. **All Catskill and Thorp Creek sediment volatile organic data are usable.**

9) Surface Soil (Table 30)

The surface soils were generally devoid of significant levels of volatile organic contaminants. SS-9, SS-10, S-11, SS-22 contained low levels of toluene, and SS-18 contained both toluene and xylene. In addition, SS-18 contained low levels of 4-methyl-2-pentanone, 2-butanone, and 1,1-dichloroethane. SS-12 contained low levels of 1,1,1-trichloroethane, while S-11 contained relatively high levels of 1,1,1-trichloroethane as well as a low level of trichloroethane.

All holding times and MS tuning criteria were met. Problems complying with calibration and internal standard criteria affected some of the reported data. Non-compliant internal standard responses were noted for SS-3, SS-13, and SS-17. Reanalysis of these samples indicates the problem relates to sample matrix effects. Continuing calibration problems affected certain aspects of all surface soil samples analyzed for volatile organics, however most violations were minor and did not seriously hamper quantitative values.

Surrogate recoveries were acceptable for all samples, except for SS-3. Reanalysis of SS-3 indicated that the recovery problems were associated with the matrix itself. The matrix spike recoveries for SS-3 also support the matrix effect theory. Results of all other matrix spikes associated with the surface soils were acceptable. No matrix spike blanks were analyzed in association with samples SS-1, SS-2, SS-15, SS-16, and SS-18, however since surrogate and matrix spike recoveries were good, the lack of a matrix spike blank is inconsequential. Due to blank contamination, the detection limits were raised slightly for methylene chloride and acetone in samples SS-12, SS-22, SS-7, and SS-14, and for methylene chloride, acetone, and chloroform in samples SS-1, SS-2, SS-15, SS-16, and SS-18. **Although the concentrations of a few analytes have been qualified, all surface soil volatile organic data are usable.**

10) Soil Borings (Table 34)

There were no volatile organic compounds detected in any of the soil boring samples. Data for BL-1 was initially rejected by Nytest, yet was never resampled. All surrogate, matrix spike, and blank spike recoveries were acceptable. Low level contamination of methylene chloride and acetone in the blanks required raising the detection limit slightly for these two compounds. **All soil boring volatile organic data are usable.**

11) Septic Tank Discharge Pipe Water (Table 38)

1,1-Dichloroethane and 1,1,1-trichloroethane were detected in two of the three septic tank water samples. Holding time and MS tuning criteria were met. Low level blank contamination of acetone, methylene chloride, and chloroform required slightly raising the detection limits for these three compounds for samples ST-1-SW and ST-3-SW; and for methylene chloride and acetone for sample ST-2-SW. Because of a poor relative response factor for 2-butanone in the continuing calibration, data for this compound is rejected for ST-2-SW. All matrix spike and surrogate spike recoveries were good. **All septic tank water volatile organic data, except for 2-butanone in sample ST-2-SW, is usable.**

12) Septic Tank Sediment (Table 42)

Chloroethane, 1-1-dichloroethane, 1,1,1-trichloroethane and toluene were detected in sample ST-2-SED, and toluene was detected in ST-3-5D. Holding times for ST-1-SD and ST-2-SED were met. However, the holding time for ST-5-SED was missed by 1 day (8 days VTSR). This sample was delivered to the laboratory within 24 hours of sampling. The NYSDEC ASP states that volatile organic samples must be analyzed within 7 days of VTSR, and allows up to 48 hours for delivery of the samples to the laboratory (totaling 9 days). EPA-CLP holding times for volatile organic analysis of water samples is 10 days VTSR. Although contractually this sample is non-compliant, it should be considered scientifically acceptable, and thus usable.

MS tuning criteria was met. Low level contamination of acetone, methylene chloride, and chloroform required slightly raising the detection limits for these three compounds for ST-1-SD; and for methylene chloride and acetone for ST-2-SED. Minor continuing calibration problems affected ST-1-SED and ST-3-SED, but should not be considered significant. Matrix spike and surrogate spike recoveries were reasonable. **All septic tank sediment volatile organic data are usable.**

13) Septic Tank Test Pit Soil (Table 46)

There were no volatile organic compounds detected in any of the septic tank test pit soil samples. MS tuning criteria was met. Low level blank contamination of acetone, methylene chloride, and chloroform required slightly raising the detection limits for these three compounds for ST-1-TP and ST-3-TP; and for methylene chloride and acetone for ST-2-SL. Minor continuing calibration problems affected all of the samples, but should not be considered significant. Matrix spike and surrogate spike recoveries were good. **All septic tank test pit soil volatile organic data are usable.**

14) Discharge Pipe Sediment (Table 50)

Data for this sample was originally rejected by Nytest due to holding time problems. No other sample was taken to replace the original sample.

15) SPDES Permit (Table 54)

No volatile organic constituents were detected in either of the SPDES water samples. Holding timing and MS tuning criteria were met. Low level blank contamination of methylene chloride and acetone required slightly raising the detection limits for these two compounds for sample SPDES-1. Because of a poor relative response factor for 2-butanone in the continuing calibration, data for this compound is rejected for SPDES-2. All matrix spike and surrogate spike recoveries were good. **All SPDES volatile organic data, except for 2-butanone in SPDES-2, is usable.**

Pesticides

1) Groundwater (Table 3)

No pesticides were detected in any of the groundwater samples analyzed. There was a false positive reported for dieldrin in MW-4 which has been deleted from the final data report. All holding times were adhered to, and all analytical QC requirements were met. **All groundwater pesticide data are usable.**

2) Fire Pond Water (Table 8)

No pesticides were detected in any of the fire pond water samples. All holding times were adhered to, and all analytical QC requirements were met. No problems were noted with the blanks, and spike recoveries were reasonable. **All fire pond water pesticide data are usable.**

3) Fire Pond Sediment (Table 12)

As with the fire pond water samples, no pesticides were detected in the fire pond sediments. Again, all holding times were adhered to, and all analytical QC requirements were met. Surrogate spike and matrix spike recoveries were adequate; however, no matrix spike blanks were analyzed. Since the surrogate spike and matrix spike results were good, the lack of a matrix spike blank is not a critical problem. **All fire pond sediment pesticide data are usable.**

4) Drainage Ditch Water (Table 16)

No pesticides were detected in the drainage ditch waters. All holding time and analytical QC criteria were met. No contaminants were noted in the blanks. Only minor deficiencies were noted in the matrix spike recoveries. **All drainage ditch water pesticide data are usable.**

5) Drainage Ditch Sediment (Table 20)

One drainage ditch sediment (DD-4-SED) contained 4100 ppb of Aroclor-1254. The NYSDEC sediment criteria for Aroclor-1254 is .74 ppb, therefore this measurement should be evaluated from a risk assessment perspective.

All holding time and analytical QC criteria was met. No contaminants were found in any of the blanks. All surrogate and matrix spike recoveries were good. No matrix spike blanks were analyzed, however since all surrogate and matrix spike recoveries were good, the lack of a matrix spike blank is inconsequential. **All drainage ditch sediment pesticide data are usable.**

6) Catskill and Thorp Creek Water (Table 24)

No pesticides were detected in any of the creek water samples. All holding time and analytical QC criteria was met. No contaminants were found in the blanks, and surrogate and matrix spike recoveries were acceptable. **All Catskill and Thorp Creek water pesticide data are usable.**

7) Catskill and Thorp Creek Sediment (Table 28)

There were also no pesticides found in the creek sediment samples. Again, all holding times and analytical QC criteria was met. Surrogate and matrix spike recoveries were good, and no contaminants were noted in the blanks. **All Catskill and Thorp Creek sediment pesticide data are usable.**

8) Surface Soil (Table 32)

No pesticides were detected in any of the surface soil samples. All holding times and analytical QC criteria was met. No contaminants were found in the blanks, and surrogate and matrix spike recoveries were acceptable. **All surface soil pesticide data are usable.**

9) Soil Boring (Table 36)

No pesticides were detected in any of the soil boring samples. All holding times were met. 4,4'-DDT and endosulfan sulfate were found to "coelute" in the DB-5 confirmation column, resulting in a resolution less than 25%. This resulted in improper calibration factors for DDT. This was of no consequence, since no DDT or endosulfan sulfate were detected in any of the samples. All surrogate and matrix spike recoveries were good. No matrix spike blanks were analyzed; however, since all surrogate and matrix spike recoveries were good, the lack of a matrix spike blank is inconsequential. **All soil boring pesticide data are usable.**

10) Septic Tank Water (Table 40)

No pesticides were detected in the one septic tank water sample analyzed. All holding times were adhered to, and all analytical QC requirements were met. **All pesticide data for the septic tank water sample are usable.**

11) Septic Tank Sediment (Table 44)

No pesticides were detected in either of the septic tank sediment samples. Holding times for both samples were met. All calibration, breakdown, and retention time shift information were reviewed and found to be acceptable for both samples. The surrogate recovery of DBC was good for ST1-SD, but initially a problem for ST2-SD. A diluted analysis of ST2-SD did produce acceptable recoveries (25% versus 20%). Matrix spike results associated with ST1-SD were good, however were poor for ST2-SD. Recoveries varied due to co-eluting compounds in the matrix. Recoveries and relative percent deviations were acceptable for lindane, dieldrin, and endrin, but high (>300%) recoveries were noted for heptachlor, aldrin, and 4,4'-DDT. Due to the matrix problems, all pesticide data for ST2-SD, which are non-detects, have been estimated. **All septic tank sediment pesticide data are usable.**

12) Septic Tank Test Pit Soil (Table 48)

No pesticides were detected in the three septic tank test pit soil samples. Holding times for all three samples were met. All calibration, breakdown and retention time shift information was acceptable. All surrogate recoveries for DBC were acceptable. The matrix spike recoveries were good for samples associated with ST-1-TP and ST-2-TP. The matrix spikes for ST-3-TP had unacceptable recoveries, including 0% for DDT in both the matrix spike and matrix spike duplicate samples and 0% for aldrin in the matrix spike. The laboratory reanalyzed the matrix spike samples at 1:9 dilution for on apparent reason. The detection limits for ST-3-TP have thus been qualified to reflect the matrix spike problems. **All septic tank test pit soil pesticide data are usable.**

13) Discharge Pipe Sediment (Table 52)

No pesticides were detected in the one discharge pipe sediment sample. The holding times for the sample were met. All calibration, breakdown, and retention time shift information were reviewed and found to be acceptable. Matrix spike recoveries were good; however, no matrix spike blank was analyzed. There was one significant QC problem associated with sample PP-1, which was analyzed at 1:10 and 1:100 dilutions due to the presence of interferences. No attempt was made to remove the interferences. 4,4'-DDD was reported to 3 µg/Kg, if calculated properly the actual concentration is 2400 µg/Kg. However, detailed review of the chromatograms indicates that DDD is <u>not</u> present. Although a peak falls within the retention time windows on both columns, the references standard retention times are shift from the initial calibration. Recalculation of the retention time windows based on this shift indicate that the DDD is false positive. The DDD result has been rejected, as it is impossible to determine if it is truly present. **The pesticide data for the discharge pipe sediment are usable for all analytes except 4,4'-DDD.**

Susan Chapnick produced the metals portion of this usability report. If you have any questions regarding the report, please do not hesitate to contact either Susan or myself.

Sincerely,

GRADIENT CORPORATION

Dallas Wait

A. Dallas Wait, Ph.D.
Director, Chemistry Division

enclosure

Appendix G

Table 1
Becker Electronics Site
Groundwater Sampling
Volatile Organic Compounds

SAMPLE LOCATION:		MW-2*	MW-6	MW-6-DUP	MW-2-EQB	MW-2*	MW-2S	MW-3*	NYSDEC Class GA Groundwater Standards/ Guidance Values	NYSDOH Drinking Water Standards
DATE SAMPLED:		11/12/90	12/6/90	12/6/90	11/12/90	5/3/91	5/2/91	5/7/91		
WELL DEPTH (FT.):		344.62	75	75	---	344.62	7.35	231.66		
UNITS:		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
COMPOUND	CRQL									
Chloromethane	10	U	U	U	U	U	U	U	5S	5
Bromomethane	10	U	U	U	U	U	U	U	5S	5
Vinyl Chloride	10	U	U	U	U	U	U	U	2S	2
Chloroethane	10	U	U	U	U	U	U	U	5S	5
Methylene Chloride	5	U	U	U	U	U	U	U	5S	5
Acetone	10	U	U	U	U	U	U	U	---	50
Carbon Disulfide	5	U	U	U	U	U	U	U	---	50
1,1-Dichloroethene	5	13	U	U	U	11	96J	U	5S	5
1,1-Dichloroethane	5	67	7	8	U	85	230	40	5S	5
1,2-Dichloroethene(total)	5	8	U	U	U	5	U	U	5S	5
Chloroform	5	U	U	U	U	U	U	U	7S	100
1,2-Dichloroethane	5	U	U	U	U	U	U	U	5S	5
2-Butanone	10	U	U	U	U	U	U	R	---	50
1,1,1-Trichloroethane	5	5	23	23	U	12	2200	U	5S	5
Carbon Tetrachloride	5	U	U	U	U	U	U	U	5S	5
Vinyl Acetate	10	U	U	U	U	U	U	U	---	50
Bromodichloromethane	5	U	U	U	U	U	U	U	50G	100
1,2-Dichloropropane	5	U	U	U	U	U	U	U	5S	5
cis-1,3-Dichloropropene	5	U	U	U	U	U	U	U	5S	5
Trichloroethene	5	6	U	U	U	5	U	U	5S	5
Dibromochloromethane	5	U	U	U	U	U	U	U	50G	100
1,1,2-Trichloroethane	5	U	U	U	U	U	U	U	5S	5
Benzene	5	U	UJ	UJ	U	U	UJ	U	0.7S	5
trans-1,3-Dichloropropene	5	U	U	U	U	U	U	U	5S	5
Bromoform	5	U	U	U	U	U	U	U	50G	100
4-Methyl-2-pentanone	10	U	U	U	U	U	U	U	---	50
2-Hexanone	10	U	U	U	U	U	U	U	50G	50
Tetrachloroethene	5	U	U	U	U	U	U	U	5S	5
1,1,2,2-Tetrachloroethane	5	U	U	U	U	U	U	U	5S	5
Toluene	5	U	UJ	UJ	U	U	UJ	U	5S	5
Chlorobenzene	5	U	UJ	UJ	U	U	UJ	U	5S	5
Ethylbenzene	5	U	UJ	UJ	U	U	UJ	U	5S	5
Styrene	5	U	UJ	UJ	U	U	UJ	U	5S	5
Total Xylenes	5	U	UJ	UJ	U	U	UJ	U	5S	5

Qualifiers
J: Concentration was estimated
U: Compound not detected
UJ: Compound not detected - the sample quantitation limit is an estimate
R: Value was rejected

Notes
CRQL: Contract Required Quantitation Limits
DUP: Duplicate sample
EQB: Equipment blank
S: Standard
G: Guidance value
*: MW-2 and MW-3 are also known as Becker Well #2 and Becker Well #3, respectively

A value followed by a U or a UJ is an elevated detection limit due to blank contamination

Table 1 (continued)
Becker Electronics Site
Groundwater Sampling
Volatile Organic Compounds

SAMPLE LOCATION:		MW-3-RE	MW-4	MW-5	MW-TB	MW-TB	MW-EQB	NYSDEC Class GA	NYSDOH
DATE SAMPLED:		5/7/91	5/3/91	5/2/91	5/3/91	5/7/91	5/7/91	Groundwater Standards/	Drinking Water
WELL DEPTH (FT.):		231.66	64.16	70.08	---	---	---	Guidance Values	Standards
UNITS:		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
COMPOUND	CRQL								
Chloromethane	10	U	U	U	U	U	U	5S	5
Bromomethane	10	U	U	U	U	U	U	5S	5
Vinyl Chloride	10	U	U	U	U	U	U	2S	2
Chloroethane	10	U	U	U	U	U	U	5S	5
Methylene Chloride	5	U	U	28U	U	U	U	5S	5
Acetone	10	U	U	U	U	U	U	---	50
Carbon Disulfide	5	U	U	U	U	U	U	---	50
1,1-Dichloroethene	5	U	230	63	U	U	U	5S	5
1,1-Dichloroethane	5	40	290	670	U	U	U	5S	5
1,2-Dichloroethene(total)	5	U	400	U	U	U	U	5S	5
Chloroform	5	U	U	17J	U	U	U	7S	100
1,2-Dichloroethane	5	U	U	U	U	U	U	5S	5
2-Butanone	10	R	U	U	U	R	R	---	50
1,1,1-Trichloroethane	5	U	1700	650	U	U	U	5S	5
Carbon Tetrachloride	5	U	U	U	U	U	U	5S	5
Vinyl Acetate	10	U	U	U	U	U	U	---	50
Bromodichloromethane	5	U	U	U	U	U	U	50G	100
1,2-Dichloropropane	5	U	U	U	U	U	U	5S	5
cis-1,3-Dichloropropene	5	U	U	U	U	U	U	5S	5
Trichloroethene	5	U	530	U	U	U	U	5S	5
Dibromochloromethane	5	U	U	U	U	U	U	50G	100
1,1,2-Trichloroethane	5	U	U	U	U	U	U	5S	5
Benzene	5	U	U	UJ	U	U	U	0.7S	5
trans-1,3-Dichloropropene	5	U	U	U	U	U	U	5S	5
Bromoform	5	U	U	U	U	U	U	50G	100
4-Methyl-2-pentanone	10	U	U	U	U	U	U	---	50
2-Hexanone	10	U	U	U	U	U	U	50G	50
Tetrachloroethene	5	U	52J	U	U	U	U	5S	5
1,1,2,2-Tetrachloroethane	5	U	U	U	U	U	U	5S	5
Toluene	5	U	62J	21J	U	U	U	5S	5
Chlorobenzene	5	U	U	UJ	U	U	U	5S	5
Ethylbenzene	5	U	U	UJ	U	U	U	5S	5
Styrene	5	U	U	UJ	U	U	U	5S	5
Total Xylenes	5	U	U	UJ	U	U	U	5S	5

Qualifiers

J: Concentration was estimated
U: Compound not detected
UJ: Compound not detected - the sample quantitation limit is an estimate
R: Value was rejected

Notes

CRQL: Contract Required Quantitation Limits
RE: Sample reanalyzed
TB: Trip blank
EQB: Equipment blank
S: Standard
G: Guidance value

A value followed by a U or a UJ is an elevated detection limit due to blank contamination

Table 2
Becker Electronics Site
Groundwater Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION: DATE SAMPLED: WELL DEPTH (FT.): UNITS:		MW-2* 11/12/90 344.62 µg/l	MW-2-EQB 11/12/90 --- µg/l	MW-3* 12/27/90 231.66 µg/l	MW-3-EQB 12/27/90 --- µg/l	MW-2* 5/3/91 344.62 µg/l	MW-2S 5/2/91 7.35 µg/l	NYSDEC Class GA Groundwater Standards/ Guidance Values µg/l	NYSDOH Drinking Water Standards µg/l
COMPOUND	CRQL								
Phenol	10	UJ	U	U	U	U	U	1S	50
bis(2-Chloroethyl) ether	10	UJ	U	U	U	U	U	1S	5
2-Chlorophenol	10	UJ	U	U	U	U	U	1S	5
1,3-Dichlorobenzene	10	UJ	U	U	U	U	U	5S	5
1,4-Dichlorobenzene	10	UJ	U	U	U	U	U	4.7Sa	5
Benzyl Alcohol	10	UJ	U	U	U	U	U	---	50
1,2-Dichlorobenzene	10	UJ	U	U	U	U	U	4.7Sa	5
2-Methylphenol	10	UJ	U	U	U	U	U	1S	5
bis(2-Chloroisopropyl) ether	10	UJ	U	U	U	U	U	5S	5
4-Methylphenol	10	UJ	U	U	U	U	U	1S	5
N-Nitroso-di-n-propylamine	10	UJ	U	U	U	U	U	---	50
Hexachloroethane	10	UJ	U	U	U	U	U	5S	5
Nitrobenzene	10	UJ	U	U	U	U	U	5S	5
Isophorone	10	UJ	U	U	U	U	U	50G	50
2-Nitrophenol	10	UJ	U	U	U	U	U	1S	5
2,4-Dimethylphenol	10	UJ	U	U	U	U	U	1S	5
Benzoic Acid	50	UJ	U	U	U	UJ	U	---	50
bis(2-Chloroethoxy)methane	10	UJ	U	U	U	U	U	5S	5
2,4-Dichlorophenol	10	UJ	U	U	U	U	U	1S	5
1,2,4-Trichlorobenzene	10	UJ	U	U	U	U	U	5S	5
Naphthalene	10	UJ	U	U	U	U	U	10G	50
4-Chloroaniline	10	UJ	U	U	U	U	U	5S	5
Hexachlorobutadiene	10	UJ	U	U	U	U	U	5S	5
4-Chloro-3-Methylphenol	10	UJ	U	U	U	U	U	1S	5
2-Methylnaphthalene	10	UJ	U	U	U	U	U	---	50
Hexachlorocyclopentadiene	10	UJ	U	U	U	U	U	5S	5
2,4,6-Trichlorophenol	10	UJ	U	U	U	U	U	1S	5
2,4,5-Trichlorophenol	50	UJ	U	U	U	U	U	1S	5
2-Chloronaphthalene	10	UJ	U	U	U	U	U	10G	5
2-Nitroaniline	50	UJ	U	U	U	U	U	5S	5
Dimethylphthalate	10	UJ	U	U	U	U	U	50G	50
Acenaphthylene	10	UJ	U	U	U	U	U	---	50
2,6-Dinitrotoluene	10	UJ	U	U	U	U	U	5S	5
3-Nitroaniline	50	UJ	U	U	U	U	U	5S	5
Acenaphthene	10	UJ	U	U	U	U	U	20G	50
2,4-Dinitrophenol	50	UJ	U	U	U	U	U	1S	5

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Table 2 (continued)
Becker Electronics Site
Groundwater Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION: DATE SAMPLED: WELL DEPTH (FT.): UNITS:		MW-2* 11/12/90 344.62 µg/l	MW-2-EQB 11/12/90 --- µg/l	MW-3* 12/27/90 231.66 µg/l	MW-3-EQB 12/27/90 --- µg/l	MW-2* 5/3/91 344.62 µg/l	MW-2S 5/2/91 7.35 µg/l	NYSDEC Class GA Groundwater Standards/ Guidance Values µg/l	NYSDOH Drinking Water Standards µg/l
COMPOUND	CRQL								
4-Nitrophenol	50	UJ	U	U	U	U	U	1S	5
Dibenzofuran	10	UJ	U	U	U	U	U	---	50
2,4-Dinitrotoluene	10	UJ	U	U	U	U	U	5S	5
Diethylphthalate	10	UJ	U	U	U	U	U	50G	50
4-Chlorophenyl-Phenylether	10	UJ	U	U	U	U	U	---	5
Fluorene	10	UJ	U	U	U	U	U	50G	50
4-Nitroaniline	50	UJ	UJ	U	U	U	U	5S	5
4,6-Dinitro-2-Methylphenol	50	UJ	U	U	U	U	U	1S	5
N-nitrosodiphenylamine(1)	10	UJ	U	U	U	U	U	50G	50
4-Bromophenyl-Phenylether	10	UJ	U	U	U	U	U	---	5
Hexachlorobenzene	10	UJ	U	U	U	U	U	0.35S	5
Pentachlorophenol	50	UJ	U	U	U	U	U	1S	5
Phenanthrene	10	UJ	U	U	U	U	U	50G	50
Anthracene	10	UJ	U	U	U	U	U	50G	50
Di-n-butylphthalate	10	UJ	U	U	U	U	U	50S	50
Fluoranthene	10	UJ	U	U	U	U	U	50G	50
Pyrene	10	UJ	U	U	U	U	U	50G	50
Butylbenzylphthalate	10	UJ	U	U	U	U	U	50G	50
3,3'-Dichlorobenzidine	20	UJ	U	UJ	UJ	U	U	5S	5
Benzo(a)anthracene	10	UJ	U	U	U	U	U	0.002G	50
Chrysene	10	UJ	U	U	U	U	U	0.002G	50
Bis(2-ethylhexyl)phthalate	10	18UJ	U	U	250	51U	19U	50S	50
Di-n-octylphthalate	10	UJ	U	U	U	U	U	50G	50
Benzo(b)fluoranthene	10	UJ	U	U	U	U	U	0.002G	50
Benzo(k)fluoranthene	10	UJ	U	U	U	U	U	0.002G	50
Benzo(a)pyrene	10	UJ	U	U	U	U	U	ND S	50
Indeno(1,2,3-cd)pyrene	10	UJ	U	U	U	U	U	0.002G	50
Dibenz(a,h)anthracene	10	UJ	U	U	U	U	U	---	50
Benzo(g,h,i)perylene	10	UJ	U	U	U	U	U	---	50

Qualifiers

J:	Concentration was estimated
U:	Compound not detected
UJ:	Compound not detected - the sample quantitation limit is an estimate

Notes

CRQL: Contract Required Quantitation Limits
EQB: Equipment blank sample
S: Standard
G: Guidance Value
@: Value applies to the sum of 1,2 and 1,4 isomers
ND: Not Detectable
*: MW-2 and MW-3 are also known as Becker Well #2 and Becker Well #3, respectively

A value followed by a U or a UJ is an elevated detection limit due to blank contamination

Table 2 (continued)
Becker Electronics Site
Groundwater Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION:		MW-4	MW-5	MW-6	MW-6-DUP	MW-EQB	NYSDEC Class GA Groundwater Standards/ Guidance Values	NYSDOH Drinking Water Standards
DATE SAMPLED:		5/3/91	5/2/91	5/3/91	5/3/91	5/7/91		
WELL DEPTH (FT.):		64.16	70.08	75	75	---		
UNITS:		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
COMPOUND	CRQL							
Phenol	10	U	U	U	U	U	1S	50
bis(2-Chloroethyl) ether	10	U	U	U	U	U	1S	5
2-Chlorophenol	10	U	U	U	U	U	1S	5
1,3-Dichlorobenzene	10	U	U	U	U	U	5S	5
1,4-Dichlorobenzene	10	U	U	U	U	U	4.7Sa	5
Benzyl Alcohol	10	U	U	U	U	U	---	50
1,2-Dichlorobenzene	10	U	U	U	U	U	4.7Sa	5
2-Methylphenol	10	U	U	U	U	U	1S	5
bis(2-Chloroisopropyl) ether	10	U	U	U	U	U	5S	5
4-Methylphenol	10	U	U	U	U	U	1S	5
N-Nitroso-di-n-propylamine	10	U	U	U	U	U	---	50
Hexachloroethane	10	U	U	U	U	U	5S	5
Nitrobenzene	10	U	U	U	U	U	5S	5
Isophorone	10	U	U	U	U	U	50G	50
2-Nitrophenol	10	U	U	U	U	U	1S	5
2,4-Dimethylphenol	10	U	U	U	U	U	1S	5
Benzoic Acid	50	UJ	U	UJ	UJ	U	---	50
bis(2-Chloroethoxy)methane	10	U	U	U	U	U	5S	5
2,4-Dichlorophenol	10	U	U	U	U	U	1S	5
1,2,4-Trichlorobenzene	10	U	U	U	U	U	5S	5
Naphthalene	10	U	U	U	U	U	10G	50
4-Chloroaniline	10	U	U	U	U	U	5S	5
Hexachlorobutadiene	10	U	U	U	U	U	5S	5
4-Chloro-3-Methylphenol	10	U	U	U	U	U	1S	5
2-Methylnaphthalene	10	U	U	U	U	U	---	50
Hexachlorocyclopentadiene	10	U	U	U	U	U	5S	5
2,4,6-Trichlorophenol	10	U	U	U	U	U	1S	5
2,4,5-Trichlorophenol	50	U	U	U	U	U	1S	5
2-Chloronaphthalene	10	U	U	U	U	U	10G	5
2-Nitroaniline	50	U	U	U	U	U	5S	5
Dimethylphthalate	10	U	U	U	U	U	50G	50
Acenaphthylene	10	U	U	U	U	U	---	50
2,6-Dinitrotoluene	10	U	U	U	U	U	5S	5
3-Nitroaniline	50	U	U	U	U	U	5S	5
Acenaphthene	10	U	U	U	U	U	20G	50
2,4-Dinitrophenol	50	U	U	U	U	U	1S	5

(continued next page)

Table 2 (continued)
Becker Electronics Site
Groundwater Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION:		MW-4	MW-5	MW-6	MW-6-DUP	MW-EQB	NYSDEC Class GA Groundwater Standards/ Guidance Values	NYSDOH Drinking Water Standards
DATE SAMPLED:		5/3/91	5/2/91	5/3/91	5/3/91	5/7/91		
WELL DEPTH (FT.):		64.16	70.08	75	75	---		
UNITS:		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
COMPOUND	CRQL							
4-Nitrophenol	50	U	U	U	U	U	1S	5
Dibenzofuran	10	U	U	U	U	U	---	50
2,4-Dinitrotoluene	10	U	U	U	U	U	5S	5
Diethylphthalate	10	U	U	U	U	U	50G	50
4-Chlorophenyl-Phenylether	10	U	U	U	U	U	---	5
Fluorene	10	U	U	U	U	U	50G	50
4-Nitroaniline	50	U	U	U	U	U	5S	5
4,6-Dinitro-2-Methylphenol	50	U	U	U	U	U	1S	5
N-nitrosodiphenylamine(1)	10	U	U	U	U	U	50G	50
4-Bromophenyl-Phenylether	10	U	U	U	U	U	---	5
Hexachlorobenzene	10	U	U	U	U	U	0.35S	5
Pentachlorophenol	50	U	U	U	U	U	1S	5
Phenanthrene	10	U	U	U	U	U	50G	50
Anthracene	10	U	U	U	U	U	50G	50
Di-n-butylphthalate	10	U	U	U	U	U	50S	50
Fluoranthene	10	U	U	U	U	U	50G	50
Pyrene	10	U	U	U	U	U	50G	50
Butylbenzylphthalate	10	U	U	U	U	U	50G	50
3,3'-Dichlorobenzidine	20	U	U	U	U	U	5S	5
Benzo(a)anthracene	10	U	U	U	U	U	0.002G	50
Chrysene	10	U	U	U	U	U	0.002G	50
Bis(2-ethylhexyl)phthalate	10	23U	U	46U	U	U	50S	50
Di-n-octylphthalate	10	U	U	U	U	U	50G	50
Benzo(b)fluoranthene	10	U	U	U	U	U	0.002G	50
Benzo(k)fluoranthene	10	U	U	U	U	U	0.002G	50
Benzo(a)pyrene	10	U	U	U	U	U	ND S	50
Indeno(1,2,3-cd)pyrene	10	U	U	U	U	U	0.002G	50
Dibenz(a,h)anthracene	10	U	U	U	U	U	---	50
Benzo(g,h,i)perylene	10	U	U	U	U	U	---	50

Qualifiers

J: Concentration was estimated
U: Compound not detected
UJ: Compound not detected - the sample quantitation limit is an estimate

Notes

CRQL: Contrct Required Quantitation Limits
EQB: Equipment blank sample
S: Standard
G: Guidance Value
a: Value applies to the sum of 1,2 and 1,4 isomers
ND: Not Detectable
DUP: Duplicate sample

A value followed by a U or a UJ is an elevated detection limit due to blank contamination

Table 3
Becker Electronics Site
Groundwater Sampling
Pesticides/PCBs

SAMPLE LOCATION:		MW-2*	MW-2S	MW-3*	MW-4	MW-5	MW-6	MW-6-DUP	MW-EQB	NYSDEC Class GA Groundwater Standards/ Guidance Values	NYSDOH Drinking Water Standards
DATE SAMPLED:		5/3/91	5/2/91	5/7/91	5/3/91	5/2/91	5/3/91	5/3/91	5/7/91		
WELL DEPTH (FT.):		344.62	7.35	231.66	64.16	70.08	75	75	-		
UNITS:		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
COMPOUND	CRQL										
alpha-BHC	0.05	U	U	U	U	U	U	U	U	ND S	5
beta-BHC	0.05	U	U	U	U	U	U	U	U	ND S	5
delta-BHC	0.05	U	U	U	U	U	U	U	U	ND S	5
gamma-BHC(Lindane)	0.05	U	U	U	U	U	U	U	U	ND S	5
Heptachlor	0.05	U	U	U	U	U	U	U	U	ND S	5
Aldrin	0.05	U	U	U	U	U	U	U	U	ND S	5
Heptachlor Epoxide	0.05	U	U	U	U	U	U	U	U	ND S	5
Endosulfan I	0.05	U	U	U	U	U	U	U	U	---	50
Dieldrin	0.1	U	U	U	U	U	U	U	U	ND S	5
4,4'-DDE	0.1	U	U	U	U	U	U	U	U	ND S	5
Endrin	0.1	U	U	U	U	U	U	U	U	ND S	0.2
Endosulfan II	0.1	U	U	U	U	U	U	U	U	---	50
4,4'-DDD	0.1	U	U	U	U	U	U	U	U	ND S	5
Endosulfan Sulfate	0.1	U	U	U	U	U	U	U	U	---	50
4,4'-DDT	0.1	U	U	U	U	U	U	U	U	ND S	5
Methoxychlor	0.5	U	U	U	U	U	U	U	U	35S	50
Endrin Ketone	0.1	U	U	U	U	U	U	U	U	ND S	5
alpha-Chlordane	0.5	U	U	U	U	U	U	U	U	0.1S	5
gamma-Chlordane	0.5	U	U	U	U	U	U	U	U	0.1S	5
Toxaphene	1	U	U	U	U	U	U	U	U	ND S	5
Aroclor-1016	0.5	U	U	U	U	U	U	U	U	0.1 S	5
Aroclor-1221	0.5	U	U	U	U	U	U	U	U	0.1 S	5
Aroclor-1232	0.5	U	U	U	U	U	U	U	U	0.1 S	5
Aroclor-1242	0.5	U	U	U	U	U	U	U	U	0.1 S	5
Aroclor-1248	0.5	U	U	U	U	U	U	U	U	0.1 S	5
Aroclor-1254	1	U	U	U	U	U	U	U	U	0.1 S	5
Aroclor-1260	1	U	U	U	U	U	U	U	U	0.1 S	5

Qualifiers
U: Compound not detected

Notes
CRQL: Contract Required Quantitation Limits
DUP: Duplicate sample
EQB: Equipment blank sample
---: Not available
S: Standard
ND: Not Detectable
*: MW-2 and MW-3 are also known as Becker Well #2 and Becker Well #3, respectively

Table 4
Becker Electronics Site
Groundwater Sampling
Inorganic Constituents

SAMPLE LOCATION:		MW-2*	MW-2*	MW-2S	MW-3*	MW-4	MW-5	NYSDEC Class GA Groundwater Standards/ Guidance Values	NYSDOH Drinking Water Standards
DATE SAMPLED:		11/12/90	12/4/90	12/6/90	12/27/90	12/6/90	12/6/90		
WELL DEPTH (FT.):		344.62	344.62	7.35	231.66	64.16	70.08		
UNITS:		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
ELEMENTS	CRDL								
ALUMINUM	200	R	219J	1560J	48BJ	1110J	327J	---	---
ANTIMONY	60	R	R	R	R	R	R	3G	---
ARSENIC	10	13.2	4.1B	U	5.3B	U	3.3B	25S	50
BARIUM	200	353J	316J	245J	519J	142BJ	237J	1000S	1000
BERYLLIUM	5	4BJ	UJ	UJ	UJ	2BJ	UJ	3G	---
CADMIUM	5	4BJ	UJ	UJ	UJ	UJ	UJ	10S	10
CALCIUM	5000	54900J	61600J	99300J	42400J	56200J	56600J	---	---
CHROMIUM	10	UJ	UJ	UJ	UJ	UJ	UJ	50S	50
COBALT	50	UJ	UJ	UJ	UJ	UJ	UJ	---	---
COPPER	25	62J	9BJ	10BJ	UJ	11BJ	UJ	200S	1000
IRON	100	34000J	5610J	3140J	R	16900J	12800J	300S	300
LEAD	3	232	11.5	1.4BJ	0.3B	25.6J	R	25S	50
MAGNESIUM	5000	7380J	9730J	11300J	9450J	7080J	9160J	35000G	---
MANGANESE	15	304J	150J	1580J	184J	470J	220J	300S	300
MERCURY	0.2	U	U	2.3	U	U	U	2S	2
NICKEL	40	UJ	UJ	UJ	UJ	UJ	UJ	---	---
POTASSIUM	5000	UJ	UJ	1990BJ	1240BJ	1700BJ	1960J	---	---
SELENIUM	5	UJ	U	U	U	U	U	10S	10
SILVER	10	R	R	R	R	R	R	50S	50
SODIUM	5000	11900J	8030J	22700J	19400J	12000J	9770J	20000S	---
THALLIUM	10	UJ	0.7B	UJ	UJ	U	U	4G	---
VANADIUM	50	UJ	UJ	UJ	UJ	UJ	UJ	---	---
ZINC	20	23600J	1050J	23J	R	192J	163J	300S	5000

Qualifiers

J: Concentration was estimated
R: Value was rejected
U: Not detectable at the IDL
B: Value is between the IDL and CRDL
UJ: Compound not detected - the sample quantitation limit is an estimate

Notes

CRDL: Contract Required Detection Limits
S: Standard
G: Guidance value
*: MW-2 and MW-3 are also known as Becker Well #2 and Becker Well #3, respectively

Table 4 (continued)
Becker Electronics Site
Groundwater Sampling
Inorganic Constituents

SAMPLE LOCATION:		MW-6	MW-6-DUP	MW-2-EQB	MW-5-EQB	MW-2-EQB	MW-3-EQB	NYSDEC Class GA	NYSDOH
DATE SAMPLED:		12/6/90	12/6/90	11/12/90	12/6/90	12/4/90	12/27/90	Groundwater Standards/	Drinking Water
WELL DEPTH (FT.):		75	75	---	---	---	---	Guidance Values	Standards
UNITS:		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
ELEMENTS	CRDL								
ALUMINUM	200	511J	350J	R	UJ	UJ	34BJ	---	---
ANTIMONY	60	R	R	R	R	R	R	3G	---
ARSENIC	10	U	U	UJ	U	U	U	25S	50
BARIUM	200	88BJ	67BJ	UJ	UJ	UJ	UJ	1000S	1000
BERYLLIUM	5	UJ	UJ	UJ	UJ	UJ	UJ	3G	---
CADMIUM	5	UJ	UJ	UJ	UJ	UJ	UJ	10S	10
CALCIUM	5000	29000J	22400J	UJ	UJ	UJ	UJ	---	---
CHROMIUM	10	UJ	UJ	UJ	UJ	UJ	UJ	50S	50
COBALT	50	UJ	UJ	UJ	UJ	UJ	UJ	---	---
COPPER	25	UJ	UJ	UJ	UJ	UJ	UJ	200S	1000
IRON	100	10700J	7230J	262J	101J	UJ	R	300S	300
LEAD	3	13J	14.8J	3.1	R	2.5B	0.4B	25S	50
MAGNESIUM	5000	4700BJ	3670BJ	UJ	UJ	UJ	UJ	35000G	---
MANGANESE	15	3450J	2620J	UJ	UJ	UJ	UJ	300S	300
MERCURY	0.2	U	U	U	U	U	U	2S	2
NICKEL	40	UJ	UJ	UJ	UJ	UJ	UJ	---	---
POTASSIUM	5000	1500BJ	1560BJ	UJ	UJ	UJ	UJ	---	---
SELENIUM	5	U	U	U	U	U	U	10S	10
SILVER	10	R	R	R	R	R	R	50S	50
SODIUM	5000	11500J	8970J	UJ	UJ	UJ	UJ	20000S	---
THALLIUM	10	U	U	U	U	0.7B	U	4G	---
VANADIUM	50	UJ	UJ	UJ	UJ	UJ	UJ	---	---
ZINC	20	64J	42J	38J	5BJ	5BJ	24J	300S	5000

Qualifiers
J: Concentration was estimated
R: Value was rejected
U: Not detectable at the IDL
B: Value is between the IDL and CRDL
UJ: Compound not detected - the sample quantitation limit is an estimate

Notes
CRDL: Contract Required Detection Limits
EQB: Equipment blank sample
DUP: Duplicate sample
S: Standard
G: Guidance value

Table 5
Becker Electronics Site
Private Water Supply Sampling
524.2 Volatile Organic Compounds

SAMPLE LOCATION: DATE SAMPLED: WELL DEPTH (FT.): UNITS:		PW-1-F 5/1/91 150 µg/l	PW-1-M 5/1/91 150 µg/l	PW-1-L 5/1/91 150 µg/l	PW-2-F 5/1/91 180 µg/l	PW-2-M 5/1/91 180 µg/l	PW-2-L 5/1/91 180 µg/l	NYSDOH Drinking Water Standards µg/l	NYSDEC Class GA Groundwater Standards/ Guidance Values µg/l
COMPOUND	CRQL								
Dichlorodifluoromethane	5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Chloromethane	5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Bromomethane	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Vinyl Chloride	0.5	0.9J	0.8J	0.9J	UJ	UJ	UJ	2	2S
Chloroethane	0.5	1.0J	1.0J	1.0J	UJ	UJ	UJ	5	5S
Trichlorofluoromethane	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,1-Dichloroethene	0.5	1.2J	1.0J	1.2J	UJ	UJ	UJ	5	5S
Methylene Chloride	2.3	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
trans-1,2-Dichloroethene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,1-Dichloroethane	0.5	29J	30J	29J	UJ	0.5J	UJ	5	5S
cis-1,2-Dichloroethene	0.5	0.6J	0.5J	0.5J	UJ	UJ	UJ	5	5S
2,2-Dichloropropane	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Bromochloromethane	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Chloroform	0.5	UJ	UJ	UJ	UJ	UJ	UJ	100*	7S
1,1,1-Trichloroethane	0.5	UJ	UJ	UJ	1.6J	UJ	UJ	5	5S
Carbon Tetrachloride	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,1-Dichloropropene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Benzene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	0.7S
1,2-Dichloroethane	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Trichloroethene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,2-Dichloropropane	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Dibromomethane	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Bromodichloromethane	0.5	UJ	UJ	UJ	UJ	UJ	UJ	100*	50G
cis-1,3-Dichloropropene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Toluene	0.5	UJ	UJ	UJ	UJ	1.3UJ	UJ	5	5S
trans-1,3-Dichloropropene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,1,2-Trichloroethane	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Tetrachloroethene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,3-Dichloropropane	0.5	0.6J	UJ	UJ	UJ	UJ	UJ	5	5S
Dibromochloromethane	0.5	UJ	UJ	UJ	UJ	UJ	UJ	100*	50G
1,2-Dibromomethane	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Chlorobenzene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,1,1,2-Tetrachloroethane	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Ethylbenzene	0.6	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
m- and p-Xylene	0.9	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
o-Xylene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Styrene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S

(continued on next page)

Table 5 (continued)
Becker Electronics Site
Private Water Supply Sampling
524.2 Volatile Organic Compounds

SAMPLE LOCATION: DATE SAMPLED: WELL DEPTH (FT.): UNITS:		PW-1-F 5/1/91 150 µg/l	PW-1-M 5/1/91 150 µg/l	PW-1-L 5/1/91 150 µg/l	PW-2-F 5/1/91 180 µg/l	PW-2-M 5/1/91 180 µg/l	PW-2-L 5/1/91 180 µg/l	NYSDOH Drinking Water Standards µg/l	NYSDEC Class GA Groundwater Standards/ Guidance Values µg/l
COMPOUND	CRQL								
Bromoform	0.5	UJ	UJ	UJ	UJ	UJ	UJ	100*	50G
Isopropylbenzene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,1,2,2-Tetrachloroethane	0.5	0.8J	UJ	UJ	UJ	UJ	UJ	5	5S
Bromobenzene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,2,3-Trichloropropane	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
n-Propylbenzene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
2-Chlorotoluene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,3,5-Trimethylbenzene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
4-Chlorotoluene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
tert-Butylbenzene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,2,4-Trimethylbenzene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
sec-Butylbenzene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,3-Dichlorobenzene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
p-Isopropyltoluene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,4-Dichlorobenzene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	4.7S
n-Butylbenzene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,2-Dichlorobenzene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	4.7S
1,2-Dibromo-3-chloropropane	1	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,2,4-Trichlorobenzene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Hexachlorobutadiene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Naphthalene	0.5	1.4J	UJ	UJ	UJ	UJ	UJ	50	10G
1,2,3-Trichlorobenzene	0.5	0.6J	UJ	UJ	UJ	UJ	UJ	5	5S

Qualifiers
J: Concentration was estimated
U: Compound not detected
UJ: Compound not detected - the sample quantitation limit is an estimate

Notes
F: First sample collected before carbon units
M: Middle sample collected between carbon units
L: Last sample collected after carbon units
S: Standard
G: Guidance value
*: Standard for trihalomethanes (chloroform, bromodichloromethane, dibromochloromethane, and bromoform) = 100 ppb

A value followed by a U or a UJ is an elevated detection limit due to blank contamination

Table 5 (continued)
Becker Electronics Site
Private Water Supply Sampling
524.2 Volatile Organic Compounds

SAMPLE LOCATION:		PW-3	PW-4	(PW-1-F-DUP) PW-5-F	(PW-1-M-DUP) PW-5-M	(PW-1-L-DUP) PW-5-L	PW-6-F	PW-6-M	NYSDOH Drinking Water Standards	NYSDEC Class GA Groundwater Standards/ Guidance Values
DATE SAMPLED:		5/1/91	5/1/91	5/1/91	5/1/91	5/1/91	5/1/91	5/1/91		
WELL DEPTH (FT.):		200	---	150	150	150	175	175		
UNITS:		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
COMPOUND	CRQL									
Dichlorodifluoromethane	5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
Chloromethane	5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
Bromomethane	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
Vinyl Chloride	0.5	UJ	UJ	0.6J	0.7J	0.6J	R	R	2	2S
Chloroethane	0.5	UJ	UJ	0.6J	0.6J	0.6J	R	0.6J	5	5S
Trichlorofluoromethane	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
1,1-Dichloroethene	0.5	UJ	UJ	0.8J	0.9J	0.8J	1.1J	0.7J	5	5S
Methylene Chloride	2.3	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
trans-1,2-Dichloroethene	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
1,1-Dichloroethane	0.5	3.0J	2.4J	23J	27J	24J	55J	32J	5	5S
cis-1,2-Dichloroethene	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
2,2-Dichloropropane	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
Bromochloromethane	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
Chloroform	0.5	UJ	UJ	UJ	UJ	UJ	R	R	100*	7S
1,1,1-Trichloroethane	0.5	UJ	UJ	UJ	UJ	UJ	0.6J	R	5	5S
Carbon Tetrachloride	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
1,1-Dichloropropene	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
Benzene	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	0.7S
1,2-Dichloroethane	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
Trichloroethene	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
1,2-Dichloropropane	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
Dibromomethane	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
Bromodichloromethane	0.5	UJ	UJ	UJ	UJ	UJ	R	R	100*	50G
cis-1,3-Dichloropropene	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
Toluene	0.5	0.9UJ	UJ	UJ	UJ	UJ	R	R	5	5S
trans-1,3-Dichloropropene	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
1,1,2-Trichloroethane	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
Tetrachloroethene	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
1,3-Dichloropropane	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
Dibromochloromethane	0.5	UJ	UJ	UJ	UJ	UJ	R	R	100*	50G
1,2-Dibromomethane	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
Chlorobenzene	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
1,1,1,2-Tetrachloroethane	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
Ethylbenzene	0.6	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
m- and p-Xylene	0.9	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
o-Xylene	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
Styrene	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S

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Table 5 (continued)
Becker Electronics Site
Private Water Supply Sampling
524.2 Volatile Organic Compounds

SAMPLE LOCATION:		PW-3	PW-4	(PW-1-F-DUP) PW-5-F	(PW-1-M-DUP) PW-5-M	(PW-1-L-DUP) PW-5-L	PW-6-F	PW-6-M	NYSDOH Drinking Water Standards	NYSDEC Class GA Groundwater Standards/ Guidance Values
DATE SAMPLED:		5/1/91	5/1/91	5/1/91	5/1/91	5/1/91	5/1/91	5/1/91		
WELL DEPTH (FT.):		200	---	150	150	150	175	175		
UNITS:		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
COMPOUND	CRQL									
Bromoform	0.5	UJ	UJ	UJ	UJ	UJ	R	R	100*	50G
Isopropylbenzene	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
1,1,2,2-Tetrachloroethane	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
Bromobenzene	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
1,2,3-Trichloropropane	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
n-Propylbenzene	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
2-Chlorotoluene	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
1,3,5-Trimethylbenzene	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
4-Chlorotoluene	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
tert-Butylbenzene	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
1,2,4-Trimethylbenzene	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
sec-Butylbenzene	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
1,3-Dichlorobenzene	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
p-Isopropyltoluene	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
1,4-Dichlorobenzene	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	4.7S
n-Butylbenzene	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
1,2-Dichlorobenzene	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	4.7S
1,2-Dibromo-3-chloropropane	1	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
1,2,4-Trichlorobenzene	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
Hexachlorobutadiene	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S
Naphthalene	0.5	UJ	UJ	UJ	UJ	UJ	R	R	50	10G
1,2,3-Trichlorobenzene	0.5	UJ	UJ	UJ	UJ	UJ	R	R	5	5S

Qualifiers
J: Concentration was estimated
U: Compound not detected
UJ: Compound not detected - the sample quantitation limit is an estimate

A value followed by a U or a UJ is an elevated detection limit due to blank contamination

Notes
F: First sample collected before carbon units
M: Middle sample collected between carbon units
L: Last sample collected after carbon units
S: Standard
G: Guidance value
*: Standard for trihalomethanes (chloroform, bromodichloromethane, dibromochloromethane, and bromoform) = 100 ppb
DUP: Duplicate sample

Table 5 (continued)
Becker Electronics Site
Private Water Supply Sampling
524.2 Volatile Organic Compounds

SAMPLE LOCATION:		PW-6-L	PW-7	PW-8	PW-9-F	PW-9-M	PW-9-L	PW-TB	NYSDOH Drinking Water Standards	NYSDEC Class GA Groundwater Standards/ Guidance Values
DATE SAMPLED:		5/1/91	5/6/91	5/6/91	5/6/91	5/6/91	5/6/91	5/6/91		
WELL DEPTH (FT.):		175	250	70	---	---	---	---		
UNITS:		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
COMPOUND	CRQL									
Dichlorodifluoromethane	5	R	R	R	R	R	R	R	5	5S
Chloromethane	5	R	R	R	R	R	R	R	5	5S
Bromomethane	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Vinyl Chloride	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	2	2S
Chloroethane	0.5	1.7J	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Trichlorofluoromethane	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,1-Dichloroethene	0.5	0.7J	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Methylene Chloride	2.3	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
trans-1,2-Dichloroethene	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,1-Dichloroethane	0.5	35J	UJ	UJ	3.3J	3.6J	3.7J	UJ	5	5S
cis-1,2-Dichloroethene	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
2,2-Dichloropropane	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Bromochloromethane	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Chloroform	0.5	R	1.2J	UJ	UJ	UJ	UJ	UJ	100*	7S
1,1,1-Trichloroethane	0.5	0.5J	UJ	UJ	UJ	UJ	2.6J	UJ	5	5S
Carbon Tetrachloride	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,1-Dichloropropene	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Benzene	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	0.7S
1,2-Dichloroethane	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Trichloroethene	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,2-Dichloropropane	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Dibromomethane	0.5	R	UJ	UJ	UJ	UJ	UJ	0.7J	5	5S
Bromodichloromethane	0.5	R	UJ	UJ	UJ	UJ	4.6J	UJ	100*	50G
cis-1,3-Dichloropropene	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Toluene	0.5	0.9UJ	0.7UJ	UJ	UJ	UJ	UJ	UJ	5	5S
trans-1,3-Dichloropropene	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,1,2-Trichloroethane	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Tetrachloroethene	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,3-Dichloropropane	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Dibromochloromethane	0.5	R	UJ	UJ	UJ	UJ	1.1J	UJ	100*	50G
1,2-Dibromomethane	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Chlorobenzene	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,1,1,2-Tetrachloroethane	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Ethylbenzene	0.6	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
m- and p-Xylene	0.9	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
o-Xylene	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Styrene	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S

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Table 5 (continued)
Becker Electronics Site
Private Water Supply Sampling
524.2 Volatile Organic Compounds

SAMPLE LOCATION:		PW-6-L	PW-7	PW-8	PW-9-F	PW-9-M	PW-9-L	PW-TB	NYSDOH Drinking Water Standards	NYSDEC Class GA Groundwater Standards/ Guidance Values
DATE SAMPLED:		5/1/91	5/6/91	5/6/91	5/6/91	5/6/91	5/6/91	5/6/91		
WELL DEPTH (FT.):		175	250	70	---	---	---	---		
UNITS:		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
COMPOUND	CRQL									
Bromoform	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	100*	50G
Isopropylbenzene	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,1,2,2-Tetrachloroethane	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Bromobenzene	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,2,3-Trichloropropane	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
n-Propylbenzene	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
2-Chlorotoluene	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,3,5-Trimethylbenzene	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
4-Chlorotoluene	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
tert-Butylbenzene	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,2,4-Trimethylbenzene	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
sec-Butylbenzene	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,3-Dichlorobenzene	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
p-Isopropyltoluene	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,4-Dichlorobenzene	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	4.7S
n-Butylbenzene	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,2-Dichlorobenzene	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	4.7S
1,2-Dibromo-3-chloropropane	1	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,2,4-Trichlorobenzene	0.5	R	UJ	UJ	UJ	UJ	UJ	0.9J	5	5S
Hexachlorobutadiene	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Naphthalene	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	50	10G
1,2,3-Trichlorobenzene	0.5	R	UJ	UJ	UJ	UJ	UJ	UJ	5	5S

Qualifiers
J: Concentration was estimated
U: Compound not detected
UJ: Compound not detected - the sample quantitation limit is an estimate

A value followed by a U or a UJ is an elevated detection limit due to blank contamination

Notes
F: First sample collected before carbon units
M: Middle sample collected between carbon units
L: Last sample collected after carbon units
S: Standard
G: Guidance value
*: Standard for trihalomethanes (chloroform, bromodichloromethane, dibromochloromethane, and bromoform) = 100 ppb
TB: Trip blank sample

Table 5 (continued)
Becker Electronics Site
Private Water Supply Sampling
524.2 Volatile Organic Compounds

SAMPLE LOCATION:		PW-10	PW-TB	PW-11-F	PW-11-M	PW-11-L	PW-12	PW-TB	NYSDOH Drinking Water Standards	NYSDEC Class GA Groundwater Standards/ Guidance Values
DATE SAMPLED:		5/7/91	5/7/91	5/8/91	5/8/91	5/8/91	5/8/91	5/8/91		
WELL DEPTH (FT.):		100	---	---	---	---	100	---		
UNITS:		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
COMPOUND	CRQL									
Dichlorodifluoromethane	5	R	R	R	R	R	R	R	5	5S
Chloromethane	5	R	R	R	R	R	R	R	5	5S
Bromomethane	0.5	UJ	UJ	UJ	UJ	0.6J	UJ	UJ	5	5S
Vinyl Chloride	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	2	2S
Chloroethane	0.5	1.5J	UJ	UJ	0.5J	0.6J	UJ	UJ	5	5S
Trichlorofluoromethane	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,1-Dichloroethene	0.5	UJ	UJ	4.7J	UJ	0.5J	UJ	UJ	5	5S
Methylene Chloride	2.3	UJ	UJ	UJ	3.4UJ	UJ	UJ	UJ	5	5S
trans-1,2-Dichloroethene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,1-Dichloroethane	0.5	14J	UJ	5.4J	0.6J	0.5J	UJ	UJ	5	5S
cis-1,2-Dichloroethene	0.5	UJ	UJ	3.5J	UJ	UJ	UJ	UJ	5	5S
2,2-Dichloropropane	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Bromochloromethane	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Chloroform	0.5	UJ	UJ	UJ	UJ	0.5J	0.6J	UJ	100*	7S
1,1,1-Trichloroethane	0.5	UJ	UJ	22J	UJ	UJ	UJ	UJ	5	5S
Carbon Tetrachloride	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,1-Dichloropropene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Benzene	0.5	UJ	UJ	UJ	UJ	0.5J	UJ	UJ	5	0.7S
1,2-Dichloroethane	0.5	UJ	UJ	UJ	UJ	0.5J	UJ	UJ	5	5S
Trichloroethene	0.5	UJ	UJ	3.1J	UJ	UJ	UJ	UJ	5	5S
1,2-Dichloropropane	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Dibromomethane	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Bromodichloromethane	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	100*	50G
cis-1,3-Dichloropropene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Toluene	0.5	UJ	1.5J	UJ	UJ	0.5UJ	UJ	1.5J	5	5S
trans-1,3-Dichloropropene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,1,2-Trichloroethane	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Tetrachloroethene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,3-Dichloropropane	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Dibromochloromethane	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	100*	50G
1,2-Dibromomethane	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Chlorobenzene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,1,1,2-Tetrachloroethane	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Ethylbenzene	0.6	UJ	UJ	UJ	UJ	0.6J	UJ	UJ	5	5S
m- and p-Xylene	0.9	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
o-Xylene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Styrene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S

(continued on next page)

Table 5 (continued)
Becker Electronics Site
Private Water Supply Sampling
524.2 Volatile Organic Compounds

SAMPLE LOCATION:		PW-10	PW-TB	PW-11-F	PW-11-M	PW-11-L	PW-12	PW-TB	NYSDOH Drinking Water Standards	NYSDEC Class GA Groundwater Standards/ Guidance Values
DATE SAMPLED:		5/7/91	5/7/91	5/8/91	5/8/91	5/8/91	5/8/91	5/8/91		
WELL DEPTH (FT.):		100	---	---	---	---	100	---		
UNITS:		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
COMPOUND	CRQL									
Bromoform	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	100*	50G
Isopropylbenzene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,1,2,2-Tetrachloroethane	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Bromobenzene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,2,3-Trichloropropane	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
n-Propylbenzene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
2-Chlorotoluene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,3,5-Trimethylbenzene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
4-Chlorotoluene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
tert-Butylbenzene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,2,4-Trimethylbenzene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
sec-Butylbenzene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,3-Dichlorobenzene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
p-Isopropyltoluene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,4-Dichlorobenzene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	4.7S
n-Butylbenzene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,2-Dichlorobenzene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	4.7S
1,2-Dibromo-3-chloropropane	1	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
1,2,4-Trichlorobenzene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Hexachlorobutadiene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S
Naphthalene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	50	10G
1,2,3-Trichlorobenzene	0.5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	5	5S

Qualifiers
J: Concentration was estimated
U: Compound not detected
UJ: Compound not detected - the sample quantitation limit is an estimate

A value followed by a U or a UJ is an elevated detection limit due to blank contamination

Notes
F: First sample collected before carbon units
M: Middle sample collected between carbon units
L: Last sample collected after carbon units
S: Standard
G: Guidance value
*: Standard for trihalomethanes (chloroform, bromodichloromethane, dibromochloromethane, and bromoform) = 100 ppb
TB: Trip blank sample

TABLE 5 (Continued)
BECKER ELECTRONICS SITE
PRIVATE WATER SUPPLY SAMPLING*
524.2 VOLATILE ORGANIC COMPOUNDS

COMPOUNDS **	PW-1F UG/L	PW-1M UG/L	PW-1L UG/L	PW-2F UG/L	PW-2M UG/L	PW-2L UG/L	PW-3 UG/L	PW-4 UG/L	PW-5F UG/L	PW-5M UG/L	PW-5L UG/L
TRICHLOROFLUOROMETHANE	1.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHANE	30	ND	ND	2.2	9.9	ND	3.4	ND	27	ND	ND
1,1,1-TRICHLOROETHANE	5.8	ND	ND	4.0	ND	ND	ND	4.3	5.4	ND	ND
1,1-DICHLOROETHENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
METHYLENE CHLORIDE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TRICHLOROETHENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

COMPOUNDS **	PW-6F UG/L	PW-6M UG/L	PW-6L UG/L	PW-9F UG/L	PW-9M UG/L	PW-9L UG/L	PW-10F UG/L	PW-10M UG/L	PW-10L UG/L
TRICHLOROFLUOROMETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHANE	60	50	2.3	2.5	ND	ND	ND	ND	ND
1,1,1-TRICHLOROETHANE	1.3	ND	ND	1.5	ND	ND	0.8	ND	ND
1,1-DICHLOROETHENE	1.8	ND	ND	ND	ND	ND	ND	ND	ND
METHYLENE CHLORIDE	ND	ND	ND	ND	ND	ND	ND	1.5 **B**	ND
TRICHLOROETHENE	ND	ND	ND	ND	ND	ND	ND	ND	ND

COMPOUNDS **	PW-11F UG/L	PW-11M UG/L	PW-11L UG/L	PW-13F UG/L	PW-13M UG/L	PW-13L UG/L
TRICHLOROFLUOROMETHANE	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHANE	4.2	1.2	ND	8.0	ND	ND
1,1,1-TRICHLOROETHANE	12	ND	ND	4.1	ND	ND
1,1-DICHLOROETHENE	2.0	ND	ND	2.1	ND	ND
METHYLENE CHLORIDE	ND	ND	ND	ND	ND	ND
TRICHLOROETHENE	2.1	ND	ND	ND	ND	ND

NOTES:

ND - **Not Detected**
B - **Compound Also Found in Trip Blank Sample**
* - - **All Samples Obtained on 8/29/91**
** - **Only Compounds Detected Are Shown**

Table 6
Becker Electronics Site
Fire Pond Water Sampling
Volatile Organic Compounds

SAMPLE LOCATION:		FP-1-SW	FP-1-BW	FP-2-SW	FP-2-SW-DUP	FP-2-BW	FP-2-BW-DUP	FP-3-SW	FP-3-BW	NYSDEC Class C Surface Water Standards/ Guidance Values
DATE SAMPLED:		11/14/90	11/14/90	11/14/90	11/14/90	11/14/90	11/14/90	11/14/90	11/14/90	
UNITS:		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
COMPOUND	CRQL									
Chloromethane	10	U	U	U	U	U	U	U	U	---
Bromomethane	10	U	U	U	U	U	U	U	U	---
Vinyl Chloride	10	U	U	U	U	U	U	U	U	---
Chloroethane	10	U	U	U	U	U	U	U	U	---
Methylene Chloride	5	U	U	U	7U	U	6U	U	U	---
Acetone	10	U	U	25U	17U	13U	U	U	U	---
Carbon Disulfide	5	U	U	U	U	U	U	U	U	---
1,1-Dichloroethene	5	U	U	U	U	U	U	U	U	---
1,1-Dichloroethane	5	U	U	U	U	U	U	U	U	---
1,2-Dichloroethene (total)	5	U	U	U	U	U	U	U	U	---
Chloroform	5	U	U	U	U	U	U	U	U	---
1,2-Dichloroethane	5	U	U	U	U	U	U	U	U	---
2-Butanone	10	U	U	U	U	U	U	U	U	---
1,1,1-Trichloroethane	5	U	U	U	U	U	U	U	U	---
Carbon Tetrachloride	5	U	U	U	U	U	U	U	U	---
Vinyl Acetate	10	U	U	U	U	U	U	U	U	---
Bromodichloromethane	5	U	U	U	U	U	U	U	U	---
1,2-Dichloropropane	5	U	U	U	U	U	U	U	U	---
cis-1,3-Dichloropropene	5	U	U	U	U	U	U	U	U	---
Trichloroethene	5	U	U	U	U	U	U	U	U	11G
Dibromochloromethane	5	U	U	U	U	U	U	U	U	---
1,1,2-Trichloroethane	5	U	U	U	U	U	U	U	U	---
Benzene	5	U	U	U	U	U	U	U	U	6G
trans-1,3-Dichloropropene	5	U	U	U	U	U	U	U	U	---
Bromoform	5	U	U	U	U	U	U	U	U	---
4-Methyl-2-pentanone	10	U	U	U	U	U	U	U	U	---
2-Hexanone	10	U	U	U	U	U	U	U	U	---
Tetrachloroethene	5	U	U	U	U	U	U	U	U	1G
1,1,2,2-Tetrachloroethane	5	U	U	U	U	U	U	U	U	---
Toluene	5	U	U	U	U	U	U	U	U	---
Chlorobenzene	5	U	U	U	U	U	U	U	U	5S
Ethylbenzene	5	U	U	U	U	U	U	U	U	---
Styrene	5	U	U	U	U	U	U	U	U	---
Total Xylenes	5	U	U	U	U	U	U	U	U	---

Qualifiers

U: Compound not detected
UJ: Compound not detected - the sample quantitation limit is an estimate

Notes

CRQL: Contract Required Quantitation Limits
SW: Surface Water - Sample collected near water surface of pond
BW: Basal Water - Sample collected at bottom of pond
DUP: Duplicate sample
G: Guidance value
S: Standard

A value followed by a U or a UJ is an elevated detection limit due to blank contamination

Table 7
Becker Electronics Site
Fire Pond Water Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION:		FP-1-SW	FP-1-BW	FP-2-SW	FP-2-BW	FP-3-BW	FP-3-SW	FP-3-SW-RE	FP-3-DUP	FP-BW-EQB	NYSDEC Class C Surface Water Standards/ Guidance Values
DATE SAMPLED:		11/14/90	11/14/90	11/14/90	4/30/91	4/30/91	4/30/91	4/30/91	4/30/91	4/30/91	
UNITS:		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
COMPOUND	CRQL										
Phenol	10	U	U	U	U	U	U	U	U	U	5S
bis(2-Chloroethyl) ether	10	U	U	U	U	U	U	U	U	U	---
2-Chlorophenol	10	U	U	U	U	U	U	U	U	U	1S
1,3-Dichlorobenzene	10	U	U	U	U	U	U	U	U	U	5S
1,4-Dichlorobenzene	10	U	U	U	U	U	U	U	U	U	5S
Benzyl Alcohol	10	U	U	U	U	U	U	U	U	U	---
1,2-Dichlorobenzene	10	U	U	U	U	U	U	U	U	U	5S
2-Methylphenol	10	U	U	U	U	U	U	U	U	U	5S
bis(2-Chloroisopropyl) ether	10	U	U	U	U	U	U	U	U	U	---
4-Methylphenol	10	U	U	U	U	U	U	U	U	U	5S
N-Nitroso-di-n-propylamine	10	U	U	U	R	R	R	R	R	R	---
Hexachloroethane	10	U	U	U	U	U	U	U	U	U	---
Nitrobenzene	10	U	U	U	U	U	U	U	U	U	---
Isophorone	10	U	U	U	U	U	U	U	U	U	---
2-Nitrophenol	10	U	U	U	U	U	U	U	U	U	5S
2,4-Dimethylphenol	10	U	U	U	U	U	U	U	U	U	5S
Benzoic Acid	50	U	U	U	U	U	U	U	U	U	---
bis(2-Chloroethoxy)methane	10	U	U	U	U	U	U	U	U	U	---
2,4-Dichlorophenol	10	U	U	U	U	U	U	U	U	U	1S
1,2,4-Trichlorobenzene	10	U	U	U	U	U	U	U	U	U	5S
Naphthalene	10	U	U	U	U	U	U	U	U	U	---
4-Chloroaniline	10	UJ	UJ	UJ	U	U	U	U	U	U	---
Hexachlorobutadiene	10	U	U	U	U	U	U	U	U	U	1S
4-Chloro-3-Methylphenol	10	U	U	U	U	U	U	U	U	U	1S
2-Methylnaphthalene	10	U	U	U	U	U	U	U	U	U	---
Hexachlorocyclopentadiene	10	U	U	U	U	U	U	U	U	U	0.45S
2,4,6-Trichlorophenol	10	U	U	U	U	U	U	U	U	U	1S
2,4,5-Trichlorophenol	50	U	U	U	U	U	U	U	U	U	1S
2-Chloronaphthalene	10	U	U	U	U	U	U	U	U	U	---
2-Nitroaniline	50	U	U	U	U	U	U	U	U	U	---
Dimethylphthalate	10	U	U	U	U	U	U	U	U	U	---
Acenaphthylene	10	U	U	U	U	U	U	U	U	U	---
2,6-Dinitrotoluene	10	U	U	U	U	U	U	U	U	U	---
3-Nitroaniline	50	U	U	U	U	U	U	U	U	U	---
Acenaphthene	10	U	U	U	U	U	U	U	U	U	---
2,4-Dinitrophenol	50	U	U	U	U	U	U	U	U	U	5S

(continued on next page)

Table 7 (continued)
Becker Electronics Site
Fire Pond Water Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION:		FP-1-SW	FP-1-BW	FP-2-SW	FP-2-BW	FP-3-BW	FP-3-SW	FP-3-SW-RE	FP-3-DUP	FP-BW-EQB	NYSDEC Class C Surface Water Standards/ Guidance Values
DATE SAMPLED:		11/14/90	11/14/90	11/14/90	4/30/91	4/30/91	4/30/91	4/30/91	4/30/91	4/30/91	
UNITS:		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
COMPOUND	CRQL										
4-Nitrophenol	50	U	U	U	U	U	U	U	U	U	5S
Dibenzofuran	10	U	U	U	U	U	U	U	U	U	---
2,4-Dinitrotoluene	10	U	U	U	R	R	R	R	R	R	---
Diethylphthalate	10	U	U	U	U	U	U	U	U	U	---
4-Chlorophenyl-Phenylether	10	U	U	U	U	U	U	U	U	U	---
Fluorene	10	U	U	U	U	U	U	U	U	U	---
4-Nitroaniline	50	U	U	U	U	U	U	U	U	U	---
4,6-Dinitro-2-Methylphenol	50	U	U	U	U	U	U	U	U	U	5S
N-nitrosodiphenylamine(1)	10	U	U	U	U	U	U	U	U	U	---
4-Bromophenyl-Phenylether	10	U	U	U	U	U	U	U	U	U	---
Hexachlorobenzene	10	U	U	U	U	U	U	U	U	U	---
Pentachlorophenol	50	U	U	U	U	U	U	U	U	U	0.4S
Phenanthrene	10	U	U	U	U	U	U	U	U	U	---
Anthracene	10	U	U	U	U	U	U	U	U	U	---
Di-n-butylphthalate	10	U	U	U	U	U	U	U	U	U	---
Fluoranthene	10	U	U	U	U	U	U	U	U	U	---
Pyrene	10	U	U	U	U	U	UJ	U	U	U	---
Butylbenzylphthalate	10	U	U	U	U	U	UJ	U	U	U	---
3,3'-Dichlorobenzidine	20	U	U	U	UJ	UJ	UJ	UJ	UJ	UJ	---
Benzo(a)anthracene	10	U	U	U	U	U	UJ	U	U	U	---
Chrysene	10	U	U	U	U	U	UJ	U	U	U	---
Bis(2-ethylhexyl)phthalate	10	U	U	9U	U	U	UJ	U	U	U	0.6S
Di-n-octylphthalate	10	U	U	U	U	U	UJ	UJ	U	U	---
Benzo(b)fluoranthene	10	U	U	U	U	U	UJ	UJ	U	U	---
Benzo(k)fluoranthene	10	U	U	U	U	U	UJ	UJ	U	U	---
Benzo(a)pyrene	10	U	U	U	U	U	UJ	UJ	U	U	0.0012G
Indeno(1,2,3-cd)pyrene	10	U	U	U	U	U	UJ	UJ	U	U	---
Dibenz(a,h)anthracene	10	U	U	U	U	U	UJ	UJ	U	U	---
Benzo(g,h,i)perylene	10	U	U	U	U	U	UJ	UJ	U	U	---

<u>Qualifiers</u>

U: Compound not detected
UJ: Compound not detected - the sample quantitation limit is an estimate
R: Value was rejected

<u>Notes</u>

CRQL: Contract Required Quantitation Limits
DUP: Duplicate sample
SW: Surface water - sample collected near water surface of pond
BW: Basal water - sample collected at bottom of pond
S: Standard
G: Guidance value
RE: Sample re-analyzed
EQB: Equipment blank sample

A value followed by a U or a UJ is an elevated detection limit due to blank contamination

Table 8
Becker Electronics Site
Fire Pond Water Sampling
Pesticides/PCBs

SAMPLE LOCATION:		FP-1-SW	FP-2-SW	FP-3-SW	FP-3-SW-DUP	NYSDEC Class C Surface Water Standards/ Guidance Values
DATE SAMPLED:		4/30/91	4/30/91	4/30/91	4/30/91	
UNITS:		µg/l	µg/l	µg/l	µg/l	µg/l
COMPOUND	CRQL					
alpha-BHC	0.05	U	U	U	U	0.01S
beta-BHC	0.05	U	U	U	U	0.01S
delta-BHC	0.05	U	U	U	U	0.01S
gamma-BHC(Lindane)	0.05	U	U	U	U	0.01S
Heptachlor	0.05	U	U	U	U	0.001S
Aldrin	0.05	U	U	U	U	0.001S
Heptachlor Epoxide	0.05	U	U	U	U	0.001S
Endosulfan I	0.05	U	U	U	U	0.009S
Dieldrin	0.1	U	U	U	U	0.001S
4,4'-DDE	0.1	U	U	U	U	0.001S
Endrin	0.1	U	U	U	U	0.002S
Endosulfan II	0.1	U	U	U	U	0.009S
4,4'-DDD	0.1	U	U	U	U	0.001S
Endosulfan Sulfate	0.1	U	U	U	U	0.009S
4,4'-DDT	0.1	U	U	U	U	0.001S
Methoxychlor	0.5	U	U	U	U	0.03S
Endrin Ketone	0.1	U	U	U	U	0.002S
alpha-Chlordane	0.5	U	U	U	U	0.002G
gamma-Chlordane	0.5	U	U	U	U	0.002G
Toxaphene	1	U	U	U	U	0.005S
Aroclor-1016	0.5	U	U	U	U	0.001S
Aroclor-1221	0.5	U	U	U	U	0.001S
Aroclor-1232	0.5	U	U	U	U	0.001S
Aroclor-1242	0.5	U	U	U	U	0.001S
Aroclor-1248	0.5	U	U	U	U	0.001S
Aroclor-1254	1	U	U	U	U	0.001S
Aroclor-1260	1	U	U	U	U	0.001S

Qualifier
U: Compound not detected

Notes
CRQL: Contract Required Quantitation Limits
SW: Surface Water - sample collected near water surface of pond
DUP: Duplicate sample
S: Standard
G: Guidance vlaue

Table 9
Becker Electronics Site
Fire Pond Water Sampling
Inorganic Constituents

SAMPLE LOCATION:		FP-1-SW	FP-1-BW	FP-2-SW	FP-2-SW-DUP	FP-2-BW	FP-2-BW-DUP	NYSDEC Class C Surface Water Standards/ Guidance Values
DATE SAMPLED:		11/14/90	11/14/90	11/14/90	11/14/90	11/14/90	11/14/90	
UNITS:		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
ELEMENTS	CRDL							
ALUMINUM	200	R	R	R	R	R	R	100S
ANTIMONY	60	R	R	R	R	R	R	---
ARSENIC	10	UJ	11.6	U	UJ	6.9B	0.8BJ	190S
BARIUM	200	69BJ	1170J	72BJ	78BJ	433J	90BJ	---
BERYLLIUM	5	UJ	15J	UJ	UJ	5J	UJ	11S*
CADMIUM	5	UJ	9J	UJ	UJ	5J	UJ	0.9S*
CALCIUM	5000	25400J	54100J	27000J	29900J	36400J	29700J	---
CHROMIUM	10	UJ	62J	UJ	7BJ	27J	UJ	156S*
COBALT	50	UJ	64J	UJ	UJ	18BJ	UJ	5S
COPPER	25	7BJ	202J	9BJ	9BJ	136J	11BJ	9S*
IRON	100	770J	80200J	780J	722J	29700J	1310J	300S
LEAD	3	R	185J	R	R	84J	R	2S*
MAGNESIUM	5000	2730BJ	17300J	2730BJ	2650BJ	8010J	2850BJ	---
MANGANESE	15	159J	6050J	158J	162J	1480J	224J	---
MERCURY	0.2	U	U	U	U	U	U	0.2G
NICKEL	40	UJ	147J	UJ	UJ	47J	UJ	74S*
POTASSIUM	5000	2040BJ	7140J	1950BJ	2530BJ	4570BJ	2450BJ	---
SELENIUM	5	U	UJ	UJ	U	UJ	U	1S
SILVER	10	R	R	R	R	R	R	0.1S
SODIUM	5000	5270J	6040J	5700J	6100J	6780J	6570J	---
THALLIUM	10	U	U	U	U	U	U	8S
VANADIUM	50	UJ	79J	UJ	UJ	35BJ	UJ	14S
ZINC	20	61J	710J	56J	41J	R	R	30S

Qualifiers

J: Concentration was estimated
R: Value was rejected
U: Not detectable at the IDL
B: Value is between the IDL and CRDL
UJ: Compound not detected - the sample quantitation limit is an estimate

Notes

CRDL: Contract Required Detection Limits
DUP: Duplicate Sample
SW: Surface Water - Sample collected near water surface of pond
BW: Basal Water - Sample collected at bottom of pond
S: Standard
G: Guidance value
*: Values are calculated based on a hardness of 71 mg/l

Table 9 (continued)
Becker Electronics Site
Fire Pond Water Sampling
Inorganic Constituents

SAMPLE LOCATION:		FP-3-SW	FP-3-BW	FP-SW-EQB	FP-BW-EQB	NYSDEC Class C Surface Water Standards/
DATE SAMPLED:		11/14/90	11/14/90	11/14/90	11/14/90	Guidance Values
UNITS:		µg/l	µg/l	µg/l	µg/l	µg/l
ELEMENTS	CRDL					
ALUMINUM	200	R	R	R	R	100S
ANTIMONY	60	R	R	R	R	---
ARSENIC	10	UJ	3.1B	U	U	190S
BARIUM	200	81BJ	279J	UJ	UJ	---
BERYLLIUM	5	UJ	UJ	UJ	UJ	11S*
CADMIUM	5	UJ	UJ	UJ	UJ	0.9S*
CALCIUM	5000	29400	33500J	UJ	UJ	---
CHROMIUM	10	UJ	UJ	UJ	UJ	156S*
COBALT	50	UJ	UJ	UJ	UJ	5S
COPPER	25	10BJ	21BJ	UJ	UJ	9S*
IRON	100	802J	7660J	139J	78BJ	300S
LEAD	3	R	R	8.7	4.2	2S*
MAGNESIUM	5000	2760BJ	3710BJ	UJ	UJ	---
MANGANESE	15	153J	4150J	31J	UJ	---
MERCURY	0.2	U	U	U	U	0.2G
NICKEL	40	UJ	UJ	UJ	UJ	74S*
POTASSIUM	5000	1810BJ	2700BJ	UJ	UJ	---
SELENIUM	5	U	U	U	U	1S
SILVER	10	R	R	R	R	0.1S
SODIUM	5000	6930J	6410J	UJ	UJ	---
THALLIUM	10	U	U	U	U	8S
VANADIUM	50	UJ	11BJ	UJ	UJ	14S
ZINC	20	63J	R	19BJ	43J	30S

Qualifiers
J: Concentration was estimated
R: Value was rejected
U: Not detectable at the IDL
B: Value is between the IDL and CRDL
UJ: Compound not detected - the sample quantitation limit is an estimate

Notes
CRDL: Contract Required Detection Limits
EQB: Equipment blank sample
SW: Surface Water - Sample collected near water surface of pond
BW: Basal Water - Sample collected at bottom of pond
S: Standard
G: Guidance value
*: Values are calculated based on a hardness of 71 mg/l

Table 10
Becker Electronics Site
Fire Pond Sediment Sampling
Volatile Organic Compounds

SAMPLE LOCATION:		FP-1-SED	FP-2-SED	FP-3-SED	FP-3-SED-DUP	FP-SED-EQB	FP-TB	NYSDEC Sediment Criteria
DATE SAMPLED:		5/1/91	5/1/91	5/1/91	5/1/91	5/1/91	5/1/91	
UNITS:		µg/kg	µg/kg	µg/kg	µg/kg	µg/l	µg/l	µg/kg
COMPOUND	CRQL							
Chloromethane	10	U	U	U	U	U	U	---
Bromomethane	10	U	U	U	U	U	U	---
Vinyl Chloride	10	U	U	U	U	U	U	1 (H)
Chloroethane	10	U	U	U	U	U	U	---
Methylene Chloride	5	U	U	13U	U	U	86U	---
Acetone	10	U	43U	U	U	U	U	---
Carbon Disulfide	5	U	U	U	U	U	U	---
1,1-Dichloroethene	5	U	U	U	U	U	U	0.35 (H)
1,1-Dichloroethane	5	U	U	U	U	U	U	---
1,2-Dichloroethene (total)	5	U	U	U	U	U	U	---
Chloroform	5	U	U	U	U	U	U	---
1,2-Dichloroethane	5	U	U	U	U	U	U	12 (H)
2-Butanone	10	U	U	U	U	U	U	---
1,1,1-Trichloroethane	5	U	U	U	U	U	U	---
Carbon Tetrachloride	5	U	U	U	U	U	U	10 (H)
Vinyl Acetate	10	U	U	U	U	U	U	---
Bromodichloromethane	5	U	U	U	U	U	U	---
1,2-Dichloropropane	5	U	U	U	U	U	U	---
cis-1,3-Dichloropropene	5	U	U	U	U	U	U	---
Trichloroethene	5	U	U	U	U	U	U	35 (H), 24 (G)
Dibromochloromethane	5	U	U	U	U	U	U	---
1,1,2-Trichloroethane	5	U	U	U	U	U	U	10 (H)
Benzene	5	U	U	U	U	U	U	10 (H), 9 (G)
trans-1,3-Dichloropropene	5	U	U	U	U	U	U	---
Bromoform	5	U	U	U	U	U	U	---
4-Methyl-2-pentanone	10	U	U	U	U	U	U	---
2-Hexanone	10	U	U	U	U	U	U	---
Tetrachloroethene	5	U	U	U	U	U	U	14 (H), 6(G)
1,1,2,2-Tetrachloroethane	5	U	U	U	U	U	U	5 (H)
Toluene	5	U	U	U	U	U	U	---
Chlorobenzene	5	U	U	U	U	U	U	61 (A), 29 (S)
Ethylbenzene	5	U	U	U	U	U	U	---
Styrene	5	U	U	U	U	U	U	---
Total Xylenes	5	U	U	U	U	U	U	---

Qualifiers
U: Compound not detected
UJ: Compound not detected - the sample quantitation limit is an estimate

Notes
CRQL: Contract Required Quantitation Limits
DUP: Duplicate sample
SED: Sediment sample
EQB: Equipment blank sample
TB: Trip blank sample

(A): Criteria calculated based on Aquatic Toxicity basis
(H): Criteria calculated based on Human Health Residue basis
(G): Criteria calculated based on Koc value and Class C surface water guidance value
(S): Criteria calculated based on Koc value and Class C surface water standard

A value followed by a U or a UJ is an elevated detection limit due to blank contamination

\BECKER\VOL-S\VOL-SED.XLU (T-10,18,26)

Table 11
Becker Electronics Site
Fire Pond Sediment Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION:		FP-1-SED	FP-1-SED-RE	FP-2-SED	FP-3-SED	FP-3-SED-DUP	FP-SED-EQB	NYSDEC Sediment Criteria
DATE SAMPLED:		5/1/91	5/1/91	5/1/91	5/1/91	5/1/91	5/1/91	
UNITS:		µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/l	µg/kg
COMPOUND	CRQL							
Phenol	330	UJ	UJ	U	U	U	U	9 (A), 1 (S)
bis(2-Chloroethyl) ether	330	UJ	UJ	U	U	U	U	0.17 (H)
2-Chlorophenol	330	UJ	UJ	U	U	U	U	10 (A)
1,3-Dichlorobenzene	330	UJ	UJ	U	U	U	U	209 (A), 148 (S)
1,4-Dichlorobenzene	330	UJ	UJ	U	U	U	U	209 (A), 148 (S)
Benzyl Alcohol	330	UJ	UJ	U	U	U	U	---
1,2-Dichlorobenzene	330	UJ	UJ	U	U	U	U	209 (A), 148 (S)
2-Methylphenol	330	UJ	UJ	U	U	U	U	9 (A)
bis(2-Chloroisopropyl) ether	330	UJ	UJ	U	U	U	U	---
4-Methylphenol	330	UJ	UJ	U	U	U	U	9 (A)
N-Nitroso-di-n-propylamine	330	UJ	UJ	U	U	U	U	---
Hexachloroethane	330	UJ	UJ	U	U	U	U	---
Nitrobenzene	330	UJ	UJ	U	U	U	U	---
Isophorone	330	UJ	UJ	U	U	U	U	---
2-Nitrophenol	330	UJ	UJ	U	U	U	U	9 (A)
2,4-Dimethylphenol	330	UJ	UJ	U	U	U	U	9 (A)
Benzoic Acid	1600	UJ	UJ	650J	U	U	U	---
bis(2-Chloroethoxy)methane	330	UJ	UJ	U	U	U	U	---
2,4-Dichlorophenol	330	UJ	UJ	U	U	U	U	10 (A), 7 (S)
1,2,4-Trichlorobenzene	330	UJ	UJ	U	U	U	U	1,583 (A), 800 (S)
Naphthalene	330	UJ	UJ	U	U	U	U	---
4-Chloroaniline	330	UJ	UJ	U	U	U	U	---
Hexachlorobutadiene	330	UJ	UJ	U	U	U	U	94 (A), 505 (S)
4-Chloro-3-Methylphenol	330	UJ	UJ	U	U	U	U	10 (A)
2-Methylnaphthalene	330	UJ	UJ	U	U	U	U	---
Hexachlorocyclopentadiene	330	UJ	UJ	UJ	U	U	U	77 (A), 38 (S)
2,4,6-Trichlorophenol	330	UJ	UJ	U	U	U	U	10 (A), 35 (S)
2,4,5-Trichlorophenol	1600	UJ	UJ	U	U	U	U	10 (A), 2 (S)
2-Chloronaphthalene	330	UJ	UJ	U	U	U	U	---
2-Nitroaniline	1600	UJ	UJ	U	U	U	U	---
Dimethylphthalate	330	UJ	UJ	U	U	U	U	---
Acenaphthylene	330	UJ	UJ	U	U	U	U	---
2,6-Dinitrotoluene	330	UJ	UJ	U	U	U	U	2 (H)
3-Nitroaniline	330	UJ	UJ	U	U	U	U	---
Acenaphthene	330	UJ	UJ	U	U	U	U	12,702 (A)
2,4-Dinitrophenol	1600	UJ	UJ	U	U	U	U	9 (A), 1 (S)

(continued on next page)

Table 11 (continued)
Becker Electronics Site
Fire Pond Sediment Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION:		FP-1-SED	FP-1-SED-RE	FP-2-SED	FP-3-SED	FP-3-SED-DUP	FP-SED-EQB	NYSDEC Sediment Criteria
DATE SAMPLED:		5/1/91	5/1/91	5/1/91	5/1/91	5/1/91	5/1/91	
UNITS:		µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/l	µg/kg
COMPOUND	CRQL							
4-Nitrophenol	1600	UJ	UJ	180J	U	U	U	9 (A), 2 (S)
Dibenzofuran	330	UJ	UJ	U	U	U	U	---
2,4-Dinitrotoluene	330	UJ	UJ	U	U	U	U	---
Diethylphthalate	330	UJ	UJ	U	U	U	U	---
4-Chlorophenyl-Phenylether	330	UJ	UJ	U	U	U	U	---
Fluorene	330	UJ	UJ	U	U	U	U	---
4-Nitroaniline	1600	UJ	UJ	U	U	U	U	---
4,6-Dinitro-2-Methylphenol	1600	UJ	UJ	U	U	U	U	9 (A)
N-nitrosodiphenylamine	330	UJ	UJ	U	U	U	U	---
4-Bromophenyl-Phenylether	330	UJ	UJ	U	U	U	U	---
Hexachlorobenzene	330	UJ	UJ	U	U	U	U	131,683 (A)
Pentachlorophenol	1600	UJ	UJ	U	U	U	U	696 (A), 369 (S)
Phenanthrene	330	UJ	UJ	U	U	U	U	2,419 (A)
Anthracene	330	UJ	UJ	U	U	U	U	---
Di-n-butylphthalate	330	UJ	UJ	U	U	U	U	---
Fluoranthene	330	UJ	UJ	U	U	U	U	---
Pyrene	330	UJ	UJ	U	U	U	U	---
Butylbenzylphthalate	330	UJ	UJ	44J	U	U	U	---
3,3'-Dichlorobenzidine	660	UJ	UJ	U	U	U	UJ	---
Benzo(a)anthracene	330	UJ	UJ	U	U	U	U	23 (H)
Chrysene	330	UJ	UJ	U	U	U	U	23 (H)
Bis(2-ethylhexyl)phthalate	330	UJ	UJ	1100J	U	U	U	2,083 (A), 75 (S)
Di-n-octylphthalate	330	UJ	UJ	U	U	U	U	---
Benzo(b)fluoranthene	330	UJ	UJ	U	U	U	U	23 (H)
Benzo(k)fluoranthene	330	UJ	UJ	U	U	U	U	23 (H)
Benzo(a)pyrene	330	UJ	UJ	U	U	U	U	23 (H), 115 (G)
Indeno(1,2,3-cd)pyrene	330	UJ	UJ	U	U	U	U	23 (H)
Dibenz(a,h)anthracene	330	UJ	UJ	U	U	U	U	---
Benzo(g,h,i)perylene	330	UJ	UJ	U	U	U	U	---

Qualifiers
J: Concentration was estimated
U: Compound not detected
UJ: Compound not detected - the sample quantitation limit is an estimate

Notes
CRQL: Contract Required Quantitation Limits
SED: Sediment sample
RE: Sample reanalyzed
DUP: Duplicate sample
EQB: Equipment blank sample

(A): Criteria calculated based on Aquatic Toxicity basis
(H): Criteria calculated based on Human Health Residue basis
(G): Criteria calculated based on Koc value and Class C surface water guidance value
(S): Criteria calculated based on Koc value and Class C surface water standard

Table 12
Becker Electronics Site
Fire Pond Sediment Sampling
Pesticides/PCBs

SAMPLE LOCATION:		FP-1-SD	FP-2-SD	FP-3-SD	FP-3-SD-DUP	NYSDEC Sediment Criteria
DATE SAMPLED:		11/14/90	11/14/90	11/14/90	11/14/90	
UNITS:		µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
COMPOUND	CRQL					
alpha-BHC	8	U	U	U	U	1 (A), 0.66 (S)
beta-BHC	8	U	U	U	U	1 (A), 0.66 (S)
delta-BHC	8	U	U	U	U	1 (A), 1.15 (S)
gamma-BHC(Lindane)	8	U	U	U	U	1 (A), 0.19 (S)
Heptachlor	8	U	U	U	U	0.52 (A), 0.21 (S)
Aldrin	8	U	U	U	U	146 (A), 1.67 (S)
Heptachlor Epoxide	8	U	U	U	U	0.52 (A), 0.004 (S)
Endosulfan I	8	U	U	U	U	0.52 (A)
Dieldrin	16	U	U	U	U	146 (A), 0.03 (S)
4,4'-DDE	16	U	U	U	U	870 (A), 76.56 (S)
Endrin	16	U	U	U	U	14 (A)
Endosulfan II	16	U	U	U	U	0.52 (A)
4,4'-DDD	16	U	U	U	U	870 (A), 13.4 (S)
Endosulfan Sulfate	16	U	U	U	U	0.52 (A)
4,4'-DDT	16	U	U	U	U	870 (A), 4.23 (S)
Methoxychlor	80	U	U	U	U	10 (A)
Endrin Ketone	16	U	U	U	U	14 (A)
alpha-Chlordane	80	U	U	U	U	0.10 (A), 4.87(G)
gamma-Chlordane	80	U	U	U	U	0.10 (A), 4.87(G)
Toxaphene	160	U	U	U	U	0.17 (A), 0.08 (S)
Aroclor-1016	80	U	U	U	U	---
Aroclor-1221	80	U	U	U	U	---
Aroclor-1232	80	U	U	U	U	---
Aroclor-1242	80	U	U	U	U	---
Aroclor-1248	80	U	U	U	U	---
Aroclor-1254	160	U	U	U	U	4,802 (A), 0.74 (S)
Aroclor-1260	160	U	U	U	U	---

Qualifiers
U: Compound not detected

Notes
CRQL: Contract Required Quantitation Limits
SD: Sediment sample
DUP: Duplicate sample
(A): Criteria calculated based on Aquatic Toxicity basis
(H): Criteria calculated based on Human Health Residue basis
(G): Criteria calculated based on Koc value and Class C surface water guidance value
(S): Criteria calculated based on Koc value and Class C surface water standard

Table 13
Becker Electronics Site
Fire Pond Sediment Sampling
Inorganic Constituents

SAMPLE LOCATION:		FP-1-SD	FP-2-SD	FP-3-SD	FP-3-SD-DUP	FP-EQB	NYSDEC Sediment Criteria	
DATE SAMPLED:		11/14/90	11/14/90	11/14/90	11/14/90	11/14/90		
UNITS:		mg/kg	mg/kg	mg/kg	mg/kg	µg/l	mg/kg	
ELEMENTS	CRDL						Sediment Criteria	Limit of Tolerance*
ALUMINUM	40	10200J	11300J	14100J	19100J	R	- - -	- - -
ANTIMONY	12	R	R	R	R	R	- - -	- - -
ARSENIC	2	R	R	R	R	U	5	33
BARIUM	40	60.2J	118J	91.4J	84.0J	UJ	- - -	- - -
BERYLLIUM	1	3.4J	4.1J	5.4J	7.9J	UJ	- - -	- - -
CADMIUM	1	0.79UJ	0.91BJ	1.3J	1.3J	UJ	0.8	10
CALCIUM	1000	1380J	2320J	2770J	2460J	UJ	- - -	- - -
CHROMIUM	2	13.9J	16.8J	20.0J	28.9J	UJ	26	111
COBALT	10	9.7BJ	27.7J	14.8J	17.6J	UJ	- - -	- - -
COPPER	5	15.4J	693J	1.4UJ	2.1BJ	UJ	19	114
IRON	20	20200J	23900J	32600J	51400J	252J	24,000	40,000
LEAD	0.6	14.0J	32.7J	5.0J	4.4J	U	27	250
MAGNESIUM	1000	2960J	3910J	4610J	4960J	UJ	- - -	- - -
MANGANESE	3	218J	557J	354J	286J	58J	428	1,100
MERCURY	0.1	0.13U	0.11U	0.11U	0.13U	U	0.11	2
NICKEL	8	25.4J	36.4J	47.0J	53.5J	UJ	22	90
POTASSIUM	1000	1190BJ	1390J	1350J	1880J	UJ	- - -	- - -
SELENIUM	1	0.31UJ	0.27UJ	0.26UJ	0.31UJ	U	- - -	- - -
SILVER	2	R	R	R	R	R	- - -	- - -
SODIUM	1000	317UJ	275UJ	260UJ	318UJ	UJ	- - -	- - -
THALLIUM	2	0.18U	0.16U	0.15U	0.18U	U	- - -	- - -
VANADIUM	10	16.2J	14.8J	20.0J	36.5J	UJ	- - -	- - -
ZINC	4	58.1J	88.2J	79.2J	90.6J	37J	85	800

Qualifiers

J: Concentration was estimated
R: Value was rejected
U: Not detectable at the IDL
B: Value is between the IDL and CRDL
UJ: Compound not detected - the sample quantitation limit is an estimate

Notes

CRDL: Contract Required Detection Limits
EQB: Equipment blank sample
DUP: Duplicate sample
SD: Sediment sample
- - -: Not available
*: Concentration that would be detrimental to the majority of species, potentially eliminating most

Table 14
Becker Electronics Site
Drainage Ditch Water Sampling
Volatile Organic Compounds

SAMPLE LOCATION: DATE SAMPLED: UNITS:		DD-1-SW 11/16/90 µg/l	DD-2-SW 11/15/90 µg/l	DD-3-SW 11/15/90 µg/l	DD-4-SW 11/13/90 µg/l	DD-5-SW 11/15/90 µg/l	DD-6-SW 11/15/90 µg/l	NYSDEC Class C Surface Water Standards/ Guidance Values µg/l
COMPOUND	**CRQL**							
Chloromethane	10	U	U	U	U	U	UJ	---
Bromomethane	10	U	U	U	U	U	UJ	---
Vinyl Chloride	10	U	U	U	U	U	UJ	---
Chloroethane	10	U	U	U	U	U	UJ	---
Methylene Chloride	5	U	U	U	U	U	UJ	---
Acetone	10	U	U	U	U	U	UJ	---
Carbon Disulfide	5	U	U	U	U	U	UJ	---
1,1-Dichloroethene	5	U	U	U	U	U	UJ	---
1,1-Dichloroethane	5	U	U	U	U	26	5J	---
1,2-Dichloroethene (total)	5	U	16	U	U	U	UJ	---
Chloroform	5	U	U	U	U	U	UJ	---
1,2-Dichloroethane	5	U	U	U	U	U	UJ	---
2-Butanone	10	U	U	U	U	U	UJ	---
1,1,1-Trichloroethane	5	U	U	5J	3J	62J	25J	---
Carbon Tetrachloride	5	U	U	U	U	U	UJ	---
Vinyl Acetate	10	U	U	U	U	U	UJ	---
Bromodichloromethane	5	U	U	U	U	U	UJ	---
1,2-Dichloropropane	5	U	U	U	U	U	UJ	---
cis-1,3-Dichloropropene	5	U	U	U	U	U	UJ	---
Trichloroethene	5	U	12	U	U	U	UJ	11G
Dibromochloromethane	5	U	U	U	U	U	UJ	---
1,1,2-Trichloroethane	5	U	U	U	U	U	UJ	---
Benzene	5	UJ	UJ	UJ	U	UJ	2J	6G
trans-1,3-Dichloropropene	5	U	U	U	U	U	UJ	---
Bromoform	5	U	U	U	U	U	UJ	---
4-Methyl-2-pentanone	10	U	U	U	U	U	UJ	---
2-Hexanone	10	U	U	U	U	U	UJ	---
Tetrachloroethene	5	U	U	U	U	U	UJ	1G
1,1,2,2-Tetrachloroethane	5	U	U	U	U	U	UJ	---
Toluene	5	UJ	UJ	UJ	U	UJ	UJ	---
Chlorobenzene	5	UJ	UJ	UJ	U	UJ	UJ	5S
Ethylbenzene	5	UJ	UJ	UJ	U	UJ	UJ	---
Styrene	5	UJ	UJ	UJ	U	UJ	UJ	---
Total Xylenes	5	UJ	UJ	UJ	U	UJ	UJ	---

Qualifiers
J: Concentration was estimated
U: Compound not detected
UJ: Compound not detected - the sample quantitation limit is an estimate

Notes
CRQL: Contract Required Quantitation Limits
SW: Surface Water
G: Guidance value
S: Standard

Table 14 (Continued)
Becker Electronics Site
Drainage Ditch Water Sampling
Volatile Organic Compounds

SAMPLE LOCATION: DATE SAMPLED: UNITS:		DD-6-SW-RE 11/15/90 µg/l	DD-6-SW-DUP 11/15/90 µg/l	DD-7-SW 11/15/90 µg/l	DD-8-SW 11/16/90 µg/l	DD-8-SW-DUP 11/16/90 µg/l	DD-9-SW* 11/13/90 µg/l	NYSDEC Class C Surface Water Standards/ Guidance Values µg/l
COMPOUND	CRQL							
Chloromethane	10	U	U	U	U	U	U	---
Bromomethane	10	U	U	U	U	U	U	---
Vinyl Chloride	10	U	U	U	U	U	U	---
Chloroethane	10	U	U	U	U	U	U	---
Methylene Chloride	5	U	U	U	U	U	U	---
Acetone	10	U	U	U	U	U	12U	---
Carbon Disulfide	5	U	U	U	U	U	U	---
1,1-Dichloroethene	5	U	U	U	U	U	U	---
1,1-Dichloroethane	5	5	5	U	2J	2J	U	---
1,2-Dichloroethene (total)	5	U	U	U	4J	U	U	---
Chloroform	5	U	U	U	U	U	U	---
1,2-Dichloroethane	5	U	U	U	U	U	U	---
2-Butanone	10	U	U	U	U	U	U	---
1,1,1-Trichloroethane	5	30	30J	U	10	10	U	---
Carbon Tetrachloride	5	U	U	U	U	U	U	---
Vinyl Acetate	10	U	U	U	U	U	U	---
Bromodichloromethane	5	U	U	U	U	U	U	---
1,2-Dichloropropane	5	U	U	U	U	U	U	---
cis-1,3-Dichloropropene	5	U	U	U	U	U	U	---
Trichloroethene	5	U	U	U	3J	U	U	11G
Dibromochloromethane	5	U	U	U	U	U	U	---
1,1,2-Trichloroethane	5	U	U	U	U	U	U	---
Benzene	5	UJ	UJ	UJ	UJ	UJ	UJ	6G
trans-1,3-Dichloropropene	5	U	U	U	U	U	U	---
Bromoform	5	U	U	U	U	U	U	---
4-Methyl-2-pentanone	10	U	U	U	U	U	U	---
2-Hexanone	10	U	U	U	U	U	U	---
Tetrachloroethene	5	U	U	U	U	U	U	1G
1,1,2,2-Tetrachloroethane	5	U	U	U	U	U	U	---
Toluene	5	UJ	UJ	UJ	UJ	UJ	UJ	---
Chlorobenzene	5	UJ	UJ	UJ	UJ	UJ	UJ	5S
Ethylbenzene	5	UJ	UJ	UJ	UJ	UJ	UJ	---
Styrene	5	UJ	UJ	UJ	UJ	UJ	UJ	---
Total Xylenes	5	UJ	UJ	UJ	UJ	UJ	UJ	---

Qualifiers

J: Concentration was estimated
U: Compound not detected
UJ: Compound not detected - the sample quantitation limit is an estimate

Notes

CRQL: Contract Required Quantitation Limits
SW: Surface Water
DUP: Duplicate sample
RE: Sample reanalyzed
G: Guidance value
S: Standard
*: Sample DD-9-SW was obtained from surface drainage

A value followed by a U or a UJ is an elevated detection limit due to blank contamination

Table 15
Becker Electronics Site
Drainage Ditch Water Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION:		DD-4-SW	DD-1-SW	DD-2-SW	DD-3-SW	DD-5-SW	DD-5-SW-RE	NYSDEC Class C Surface Water Standards/ Guidance Values
DATE SAMPLED:		11/13/90	4/24/91	4/24/91	4/24/91	4/24/91	4/24/91	
UNITS:		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
COMPOUND	CRQL							
Phenol	10	U	U	U	UJ	UJ	UJ	5S
bis(2-Chloroethyl) ether	10	U	U	U	UJ	UJ	UJ	---
2-Chlorophenol	10	U	U	U	UJ	UJ	UJ	1S
1,3-Dichlorobenzene	10	U	U	U	UJ	UJ	UJ	5S
1,4-Dichlorobenzene	10	U	U	U	UJ	UJ	UJ	5S
Benzyl Alcohol	10	U	U	U	UJ	UJ	UJ	---
1,2-Dichlorobenzene	10	U	U	U	UJ	UJ	UJ	5S
2-Methylphenol	10	U	U	U	UJ	UJ	UJ	5S
bis(2-Chloroisopropyl) ether	10	U	U	U	UJ	UJ	UJ	---
4-Methylphenol	10	U	U	U	UJ	UJ	UJ	5S
N-Nitroso-di-n-propylamine	10	U	U	U	UJ	UJ	UJ	---
Hexachloroethane	10	U	U	U	UJ	UJ	UJ	---
Nitrobenzene	10	U	U	U	UJ	UJ	UJ	---
Isophorone	10	U	U	U	UJ	UJ	UJ	---
2-Nitrophenol	10	U	U	U	UJ	UJ	UJ	5S
2,4-Dimethylphenol	10	U	U	U	UJ	UJ	UJ	5S
Benzoic Acid	50	U	U	U	UJ	UJ	UJ	---
bis(2-Chloroethoxy)methane	10	U	U	U	UJ	UJ	UJ	---
2,4-Dichlorophenol	10	U	U	U	UJ	UJ	UJ	1S
1,2,4-Trichlorobenzene	10	U	U	U	UJ	UJ	UJ	5S
Naphthalene	10	U	U	U	UJ	UJ	UJ	---
4-Chloroaniline	10	U	U	U	UJ	UJ	UJ	---
Hexachlorobutadiene	10	U	U	U	UJ	UJ	UJ	1S
4-Chloro-3-Methylphenol	10	U	U	U	UJ	UJ	UJ	1S
2-Methylnaphthalene	10	U	U	U	UJ	UJ	UJ	---
Hexachlorocyclopentadiene	10	U	U	U	UJ	UJ	UJ	0.45S
2,4,6-Trichlorophenol	10	U	U	U	UJ	UJ	UJ	1S
2,4,5-Trichlorophenol	50	U	U	U	UJ	UJ	UJ	1S
2-Chloronaphthalene	10	U	U	U	UJ	UJ	UJ	---
2-Nitroaniline	50	U	U	U	UJ	UJ	UJ	---
Dimethylphthalate	10	U	U	U	UJ	UJ	UJ	---
Acenaphthylene	10	U	U	U	UJ	UJ	UJ	---
2,6-Dinitrotoluene	10	U	U	U	UJ	UJ	UJ	---
3-Nitroaniline	50	UJ	U	UJ	UJ	UJ	UJ	---
Acenaphthene	10	U	U	U	UJ	UJ	UJ	---
2,4-Dinitrophenol	50	U	U	U	UJ	UJ	UJ	5S

(continued on next page)

Table 15 (continued)
Becker Electronics Site
Drainage Ditch Water Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION:		DD-4-SW	DD-1-SW	DD-2-SW	DD-3-SW	DD-5-SW	DD-5-SW-RE	NYSDEC Class C Surface Water Standards/ Guidance Values
DATE SAMPLED:		11/13/90	4/24/91	4/24/91	4/24/91	4/24/91	4/24/91	
UNITS:		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
COMPOUND	CRQL							
4-Nitrophenol	50	U	U	U	UJ	UJ	UJ	5S
Dibenzofuran	10	U	U	U	UJ	UJ	UJ	---
2,4-Dinitrotoluene	10	U	U	U	UJ	UJ	UJ	---
Diethylphthalate	10	U	U	U	UJ	UJ	UJ	---
4-Chlorophenyl-Phenylether	10	U	U	U	UJ	UJ	UJ	---
Fluorene	10	U	U	U	UJ	UJ	UJ	---
4-Nitroaniline	50	U	U	U	UJ	UJ	UJ	---
4,6-Dinitro-2-Methylphenol	50	U	U	U	UJ	UJ	UJ	5S
N-nitrosodiphenylamine(1)	10	U	U	U	UJ	UJ	UJ	---
4-Bromophenyl-Phenylether	10	U	U	U	UJ	UJ	UJ	---
Hexachlorobenzene	10	U	U	U	UJ	UJ	UJ	---
Pentachlorophenol	50	U	U	U	UJ	UJ	UJ	0.4S
Phenanthrene	10	U	U	U	UJ	UJ	UJ	---
Anthracene	10	U	U	U	UJ	UJ	UJ	---
Di-n-butylphthalate	10	U	U	U	UJ	UJ	UJ	---
Fluoranthene	10	U	U	U	UJ	UJ	UJ	---
Pyrene	10	U	U	U	UJ	UJ	UJ	---
Butylbenzylphthalate	10	U	U	U	UJ	UJ	UJ	---
3,3'-Dichlorobenzidine	20	U	U	U	UJ	UJ	UJ	---
Benzo(a)anthracene	10	U	U	U	UJ	UJ	UJ	---
Chrysene	10	U	U	U	UJ	UJ	UJ	---
Bis(2-ethylhexyl)phthalate	10	U	U	14	UJ	UJ	UJ	0.6S
Di-n-octylphthalate	10	U	U	U	UJ	UJ	UJ	---
Benzo(b)fluoranthene	10	U	U	U	UJ	UJ	UJ	---
Benzo(k)fluoranthene	10	U	U	U	UJ	UJ	UJ	---
Benzo(a)pyrene	10	U	U	U	UJ	UJ	UJ	0.0012G
Indeno(1,2,3-cd)pyrene	10	U	U	U	UJ	UJ	UJ	---
Dibenz(a,h)anthracene	10	U	U	U	UJ	UJ	UJ	---
Benzo(g,h,i)perylene	10	U	U	U	UJ	UJ	UJ	---

Qualifiers

J: Concentration was estimated
U: Compound not detected
UJ: Compound not detected - the sample quantitation limit is an estimate

Notes

CRQL: Contract Required Quantitation Limits
SW: Surface water
RE: Sample reanalyzed
S: Standard
G: Guidance value

Table 15 (continued)
Becker Electronics Site
Drainage Ditch Water Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION: DATE SAMPLED: UNITS:		DD-6-SW 4/24/91 µg/l	DD-6-SW-RE 4/24/91 µg/l	DD-7-SW 4/24/91 µg/l	DD-8-SW 4/24/91 µg/l	DD-9-SW* 11/13/90 µg/l	DD-6-SW-DUP 4/24/91 µg/l	DD-8-SW-DUP 4/24/91 µg/l	NYSDEC Class C Surface Water Standards/ Guidance Values µg/l
COMPOUND	CRQL								
Phenol	10	UJ	UJ	U	U	U	U	U	5S
bis(2-Chloroethyl) ether	10	UJ	UJ	U	U	U	U	U	---
2-Chlorophenol	10	UJ	UJ	U	U	U	U	U	1S
1,3-Dichlorobenzene	10	UJ	UJ	U	U	U	U	U	5S
1,4-Dichlorobenzene	10	UJ	UJ	U	U	U	U	U	5S
Benzyl Alcohol	10	UJ	UJ	U	U	U	U	U	---
1,2-Dichlorobenzene	10	UJ	UJ	U	U	U	U	U	5S
2-Methylphenol	10	UJ	UJ	U	U	U	U	U	5S
bis(2-Chloroisopropyl) ether	10	UJ	UJ	U	U	U	U	U	---
4-Methylphenol	10	UJ	UJ	U	U	U	U	U	5S
N-Nitroso-di-n-propylamine	10	UJ	UJ	U	U	U	U	U	---
Hexachloroethane	10	UJ	UJ	U	U	U	U	U	---
Nitrobenzene	10	UJ	UJ	U	U	U	U	U	---
Isophorone	10	UJ	UJ	U	U	U	U	U	---
2-Nitrophenol	10	UJ	UJ	U	U	U	U	U	5S
2,4-Dimethylphenol	10	UJ	UJ	U	U	U	U	U	5S
Benzoic Acid	50	UJ	UJ	U	U	18J	U	U	---
bis(2-Chloroethoxy)methane	10	UJ	UJ	U	U	U	U	U	---
2,4-Dichlorophenol	10	UJ	UJ	U	U	U	U	U	1S
1,2,4-Trichlorobenzene	10	UJ	UJ	U	U	U	U	U	5S
Naphthalene	10	UJ	UJ	U	U	U	U	U	---
4-Chloroaniline	10	UJ	UJ	U	U	U	U	U	---
Hexachlorobutadiene	10	UJ	UJ	U	U	U	U	U	1S
4-Chloro-3-Methylphenol	10	UJ	UJ	U	U	U	U	U	1S
2-Methylnaphthalene	10	UJ	UJ	U	U	U	U	U	---
Hexachlorocyclopentadiene	10	UJ	UJ	U	U	U	U	U	0.45S
2,4,6-Trichlorophenol	10	UJ	UJ	U	U	U	U	U	1S
2,4,5-Trichlorophenol	50	UJ	UJ	U	U	U	U	U	1S
2-Chloronaphthalene	10	UJ	UJ	U	U	U	U	U	---
2-Nitroaniline	50	UJ	UJ	U	U	U	U	U	---
Dimethylphthalate	10	UJ	UJ	U	U	U	U	U	---
Acenaphthylene	10	UJ	UJ	U	U	U	U	U	---
2,6-Dinitrotoluene	10	UJ	UJ	U	U	U	U	U	---
3-Nitroaniline	50	UJ	UJ	U	U	UJ	U	U	---
Acenaphthene	10	UJ	UJ	U	U	U	U	U	---
2,4-Dinitrophenol	50	UJ	UJ	U	U	U	U	U	5S

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Table 15 (continued)
Becker Electronics Site
Drainage Ditch Water Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION: DATE SAMPLED: UNITS:		DD-6-SW 4/24/91 µg/l	DD-6-SW-RE 4/24/91 µg/l	DD-7-SW 4/24/91 µg/l	DD-8-SW 4/24/91 µg/l	DD-9-SW* 11/13/90 µg/l	DD-6-SW-DUP 4/24/91 µg/l	DD-8-SW-DUP 4/24/91 µg/l	NYSDEC Class C Surface Water Standards/ Guidance Values µg/l
COMPOUND	CRQL								
4-Nitrophenol	50	UJ	UJ	U	U	U	U	U	5S
Dibenzofuran	10	UJ	UJ	U	U	U	U	U	---
2,4-Dinitrotoluene	10	UJ	UJ	U	U	U	U	U	---
Diethylphthalate	10	UJ	UJ	U	U	U	U	U	---
4-Chlorophenyl-Phenylether	10	UJ	UJ	U	U	U	U	U	---
Fluorene	10	UJ	UJ	U	U	U	U	U	---
4-Nitroaniline	50	UJ	UJ	U	U	U	U	U	---
4,6-Dinitro-2-Methylphenol	50	UJ	UJ	U	U	U	U	U	5S
N-nitrosodiphenylamine(1)	10	UJ	UJ	U	U	U	U	U	---
4-Bromophenyl-Phenylether	10	UJ	UJ	U	U	U	U	U	---
Hexachlorobenzene	10	UJ	UJ	U	U	U	U	U	---
Pentachlorophenol	50	UJ	UJ	U	U	U	U	U	0.4S
Phenanthrene	10	UJ	UJ	U	U	U	U	U	---
Anthracene	10	UJ	UJ	U	U	U	U	U	---
Di-n-butylphthalate	10	UJ	UJ	U	U	U	U	U	---
Fluoranthene	10	UJ	UJ	U	U	U	U	U	---
Pyrene	10	UJ	UJ	U	U	U	U	U	---
Butylbenzylphthalate	10	UJ	UJ	U	U	U	U	U	---
3,3'-Dichlorobenzidine	20	UJ	UJ	U	U	U	U	U	---
Benzo(a)anthracene	10	UJ	UJ	U	U	U	U	U	---
Chrysene	10	UJ	UJ	U	U	U	U	U	---
Bis(2-ethylhexyl)phthalate	10	UJ	UJ	U	U	U	U	U	0.6S
Di-n-octylphthalate	10	UJ	UJ	U	U	U	U	U	---
Benzo(b)fluoranthene	10	UJ	UJ	U	U	U	U	U	---
Benzo(k)fluoranthene	10	UJ	UJ	U	U	U	U	U	---
Benzo(a)pyrene	10	UJ	UJ	U	U	U	U	U	0.0012G
Indeno(1,2,3-cd)pyrene	10	UJ	UJ	U	U	U	U	U	---
Dibenz(a,h)anthracene	10	UJ	UJ	U	U	U	U	U	---
Benzo(g,h,i)perylene	10	UJ	UJ	U	U	U	U	U	---

Qualifiers
J: Concentration was estimated
U: Compound not detected
UJ: Compound not detected - the sample quantitation limit is an estimate

Notes
CRQL: Contract Required Quantitation Limits
SW: Surface water
RE: Sample reanalyzed
S: Standard
G: Guidance value
*: Sample DD-9-SW was obtained from surface drainage

Table 16
Becker Electronics Site
Drainage Ditch Water Sampling
Pesticides/PCBs

SAMPLE LOCATION: DATE SAMPLED: UNITS:		DD-1-SW 4/24/91 µg/l	DD-2-SW 4/24/91 µg/l	DD-3-SW 4/24/91 µg/l	DD-4-SW 4/24/91 µg/l	DD-5-SW 4/24/91 µg/l	DD-6-SW 4/24/91 µg/l	NYSDEC Class C Surface Water Standards/ Guidance Values µg/l
COMPOUND	CRQL							
alpha-BHC	0.05	U	U	U	U	U	U	0.01S
beta-BHC	0.05	U	U	U	U	U	U	0.01S
delta-BHC	0.05	U	U	U	U	U	U	0.01S
gamma-BHC(Lindane)	0.05	U	U	U	U	U	U	0.01S
Heptachlor	0.05	U	U	U	U	U	U	0.001S
Aldrin	0.05	U	U	U	U	U	U	0.001S
Heptachlor Epoxide	0.05	U	U	U	U	U	U	0.001S
Endosulfan I	0.05	U	U	U	U	U	U	0.009S
Dieldrin	0.1	U	U	U	U	U	U	0.001S
4,4'-DDE	0.1	U	U	U	U	U	U	0.001S
Endrin	0.1	U	U	U	U	U	U	0.002S
Endosulfan II	0.1	U	U	U	U	U	U	0.009S
4,4'-DDD	0.1	U	U	U	U	U	U	0.001S
Endosulfan Sulfate	0.1	U	U	U	U	U	U	0.009S
4,4'-DDT	0.1	U	U	U	U	U	U	0.001S
Methoxychlor	0.5	U	U	U	U	U	U	0.03S
Endrin Ketone	0.1	U	U	U	U	U	U	0.002S
alpha-Chlordane	0.5	U	U	U	U	U	U	0.002G
gamma-Chlordane	0.5	U	U	U	U	U	U	0.002G
Toxaphene	1	U	U	U	U	U	U	0.005S
Aroclor-1016	0.5	U	U	U	U	U	U	0.001S
Aroclor-1221	0.5	U	U	U	U	U	U	0.001S
Aroclor-1232	0.5	U	U	U	U	U	U	0.001S
Aroclor-1242	0.5	U	U	U	U	U	U	0.001S
Aroclor-1248	0.5	U	U	U	U	U	U	0.001S
Aroclor-1254	1	U	U	U	U	U	U	0.001S
Aroclor-1260	1	U	U	U	U	U	U	0.001S

Qualifier
U: Compound not detected

Notes
CRQL: Contract Required Quantitation Limits
SW: Surface Water
DUP: Duplicate sample
S: Standard
G: Guidance value

Table 16 (continued)
Becker Electronics Site
Drainage Ditch Water Sampling
Pesticides/PCBs

SAMPLE LOCATION: DATE SAMPLED: UNITS:		DD-7-SW 4/24/91 µg/l	DD-8-SW 4/24/91 µg/l	DD-6-SW-DUP 4/24/91 µg/l	DD-8-SW-DUP 4/24/91 µg/l	DD-9-SW* 4/24/91 µg/l	NYSDEC Class C Surface Water Standards/ Guidance Values µg/l
COMPOUND	CRQL						
alpha-BHC	0.05	U	U	U	U	U	0.01S
beta-BHC	0.05	U	U	U	U	U	0.01S
delta-BHC	0.05	U	U	U	U	U	0.01S
gamma-BHC(Lindane)	0.05	U	U	U	U	U	0.01S
Heptachlor	0.05	U	U	U	U	U	0.001S
Aldrin	0.05	U	U	U	U	U	0.001S
Heptachlor Epoxide	0.05	U	U	U	U	U	0.001S
Endosulfan I	0.05	U	U	U	U	U	0.009S
Dieldrin	0.1	U	U	U	U	U	0.001S
4,4'-DDE	0.1	U	U	U	U	U	0.001S
Endrin	0.1	U	U	U	U	U	0.002S
Endosulfan II	0.1	U	U	U	U	U	0.009S
4,4'-DDD	0.1	U	U	U	U	U	0.001S
Endosulfan Sulfate	0.1	U	U	U	U	U	0.009S
4,4'-DDT	0.1	U	U	U	U	U	0.001S
Methoxychlor	0.5	U	U	U	U	U	0.03S
Endrin Ketone	0.1	U	U	U	U	U	0.002S
alpha-Chlordane	0.5	U	U	U	U	U	0.002G
gamma-Chlordane	0.5	U	U	U	U	U	0.002G
Toxaphene	1	U	U	U	U	U	0.005S
Aroclor-1016	0.5	U	U	U	U	U	0.001S
Aroclor-1221	0.5	U	U	U	U	U	0.001S
Aroclor-1232	0.5	U	U	U	U	U	0.001S
Aroclor-1242	0.5	U	U	U	U	U	0.001S
Aroclor-1248	0.5	U	U	U	U	U	0.001S
Aroclor-1254	1	U	U	U	U	U	0.001S
Aroclor-1260	1	U	U	U	U	U	0.001S

Qualifier
U: Compound not detected

Notes
CRQL: Contract Required Quantitation Limits
SW: Surface Water
DUP: Duplicate sample
S: Standard
G: Guidance value
*: Sample DD-9-SW was obtained from surface drainage

Table 17
Becker Electronics Site
Drainage Ditch Water Sampling
Inorganic Constituents

SAMPLE LOCATION:		DD-1-SW	DD-2-SW	DD-3-SW	DD-4-SW	DD-5-SW	DD-6-SW	NYSDEC Class C Surface Water Standards/ Guidance Values
DATE SAMPLED:		11/16/90	11/15/90	11/15/90	11/13/90	11/15/90	11/15/90	
UNITS:		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
ELEMENTS	CRDL							
ALUMINUM	200	504J	428J	335J	R	6410J	219J	100S
ANTIMONY	60	R	R	R	R	R	R	---
ARSENIC	10	0.6BJ	UJ	UJ	3.2B	8.4BJ	UJ	190S
BARIUM	200	158BJ	128BJ	134BJ	378J	330J	61BJ	---
BERYLLIUM	5	UJ	UJ	UJ	UJ	2BJ	UJ	11S*
CADMIUM	5	UJ	UJ	UJ	14J	5J	UJ	0.9S*
CALCIUM	5000	26800J	52700J	56400J	99300J	101000J	20000J	---
CHROMIUM	10	UJ	UJ	UJ	52J	26J	UJ	156S*
COBALT	50	UJ	UJ	UJ	UJ	UJ	UJ	5S
COPPER	25	18BJ	24BJ	24BJ	85J	32J	8BJ	9S*
IRON	100	1110J	968J	675J	6570J	11300J	449J	300S
LEAD	3	8.1J	2.9BJ	1.8	99J	42J	18.6J	2S*
MAGNESIUM	5000	3600BJ	4450BJ	4940BJ	10500J	15200J	2870BJ	---
MANGANESE	15	1370J	103J	66J	947J	2380J	164J	---
MERCURY	0.2	U	U	U	U	U	U	0.2G
NICKEL	40	UJ	UJ	UJ	21BJ	18BJ	UJ	74S*
POTASSIUM	5000	9180J	2600BJ	3800BJ	4910BJ	5910J	2310BJ	---
SELENIUM	5	U	U	U	UJ	UJ	U	1S
SILVER	10	R	R	R	R	R	R	0.1S
SODIUM	5000	11800J	6430J	8020J	8430J	14400J	7010J	---
THALLIUM	10	U	U	U	U	U	U	8S
VANADIUM	50	UJ	UJ	UJ	UJ	17BJ	UJ	14S
ZINC	20	97J	117J	212J	548J	1100J	43J	30S

Qualifiers

J: Concentration was estimated
R: Value was rejected
U: Not detectable at the IDL
B: Value is between the IDL and CRDL
UJ: Compound not detected - the sample quantitation limit is an estimate

Notes

CRDL: Contract Required Detection Limits
SW: Surface Water
S: Standard
G: Guidance value
*: Values are calculated based on a hardness of 71 mg/l

Table 17 (continued)
Becker Electronics Site
Drainage Ditch Water Sampling
Inorganic Constituents

SAMPLE LOCATION:		DD-6-SW-DUP	DD-7-SW	DD-8-SW	DD-8-SW-DUP	DD-9-SW**	NYSDEC Class C Surface Water Standards/ Guidance Values
DATE SAMPLED:		11/15/90	11/15/90	11/16/90	11/16/90	11/13/90	
UNITS:		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
ELEMENTS	CRDL						
ALUMINUM	200	121BJ	3680J	166BJ	161BJ	R	100S
ANTIMONY	60	R	R	R	R	R	---
ARSENIC	10	UJ	0.8BJ	UJ	UJ	13.7	190S
BARIUM	200	50BJ	225J	UJ	43BJ	3110J	---
BERYLLIUM	5	UJ	UJ	UJ	UJ	27J	11S*
CADMIUM	5	UJ	UJ	UJ	UJ	21J	0.9S*
CALCIUM	5000	16500J	41400J	16900J	17400J	186000J	---
CHROMIUM	10	UJ	UJ	UJ	UJ	120J	156S*
COBALT	50	UJ	UJ	UJ	UJ	105J	5S
COPPER	25	7BJ	28J	8BJ	UJ	447J	9S*
IRON	100	316J	6280J	266J	309J	144000J	300S
LEAD	3	1BJ	12.5J	0.7BJ	1.1BJ	125J	2S*
MAGNESIUM	5000	2450BJ	4430BJ	2500BJ	2620BJ	38200J	---
MANGANESE	15	118J	1460J	29J	44J	15900J	---
MERCURY	0.2	U	U	U	U	0.32J	0.2G
NICKEL	40	UJ	UJ	UJ	UJ	283J	74S*
POTASSIUM	5000	1490BJ	2280BJ	1580BJ	1960BJ	51700J	---
SELENIUM	5	U	U	U	U	UJ	1S
SILVER	10	R	R	R	R	R	0.1S
SODIUM	5000	5150J	5420J	5090J	5110J	61600J	---
THALLIUM	10	U	U	U	U	UJ	8S
VANADIUM	50	UJ	9BJ	UJ	UJ	112J	14S
ZINC	20	38J	77J	33J	65J	1370J	30S

Qualifiers

J: Concentration was estimated
R: Value was rejected
U: Not detectable at the IDL
B: Value is between the IDL and CRDL
UJ: Compound not detected - the sample quantitation limit is an estimate

Notes

CRDL: Contract Required Detection Limits
DUP: Duplicate sample
SW: Surface Water
S: Standard
G: Guidance value
*: Values are calculated based on a hardness of 71 mg/l
**: Sample DD-9-SW was obtained from surface drainage

Table 18
Becker Electronics Site
Drainage Ditch Sediment Sampling
Volatile Organic Compounds

SAMPLE LOCATION: DATE SAMPLED: DEPTH OF SAMPLE (FT): UNITS:		DD-1-SD 11/16/90 0-0.5 µg/kg	DD-1-SD-RE 11/16/90 0-0.5 µg/kg	DD-2-SD 11/15/90 0-0.5 µg/kg	DD-3-SD 11/15/90 0-0.5 µg/kg	DD-4-SD 11/13/90 0-0.5 µg/kg	DD-4-SD-RE 11/13/90 0-0.5 µg/kg	DD-5-SD 11/15/90 0-0.5 µg/kg	DD-5-SD-RE 11/15/90 0-0.5 µg/kg	NYSDEC Sediment Criteria µg/kg
COMPOUND	CRQL									
Chloromethane	10	UJ	UJ	UJ	UJ	U	R	UJ	UJ	---
Bromomethane	10	UJ	UJ	UJ	UJ	U	R	UJ	UJ	---
Vinyl Chloride	10	UJ	UJ	UJ	UJ	U	R	UJ	UJ	1 (H)
Chloroethane	10	UJ	UJ	UJ	UJ	13J	7J	UJ	UJ	---
Methylene Chloride	5	UJ	UJ	UJ	UJ	U	R	UJ	UJ	---
Acetone	10	UJ	UJ	51UJ	43UJ	24UJ	R	40UJ	UJ	---
Carbon Disulfide	5	UJ	UJ	UJ	UJ	U	R	UJ	UJ	---
1,1-Dichloroethene	5	UJ	UJ	UJ	UJ	U	R	UJ	UJ	0.35 (H)
1,1-Dichloroethane	5	UJ	UJ	UJ	UJ	36	24J	UJ	UJ	---
1,2-Dichloroethene (total)	5	UJ	UJ	UJ	UJ	U	R	UJ	UJ	---
Chloroform	5	UJ	UJ	UJ	UJ	U	R	UJ	UJ	---
1,2-Dichloroethane	5	UJ	UJ	UJ	UJ	U	R	UJ	UJ	12 (H)
2-Butanone	10	UJ	UJ	UJ	UJ	UJ	R	UJ	UJ	---
1,1,1-Trichloroethane	5	UJ	UJ	UJ	UJ	UJ	4J	UJ	UJ	---
Carbon Tetrachloride	5	UJ	UJ	UJ	UJ	UJ	R	UJ	UJ	10 (H)
Vinyl Acetate	10	UJ	UJ	UJ	UJ	UJ	R	UJ	UJ	---
Bromodichloromethane	5	UJ	UJ	UJ	UJ	UJ	R	UJ	UJ	---
1,2-Dichloropropane	5	UJ	UJ	UJ	UJ	UJ	R	UJ	UJ	---
cis-1,3-Dichloropropene	5	UJ	UJ	UJ	UJ	UJ	R	UJ	UJ	---
Trichloroethene	5	UJ	UJ	UJ	UJ	UJ	R	UJ	UJ	35 (H), 24 (G)
Dibromochloromethane	5	UJ	UJ	UJ	UJ	UJ	R	UJ	UJ	---
1,1,2-Trichloroethane	5	UJ	UJ	UJ	UJ	UJ	R	UJ	UJ	10 (H)
Benzene	5	UJ	UJ	UJ	UJ	UJ	R	UJ	UJ	10 (H), 9 (G)
trans-1,3-Dichloropropene	5	UJ	UJ	UJ	UJ	UJ	R	UJ	UJ	---
Bromoform	5	UJ	UJ	UJ	UJ	UJ	R	UJ	UJ	---
4-Methyl-2-pentanone	10	UJ	UJ	UJ	UJ	UJ	R	UJ	UJ	---
2-Hexanone	10	UJ	UJ	UJ	UJ	UJ	R	UJ	UJ	---
Tetrachloroethene	5	UJ	UJ	UJ	UJ	UJ	R	UJ	UJ	14 (H), 6(G)
1,1,2,2-Tetrachloroethane	5	UJ	UJ	UJ	UJ	UJ	R	UJ	UJ	5 (H)
Toluene	5	UJ	UJ	UJ	UJ	UJ	R	UJ	UJ	---
Chlorobenzene	5	UJ	UJ	UJ	UJ	UJ	R	UJ	UJ	61 (A), 29 (S)
Ethylbenzene	5	UJ	UJ	UJ	UJ	UJ	R	UJ	UJ	---
Styrene	5	UJ	UJ	UJ	UJ	UJ	R	UJ	UJ	---
Total Xylenes	5	UJ	UJ	UJ	UJ	UJ	R	UJ	UJ	---

Qualifiers

J: Concentration estimate
U: Compound not detected
UJ: Compound not detected - the sample quantitation limit is an estimate
R: Value was rejected

A value followed by a U or a UJ is an elevated detection limit due to blank contamination

Notes

CRQL: Contract Required Quantitation Limits
SD: Sediment sample
RE: Sample reanalyzed

(A): Criteria calculated based on Aquatic Toxicity basis
(H): Criteria calculated based on Human Health Residue basis
(G): Criteria calculated based on Koc value and Class C surface water guidance value
(S): Criteria calculated based on Koc value and Class C surface water standard

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Table 18 (Continued)
Becker Electronics Site
Drainage Ditch Sediment Sampling
Volatile Organic Compounds

SAMPLE LOCATION:		DD-6-SD	DD-6-SD-DUP	DD-7-SD	DD-8-SD	DD-8-SD-RE	DD-8-SD-DUP	DD-8-SD-DUP-RE	DD-9-SD*	DD-9-SD-RE*	NYSDEC Sediment Criteria
DATE SAMPLED:		11/15/90	11/15/90	11/15/90	11/16/90	11/16/90	11/16/90	11/16/90	11/13/90	11/13/90	
DEPTH OF SAMPLE (FT):		0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5 ft.	0-0.5 ft.	
UNITS:		µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
COMPOUND	CRQL										
Chloromethane	10	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	R	---
Bromomethane	10	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	R	---
Vinyl Chloride	10	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	R	1 (H)
Chloroethane	10	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	R	---
Methylene Chloride	5	30UJ	9UJ	UJ	13UJ	UJ	110UJ	UJ	UJ	R	---
Acetone	10	UJ	UJ	UJ	UJ	UJ	UJ	UJ	100UJ	R	---
Carbon Disulfide	5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	R	---
1,1-Dichloroethene	5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	R	0.35 (H)
1,1-Dichloroethane	5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	R	---
1,2-Dichloroethene (total)	5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	R	---
Chloroform	5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	R	---
1,2-Dichloroethane	5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	R	12 (H)
2-Butanone	10	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	R	---
1,1,1-Trichloroethane	5	UJ	UJ	UJ	28J	6J	9J	UJ	U	R	---
Carbon Tetrachloride	5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	U	R	10 (H)
Vinyl Acetate	10	UJ	UJ	UJ	UJ	UJ	UJ	UJ	U	R	---
Bromodichloromethane	5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	U	R	---
1,2-Dichloropropane	5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	U	R	---
cis-1,3-Dichloropropene	5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	U	R	---
Trichloroethene	5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	U	R	35 (H), 24 (G)
Dibromochloromethane	5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	U	R	---
1,1,2-Trichloroethane	5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	U	R	10 (H)
Benzene	5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	U	R	10 (H), 9 (G)
trans-1,3-Dichloropropene	5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	U	R	---
Bromoform	5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	U	R	---
4-Methyl-2-pentanone	10	UJ	UJ	UJ	UJ	UJ	UJ	UJ	U	R	---
2-Hexanone	10	UJ	UJ	UJ	UJ	UJ	UJ	UJ	U	R	---
Tetrachloroethene	5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	U	R	14 (H), 6(G)
1,1,2,2-Tetrachloroethane	5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	U	R	5 (H)
Toluene	5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	U	R	---
Chlorobenzene	5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	U	R	61 (A), 29 (S)
Ethylbenzene	5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	U	R	---
Styrene	5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	U	R	---
Total Xylenes	5	UJ	UJ	UJ	UJ	UJ	UJ	UJ	U	R	---

Qualifiers

J: Concentration estimate
U: Compound not detected
UJ: Compound not detected - the sample quantitation limit is an estimate
R: Value was rejected

A value followed by a U or a UJ is an elevated detection limit due to blank contamination

Notes

CRQL: Contract Required Quantitation Limits
SD: Sediment sample
RE: Sample reanalyzed
DUP: Duplicate sample
*: Sample DD-9-SD was obtained from surface drainage sediment

(A): Criteria calculated based on Aquatic Toxicity basis
(H): Criteria calculated based on Human Health Residue basis
(G): Criteria calculated based on Koc value and Class C surface water guidance value
(S): Criteria calculated based on Koc value and Class C surface water standard

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Table 19
Becker Electronics Site
Drainage Ditch Sediment Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION:		DD-1-SD	DD-4-SD	DD-4-SD-RE	DD-2-SED	DD-2-SED-RE	DD-3-SED	DD-5-SED	DD-6-SED	DD-7-SED	NYSDEC Sediment Criteria
DATE SAMPLED:		11/16/90	11/13/90	11/13/90	4/24/91	4/24/91	4/24/91	4/24/91	4/24/91	4/24/91	
DEPTH OF SAMPLE (FT.):		0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	
UNITS:		µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
COMPOUND	CRQL										
Phenol	330	U	U	U	U	U	U	U	U	U	9 (A), 1 (S)
bis(2-Chloroethyl) ether	330	U	U	U	U	U	U	U	U	U	0.17 (H)
2-Chlorophenol	330	U	U	U	U	U	U	U	U	U	10 (A)
1,3-Dichlorobenzene	330	U	U	U	U	U	U	U	U	U	209 (A), 148 (S)
1,4-Dichlorobenzene	330	U	U	U	U	U	230J	130J	85J	U	209 (A), 148 (S)
Benzyl Alcohol	330	U	U	U	U	U	U	U	U	U	---
1,2-Dichlorobenzene	330	U	U	U	U	U	U	U	U	U	209 (A), 148 (S)
2-Methylphenol	330	U	U	U	U	U	U	U	U	U	9 (A)
bis(2-Chloroisopropyl) ether	330	U	U	U	U	U	U	U	U	U	---
4-Methylphenol	330	U	U	U	U	U	U	U	U	U	9 (A)
N-Nitroso-di-n-propylamine	330	U	U	U	U	U	U	U	U	U	---
Hexachloroethane	330	U	U	U	U	U	U	U	U	U	---
Nitrobenzene	330	U	U	U	U	U	U	U	U	U	---
Isophorone	330	U	U	U	U	U	U	U	59J	U	---
2-Nitrophenol	330	U	U	U	U	U	U	U	U	U	9 (A)
2,4-Dimethylphenol	330	U	U	U	U	U	U	U	U	U	9 (A)
Benzoic Acid	1600	U	U	U	390J	U	U	U	U	U	---
bis(2-Chloroethoxy)methane	330	U	U	U	U	U	U	U	U	U	---
2,4-Dichlorophenol	330	U	U	U	U	U	U	U	U	U	10 (A), 7 (S)
1,2,4-Trichlorobenzene	330	U	U	U	U	U	U	U	U	U	1,583 (A), 800 (S)
Naphthalene	330	U	U	U	U	U	U	U	59J	U	---
4-Chloroaniline	330	U	U	U	U	U	U	U	U	U	---
Hexachlorobutadiene	330	U	U	U	U	U	U	U	U	U	94 (A), 505 (S)
4-Chloro-3-Methylphenol	330	U	U	U	U	U	U	U	U	U	10 (A)
2-Methylnaphthalene	330	U	U	U	U	U	U	U	63J	U	---
Hexachlorocyclopentadiene	330	U	U	U	U	U	U	U	U	U	77 (A), 38 (S)
2,4,6-Trichlorophenol	330	U	U	U	U	U	U	U	U	U	10 (A), 35 (S)
2,4,5-Trichlorophenol	1600	U	U	U	U	U	U	U	U	U	10 (A), 2 (S)
2-Chloronaphthalene	330	U	U	U	U	U	U	U	U	U	---
2-Nitroaniline	1600	U	U	U	U	U	U	U	U	U	---
Dimethylphthalate	330	U	U	U	U	U	U	U	U	U	---
Acenaphthylene	330	U	U	U	U	U	U	U	54J	U	---
2,6-Dinitrotoluene	330	U	U	U	U	U	U	U	U	U	2 (H)
3-Nitroaniline	330	U	U	U	U	U	U	U	U	U	---
Acenaphthene	330	U	U	U	U	U	U	U	58J	U	12,702 (A)
2,4-Dinitrophenol	1600	U	U	UJ	U	U	U	U	U	U	9 (A), 1 (S)

(continued on next page)

Table 19 (continued)
Becker Electronics Site
Drainage Ditch Sediment Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION:		DD-1-SD	DD-4-SD	DD-4-SD-RE	DD-2-SED	DD-2-SED-RE	DD-3-SED	DD-5-SED	DD-6-SED	DD-7-SED	NYSDEC Sediment Criteria
DATE SAMPLED:		11/16/90	11/13/90	11/13/90	4/24/91	4/24/91	4/24/91	4/24/91	4/24/91	4/24/91	
DEPTH OF SAMPLE (FT.):		0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	
UNITS:		µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
COMPOUND	CRQL										
4-Nitrophenol	1600	U	U	U	U	U	U	U	U	U	9 (A), 2 (S)
Dibenzofuran	330	U	U	U	U	U	U	U	55J	U	---
2,4-Dinitrotoluene	330	U	U	U	U	U	U	U	U	U	---
Diethylphthalate	330	U	U	U	U	U	50J	81J	110J	U	---
4-Chlorophenyl-Phenylether	330	U	U	U	U	U	U	U	U	U	---
Fluorene	330	U	U	U	U	U	U	U	59J	U	---
4-Nitroaniline	1600	U	U	U	U	U	U	U	U	U	---
4,6-Dinitro-2-Methylphenol	1600	U	U	U	U	U	U	U	U	U	9 (A)
N-nitrosodiphenylamine	330	U	U	U	U	U	U	U	U	U	---
4-Bromophenyl-Phenylether	330	U	U	U	U	U	U	U	U	U	---
Hexachlorobenzene	330	U	U	U	U	U	U	U	U	U	131,683 (A)
Pentachlorophenol	1600	U	U	U	U	U	U	U	U	U	696 (A), 369 (S)
Phenanthrene	330	U	U	U	U	U	U	U	58J	U	2,419 (A)
Anthracene	330	U	U	U	U	U	U	U	41J	U	---
Di-n-butylphthalate	330	U	U	U	250J	U	U	U	74J	U	---
Fluoranthene	330	U	U	U	U	U	U	U	54J	U	---
Pyrene	330	U	U	U	U	UJ	U	U	69J	U	---
Butylbenzylphthalate	330	U	160J	U	U	210J	U	U	U	U	---
3,3'-Dichlorobenzidine	660	U	U	U	U	UJ	U	U	U	U	---
Benzo(a)anthracene	330	U	U	U	U	UJ	U	U	62J	U	23 (H)
Chrysene	330	U	U	U	U	UJ	U	U	64J	U	23 (H)
Bis(2-ethylhexyl)phthalate	330	U	23000J	65000	32000J	13000J	1000U	2900	U	U	2,083 (A), 75 (S)
Di-n-octylphthalate	330	U	910J	1400J	2500J	600J	U	100J	57J	U	---
Benzo(b)fluoranthene	330	U	UJ	U	UJ	UJ	U	U	U	U	23 (H)
Benzo(k)fluoranthene	330	U	UJ	U	UJ	UJ	U	U	U	U	23 (H)
Benzo(a)pyrene	330	U	UJ	U	UJ	UJ	U	U	U	U	23 (H), 115 (G)
Indeno(1,2,3-cd)pyrene	330	U	UJ	U	UJ	UJ	U	U	U	U	23 (H)
Dibenz(a,h)anthracene	330	U	UJ	U	UJ	UJ	U	U	U	U	---
Benzo(g,h,i)perylene	330	U	UJ	U	UJ	UJ	U	U	U	U	---

Qualifiers

J: Concentration was estimated
U: Compound not detected
UJ: Compound not detected - the sample quantitation limit is an estimate

A value followed by a U or a UJ is an elevated detection limit due to blank contamination

Notes

CRQL: Contract Required Quantitation Limits
SD, SED: Sediment sample
RE: Sample reanalyzed

(A): Criteria calculated based on Aquatic Toxicity basis
(H): Criteria calculated based on Human Health Residue basis
(G): Criteria calculated based on Koc value and Class C surface water guidance value
(S): Criteria calculated based on Koc value and Class C surface water standard

Table 19 (continued)
Becker Electronics Site
Drainage Ditch Sediment Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION:		DD-8-SED	DD-6-DUP	DD-8-DUP	DD-8-SED-RE	DD-9-SD*	DD-EQB-SED	NYSDEC
DATE SAMPLED:		4/24/91	4/24/91	4/24/91	4/24/91	11/13/90	4/24/91	Sediment
DEPTH OF SAMPLE (FT.):		0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	---	Criteria
UNITS:		µg/kg	µg/kg	µg/kg	µg/kg	µg/l	µg/l	µg/kg
COMPOUND	CRQL							
Phenol	330	U	U	UJ	U	U	U	9 (A), 1 (S)
bis(2-Chloroethyl) ether	330	U	U	UJ	U	U	U	0.17 (H)
2-Chlorophenol	330	U	U	UJ	U	U	U	10 (A)
1,3-Dichlorobenzene	330	U	U	UJ	U	U	U	209 (A), 148 (S)
1,4-Dichlorobenzene	330	130J	U	240J	260J	U	U	209 (A), 148 (S)
Benzyl Alcohol	330	U	U	UJ	U	U	U	---
1,2-Dichlorobenzene	330	U	U	UJ	U	U	U	209 (A), 148 (S)
2-Methylphenol	330	U	U	UJ	U	U	U	9 (A)
bis(2-Chloroisopropyl) ether	330	U	U	UJ	U	U	U	---
4-Methylphenol	330	U	U	UJ	U	U	U	9 (A)
N-Nitroso-di-n-propylamine	330	U	U	UJ	U	U	U	---
Hexachloroethane	330	U	U	UJ	U	U	U	---
Nitrobenzene	330	U	U	U	U	U	U	---
Isophorone	330	U	U	U	U	U	U	---
2-Nitrophenol	330	U	U	U	U	U	U	9 (A)
2,4-Dimethylphenol	330	U	U	U	U	U	U	9 (A)
Benzoic Acid	1600	U	U	U	220J	U	U	---
bis(2-Chloroethoxy)methane	330	U	U	U	U	U	U	---
2,4-Dichlorophenol	330	U	U	U	U	U	U	10 (A), 7 (S)
1,2,4-Trichlorobenzene	330	U	U	U	U	U	U	1,583 (A), 800 (S)
Naphthalene	330	U	U	U	U	U	U	---
4-Chloroaniline	330	U	U	U	U	U	U	---
Hexachlorobutadiene	330	U	U	U	U	U	U	94 (A), 505 (S)
4-Chloro-3-Methylphenol	330	U	U	U	U	U	U	10 (A)
2-Methylnaphthalene	330	U	U	U	U	U	U	---
Hexachlorocyclopentadiene	330	U	U	U	U	U	U	77 (A), 38 (S)
2,4,6-Trichlorophenol	330	U	U	U	U	U	U	10 (A), 35 (S)
2,4,5-Trichlorophenol	1600	U	U	U	U	U	U	10 (A), 2 (S)
2-Chloronaphthalene	330	U	U	U	U	U	U	---
2-Nitroaniline	1600	U	U	U	U	U	U	---
Dimethylphthalate	330	U	U	U	U	U	U	---
Acenaphthylene	330	U	U	U	U	U	U	---
2,6-Dinitrotoluene	330	U	U	U	U	U	U	2 (H)
3-Nitroaniline	330	U	U	U	U	U	U	---
Acenaphthene	330	U	U	U	U	U	U	12,702 (A)
2,4-Dinitrophenol	1600	U	U	U	U	U	U	9 (A), 1 (S)

(continued on next page)

Table 19 (continued)
Becker Electronics Site
Drainage Ditch Sediment Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION:		DD-8-SED	DD-6-DUP	DD-8-DUP	DD-8-SED-RE	DD-9-SD*	DD-EQB-SED	NYSDEC Sediment Criteria
DATE SAMPLED:		4/24/91	4/24/91	4/24/91	4/24/91	11/13/90	4/24/91	
DEPTH OF SAMPLE (FT.):		0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	---	
UNITS:		µg/kg	µg/kg	µg/kg	µg/kg	µg/l	µg/l	µg/kg
COMPOUND	CRQL							
4-Nitrophenol	1600	U	U	U	U	U	U	9 (A), 2 (S)
Dibenzofuran	330	U	U	U	U	U	U	---
2,4-Dinitrotoluene	330	U	U	U	U	U	U	---
Diethylphthalate	330	U	U	U	43J	U	U	---
4-Chlorophenyl-Phenylether	330	U	U	U	U	U	U	---
Fluorene	330	U	U	U	U	U	U	---
4-Nitroaniline	1600	U	U	U	U	U	U	---
4,6-Dinitro-2-Methylphenol	1600	U	U	U	U	U	U	9 (A)
N-nitrosodiphenylamine	330	U	U	U	U	U	U	---
4-Bromophenyl-Phenylether	330	U	U	U	U	U	U	---
Hexachlorobenzene	330	U	U	U	U	U	U	131,683 (A)
Pentachlorophenol	1600	U	U	U	U	U	U	696 (A), 396 (S)
Phenanthrene	330	U	U	140J	150J	U	U	2,419 (A)
Anthracene	330	U	U	U	U	U	U	---
Di-n-butylphthalate	330	U	U	U	U	U	U	---
Fluoranthene	330	100J	U	260J	180J	U	U	---
Pyrene	330	91J	U	210J	290J	U	U	---
Butylbenzylphthalate	330	U	U	U	UJ	720	U	---
3,3'-Dichlorobenzidine	660	U	U	U	UJ	U	U	---
Benzo(a)anthracene	330	U	U	110J	130J	U	U	23 (H)
Chrysene	330	U	U	130J	170J	U	U	23 (H)
Bis(2-ethylhexyl)phthalate	330	2900	U	2300	2800J	4700	U	2,083 (A), 75 (S)
Di-n-octylphthalate	330	U	U	U	UJ	440	U	---
Benzo(b)fluoranthene	330	85J	U	220J	UJ	U	U	23 (H)
Benzo(k)fluoranthene	330	U	U	110J	UJ	U	U	23 (H)
Benzo(a)pyrene	330	U	U	U	110J	U	U	23 (H), 115 (G)
Indeno(1,2,3-cd)pyrene	330	U	U	U	180J	U	U	23 (H)
Dibenz(a,h)anthracene	330	U	U	U	UJ	U	U	---
Benzo(g,h,i)perylene	330	U	U	U	UJ	U	U	---

Qualifiers

J: Concentration was estimated
U: Compound not detected
UJ: Compound not detected - the sample quantitation limit is an estimate

Notes

CRQL: Contract Required Quantitation Limits
SD, SED: Sediment sample
RE: Sample reanalyzed
DUP: Duplicate sample
EQB: Equipment blank sample
*: Sample DD-9-SD was obtained from surface drainage sediment

(A): Criteria calculated based on Aquatic Toxicity basis
(H): Criteria calculated based on Human Health Residue basis
(G): Criteria calculated based on Koc value and Class C surface water guidance value
(S): Criteria calculated based on Koc value and Class C surface water standard

A value followed by a U or a UJ is an elevated detection limit due to blank contamination

Table 20
Becker Electronics Site
Drainage Ditch Sediment Sampling
Pesticides/PCBs

SAMPLE LOCATION:		DD-1-SD	DD-2-SD	DD-3-SED	DD-4-SD	DD-5-SD	DD-6-SD	DD-6-SD-DUP	NYSDEC Sediment Criteria
DATE SAMPLED:		11/16/90	11/15/90	4/24/91	11/13/90	11/15/90	11/15/90	11/15/90	
DEPTH OF SAMPLE (FT):		0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	
UNITS:		µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
COMPOUND	CRQL								
alpha-BHC	8	U	U	UJ	U	U	U	U	1 (A), 0.66 (S)
beta-BHC	8	U	U	UJ	U	U	U	U	1 (A), 0.66 (S)
delta-BHC	8	U	U	UJ	U	U	U	U	1 (A), 1.15 (S)
gamma-BHC(Lindane)	8	U	U	UJ	U	U	U	U	1 (A), 0.19 (S)
Heptachlor	8	U	U	UJ	U	U	U	U	0.52 (A), 0.21 (S)
Aldrin	8	U	U	UJ	U	U	U	U	146 (A), 1.67 (S)
Heptachlor Epoxide	8	U	U	U	U	U	U	U	0.52 (A), 0.004 (S)
Endosulfan I	8	U	U	U	U	U	U	U	0.52 (A)
Dieldrin	16	U	U	U	U	U	U	U	146 (A), 0.03 (S)
4,4'-DDE	16	U	U	U	U	U	U	U	870 (A), 76.56 (S)
Endrin	16	U	U	U	U	U	U	U	14 (A)
Endosulfan II	16	U	U	U	U	U	U	U	0.52 (A)
4,4'-DDD	16	U	U	U	U	U	U	U	870 (A), 13.4 (S)
Endosulfan Sulfate	16	U	U	U	U	U	U	U	0.52 (A)
4,4'-DDT	16	U	U	U	U	U	U	U	870 (A), 4.23 (S)
Methoxychlor	80	U	U	U	U	U	U	U	10 (A)
Endrin Ketone	16	U	U	U	U	U	U	U	14 (A)
alpha-Chlordane	80	U	U	U	U	U	U	U	0.10 (A), 4.87(G)
gamma-Chlordane	80	U	U	U	U	U	U	U	0.10 (A), 4.87(G)
Toxaphene	160	U	U	U	U	U	U	U	0.17 (A), 0.08 (S)
Aroclor-1016	80	U	U	UJ	U	U	U	U	---
Aroclor-1221	80	U	U	UJ	U	U	U	U	---
Aroclor-1232	80	U	U	UJ	U	U	U	U	---
Aroclor-1242	80	U	U	UJ	U	U	U	U	---
Aroclor-1248	80	U	U	U	U	U	U	U	---
Aroclor-1254	160	U	U	U	4100	U	U	U	4,802 (A), 0.74 (S)
Aroclor-1260	160	U	U	U	U	U	U	U	---

Qualifiers

U: Compound not detected

UJ: Compound not detected - the sample quantitation limit is an estimate

Notes

CRQL: Contract Required Quantitation Limits
SD, SED: Sediment sample
DUP: Duplicate sample
(A): Criteria calculated based on Aquatic Toxicity basis
(H): Criteria calculated based on Human Health Residue basis
(G): Criteria calculated based on Koc value and Class C surface water guidance value
(S): Criteria calculated based on Koc value and Class C surface water standard

Table 20 (continued)
Becker Electronics Site
Drainage Ditch Sediment Sampling
Pesticides/PCBs

SAMPLE LOCATION:		DD-7-SD	DD-8-SD	DD-8-SD-DUP	DD-9-SED*	DD-EQB-SED	NYSDEC Sediment Criteria
DATE SAMPLED:		11/15/90	11/16/90	11/16/90	4/25/91	4/24/91	
DEPTH OF SAMPLE (FT):		0-0.5	0-0.5	0-0.5	0-0.5	---	
UNITS:		µg/kg	µg/kg	µg/kg	µg/kg	µg/l	µg/kg
COMPOUND	CRQL						
alpha-BHC	8	U	U	U	U	U	1 (A), 0.66 (S)
beta-BHC	8	U	U	U	U	U	1 (A), 0.66 (S)
delta-BHC	8	U	U	U	U	U	1 (A), 1.15 (S)
gamma-BHC(Lindane)	8	U	U	U	U	U	1 (A), 0.19 (S)
Heptachlor	8	U	U	U	U	U	0.52 (A), 0.21 (S)
Aldrin	8	U	U	U	U	U	146 (A), 1.67 (S)
Heptachlor Epoxide	8	U	U	U	U	U	0.52 (A), 0.004 (S)
Endosulfan I	8	U	U	U	U	U	0.52 (A)
Dieldrin	16	U	U	U	U	U	146 (A), 0.03 (S)
4,4'-DDE	16	U	U	U	U	U	870 (A), 76.56 (S)
Endrin	16	U	U	U	U	U	14 (A)
Endosulfan II	16	U	U	U	U	U	0.52 (A)
4,4'-DDD	16	U	U	U	U	U	870 (A), 13.4 (S)
Endosulfan Sulfate	16	U	U	U	U	U	0.52 (A)
4,4'-DDT	16	U	U	U	U	U	870 (A), 4.23 (S)
Methoxychlor	80	U	U	U	U	U	10 (A)
Endrin Ketone	16	U	U	U	U	U	14 (A)
alpha-Chlordane	80	U	U	U	U	U	0.10 (A), 4.87(G)
gamma-Chlordane	80	U	U	U	U	U	0.10 (A), 4.87(G)
Toxaphene	160	U	U	U	U	U	0.17 (A), 0.08 (S)
Aroclor-1016	80	U	U	U	U	U	---
Aroclor-1221	80	U	U	U	U	U	---
Aroclor-1232	80	U	U	U	U	U	---
Aroclor-1242	80	U	U	U	U	U	---
Aroclor-1248	80	U	U	U	U	U	---
Aroclor-1254	160	U	U	U	U	U	4,802 (A), 0.74 (S)
Aroclor-1260	160	U	U	U	U	U	---

Qualifiers
U: Compound not detected

Notes
CRQL: Contract Required Quantitation Limits
SD, SED: Sediment sample
DUP: Duplicate sample
EQB: Equipment blank sample
(A): Criteria calculated based on Aquatic Toxicity basis
(H): Criteria calculated based on Human Health Residue basis
(G): Criteria calculated based on Koc value and Class C surface water guidance value
(S): Criteria calculated based on Koc value and Class C surface water standard
*: Sample DD-9-SD was obtained from surface drainage sediment

Table 21
Becker Electronics Site
Drainage Ditch Sediment Sampling
Inorganic Constituents

SAMPLE LOCATION:		DD-1-SD	DD-2-SD	DD-3-SD	DD-4-SD	DD-5-SD	DD-6-SD	NYSDEC	
DATE SAMPLED:		11/16/90	11/15/90	11/15/90	11/13/90	11/15/90	11/15/90	Sediment	
DEPTH OF SAMPLE (FT.):		0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	Criteria	
UNITS:		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	
ELEMENTS	CRDL							Sediment Criteria	Limit of Tolerance*
ALUMINUM	40	12300J	11140J	17400J	8130J	10300J	10400J	- - -	- - -
ANTIMONY	12	R	R	R	R	R	R	- - -	- - -
ARSENIC	2	5.3J	1.1BJ	4.1J	5.4	4.3J	5.2J	5	33
BARIUM	40	105J	94.6J	160J	200J	123J	93.3J	- - -	- - -
BERYLLIUM	1	4.8J	3.4J	5.8J	2.2J	4.0J	3.9J	- - -	- - -
CADMIUM	1	1.5J	2.1J	2.0J	13.1J	1.8J	1.0BJ	0.8	10
CALCIUM	1000	1380J	1570J	2570J	28200J	3990J	1350J	- - -	- - -
CHROMIUM	2	22.4J	33.5J	88.1J	74.5J	27.9J	19.0J	26	111
COBALT	10	13.6J	13.4J	18.6J	10.5BJ	14.9BJ	13.9J	- - -	- - -
COPPER	5	28.1J	55.4J	22.1J	44.2J	15.9J	26.7J	19	114
IRON	20	28600J	20900J	37500J	14300J	23900J	24300J	24,000	40,000
LEAD	0.6	R	R	R	159J	R	R	27	250
MAGNESIUM	1000	3820J	3660J	5380J	3620J	4240J	3390J	- - -	- - -
MANGANESE	3	R	R	R	652J	R	R	428	1100
MERCURY	0.1	0.13U	0.13U	0.15U	0.19U	0.18U	0.13U	0.11	2
NICKEL	8	36.7J	35.1J	48.8J	23.6J	36.2J	32.1J	22	90
POTASSIUM	1000	1210BJ	974BJ	1310BJ	1150BJ	1040BJ	1300J	- - -	- - -
SELENIUM	1	0.30U	0.31U	0.35U	0.45U	0.43U	0.31U	- - -	- - -
SILVER	2	R	R	R	R	R	R	- - -	- - -
SODIUM	1000	304UJ	312UJ	352UJ	454UJ	439UJ	311UJ	- - -	- - -
THALLIUM	2	0.18U	0.18U	0.20U	0.26U	0.25U	0.18U	- - -	- - -
VANADIUM	10	20.4J	15.5J	25.3J	15.4BJ	13.8BJ	15.9J	- - -	- - -
ZINC	4	61.6J	256J	323J	215J	395J	88.7J	85	800

Qualifiers
J: Concentration was estimated
R: Value was rejected
U: Not detectable at the IDL
B: Value is between the IDL and CRDL
UJ: Compound not detected - the sample quantitation limit is an estimate

Notes
CRDL: Contract Required Detection Limits
SD: Sediment sample
- - -: Not available
*: Concentration that would be detrimental to the majority of species, potentially eliminating most

Table 21 (continued)
Becker Electronics Site
Drainage Ditch Sediment Sampling
Inorganic Constituents

SAMPLE LOCATION:		DD-6-SD-DUP	DD-7-SD	DD-8-SD	DD-8-SD-DUP	DD-SD-EQB	DD-9-SD**	NYSDEC Sediment Criteria mg/kg	
DATE SAMPLED:		11/15/90	11/15/90	11/16/90	11/16/90	11/15/90	11/13/90		
DEPTH OF SAMPLE (FT.):		0-0.5	0-0.5	0-0.5	0-0.5	---	0-0.5		
UNITS:		mg/kg	mg/kg	mg/kg	mg/kg	µg/l	mg/kg		
ELEMENTS	CRDL							Sediment Criteria	Limit of Tolerance*
ALUMINUM	40	10300J	22600J	17500J	15700J	48BJ	6770J	- - -	- - -
ANTIMONY	12	R	R	R	R	R	R	- - -	- - -
ARSENIC	2	6.0J	6.0J	3.1J	2.3J	U	1.80B	5	33
BARIUM	40	130J	251J	203J	236J	UJ	61.2J	- - -	- - -
BERYLLIUM	1	4.0J	5.0J	4.6J	4.9J	UJ	2.8J	- - -	- - -
CADMIUM	1	1.0BJ	1.6J	2.0J	1.4J	UJ	0.78UJ	0.8	10
CALCIUM	1000	1500J	4490J	3260J	5110J	1570BJ	4470J	- - -	- - -
CHROMIUM	2	20.6J	34.3J	32.9J	30.0J	UJ	12.9J	26	111
COBALT	10	12.7J	16.8J	13.4BJ	15.7J	UJ	7.8BJ	- - -	- - -
COPPER	5	16.7J	27.4J	18.6J	18.9J	UJ	10.6J	19	114
IRON	20	25900J	30400J	27100J	30000J	85BJ	16100J	24,000	40,000
LEAD	0.6	R	R	R	R	0.7BJ	8.2J	27	250
MAGNESIUM	1000	3910J	4860J	3340J	4400J	UJ	2360J	- - -	- - -
MANGANESE	3	R	R	R	R	3BJ	307J	428	1100
MERCURY	0.1	0.12U	0.16U	0.14U	0.14U	U	0.13U	0.11	2
NICKEL	8	35.6J	40.5J	31.7J	38.9J	UJ	21.7J	22	90
POTASSIUM	1000	744BJ	2170J	1690BJ	1700J	UJ	1020BJ	- - -	- - -
SELENIUM	1	0.30U	0.37U	0.34U	0.34U	U	0.31U	- - -	- - -
SILVER	2	R	R	R	R	R	R	- - -	- - -
SODIUM	1000	301UJ	377UJ	346UJ	346UJ	UJ	313UJ	- - -	- - -
THALLIUM	2	0.17U	0.22U	0.20U	0.20U	U	0.18U	- - -	- - -
VANADIUM	10	14.2J	33.3J	27.7J	24.6J	UJ	12.1BJ	- - -	- - -
ZINC	4	102J	135J	135J	181J	38J	71.3J	85	800

Qualifiers

J: Concentration was estimated
R: Value was rejected
U: Not detectable at the IDL
B: Value is between the IDL and CRDL
UJ: Compound not detected - the sample quantitation limit is an estimate

Notes

CRDL: Contract Required Detection Limits
EQB: Equipment blank sample
DUP: Duplicate sample
SD: Sediment sample
- - -: Not available
*: Concentration that would be detrimental to the majority of species, potentially eliminating most
**: Sample DD-9-SD was obtained from surface drainage sediment

Table 22
Becker Electronics Site
Catskill and Thorp Creeks Water Sampling
Volatile Organic Compounds

SAMPLE LOCATION:		TC-1-SW	TC-2-SW	TC-2-SW-DUP	CC-1-SW	CC-2-SW	CC-TB	NYSDEC Class C Surface Water Standards/ Guidance Values
DATE SAMPLED:		11/19/90	11/19/90	11/19/90	11/19/90	11/19/90	11/19/90	
UNITS:		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
COMPOUND	CRQL							
Chloromethane	10	U	U	U	U	U	U	---
Bromomethane	10	U	U	U	U	U	U	---
Vinyl Chloride	10	U	U	U	U	U	U	---
Chloroethane	10	U	U	U	U	U	U	---
Methylene Chloride	5	U	U	U	U	U	U	---
Acetone	10	U	U	U	U	U	U	---
Carbon Disulfide	5	U	U	U	U	U	U	---
1,1-Dichloroethene	5	U	U	U	U	U	U	---
1,1-Dichloroethane	5	U	U	U	U	U	U	---
1,2-Dichloroethene (total)	5	U	U	U	2J	U	U	---
Chloroform	5	U	U	U	U	U	U	---
1,2-Dichloroethane	5	U	U	U	U	U	U	---
2-Butanone	10	U	U	U	U	U	U	---
1,1,1-Trichloroethane	5	U	U	U	U	U	U	---
Carbon Tetrachloride	5	U	U	U	U	U	U	---
Vinyl Acetate	10	U	U	U	U	U	U	---
Bromodichloromethane	5	U	U	U	U	U	U	---
1,2-Dichloropropane	5	U	U	U	U	U	U	---
cis-1,3-Dichloropropene	5	U	U	U	U	U	U	---
Trichloroethene	5	U	10J	U	2J	U	U	11G
Dibromochloromethane	5	U	U	U	U	U	U	---
1,1,2-Trichloroethane	5	U	U	U	U	U	U	---
Benzene	5	U	U	U	U	U	U	6G
trans-1,3-Dichloropropene	5	U	U	U	U	U	U	---
Bromoform	5	U	U	U	U	U	U	---
4-Methyl-2-pentanone	10	U	U	U	U	U	U	---
2-Hexanone	10	U	U	U	U	U	U	---
Tetrachloroethene	5	U	U	U	U	U	U	1G
1,1,2,2-Tetrachloroethane	5	U	U	U	U	U	U	---
Toluene	5	U	U	U	U	U	U	---
Chlorobenzene	5	U	U	U	U	U	U	5S
Ethylbenzene	5	U	U	U	U	U	U	---
Styrene	5	U	U	U	U	U	U	---
Total Xylenes	5	U	U	U	U	U	U	---

Qualifiers

U: Compound not detected
J: Concentration was estimated

Notes

CRQL: Contract Required Quantitation Limits
SW: Surface Water - Sample collected near water surface
TB: Trip blank sample
DUP: Duplicate sample
G: Guidance value
S: Standard

Table 23
Becker Electronics Site
Catskill and Thorp Creeks Water Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION:		CC-2-SW	TC-2-SW	TC-2-SW-DUP	TC-1-SW	CC-1-SW	NYSDEC Class C Surface Water Standards/ Guidance Values
DATE SAMPLED:		11/19/90	11/19/90	11/19/90	4/26/91	4/26/91	
UNITS:		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
COMPOUND	CRQL						
Phenol	10	U	U	U	U	U	5S
bis(2-Chloroethyl) ether	10	U	U	U	U	U	---
2-Chlorophenol	10	U	U	U	U	U	1S
1,3-Dichlorobenzene	10	U	U	U	U	U	5S
1,4-Dichlorobenzene	10	U	U	U	U	U	5S
Benzyl Alcohol	10	U	U	U	U	U	---
1,2-Dichlorobenzene	10	U	U	U	U	U	5S
2-Methylphenol	10	U	U	U	U	U	5S
bis(2-Chloroisopropyl) ether	10	U	U	U	U	U	---
4-Methylphenol	10	U	U	U	U	U	5S
N-Nitroso-di-n-propylamine	10	U	U	U	R	R	---
Hexachloroethane	10	U	U	U	U	U	---
Nitrobenzene	10	U	U	U	U	U	---
Isophorone	10	U	U	U	U	U	---
2-Nitrophenol	10	U	U	U	U	U	5S
2,4-Dimethylphenol	10	U	U	U	U	U	5S
Benzoic Acid	50	UJ	U	U	U	U	---
bis(2-Chloroethoxy)methane	10	U	U	U	U	U	---
2,4-Dichlorophenol	10	U	U	U	U	U	1S
1,2,4-Trichlorobenzene	10	U	U	U	U	U	5S
Naphthalene	10	U	U	U	U	U	---
4-Chloroaniline	10	U	U	U	U	U	---
Hexachlorobutadiene	10	U	U	U	U	U	1S
4-Chloro-3-Methylphenol	10	U	U	U	U	U	1S
2-Methylnaphthalene	10	U	U	U	U	U	---
Hexachlorocyclopentadiene	10	U	U	U	U	U	0.45S
2,4,6-Trichlorophenol	10	U	U	U	U	U	1S
2,4,5-Trichlorophenol	50	U	U	U	U	U	1S
2-Chloronaphthalene	10	U	U	U	U	U	---
2-Nitroaniline	50	U	U	U	U	U	---
Dimethylphthalate	10	U	U	U	U	U	---
Acenaphthylene	10	U	U	U	U	U	---
2,6-Dinitrotoluene	10	U	U	U	U	U	---
3-Nitroaniline	50	U	U	U	U	U	---
Acenaphthene	10	U	U	U	U	U	---
2,4-Dinitrophenol	50	U	U	U	U	U	5S

(continued on next page)

Table 23 (continued)
Becker Electronics Site
Catskill and Thorp Creeks Water Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION:		CC-2-SW	TC-2-SW	TC-2-SW-DUP	TC-1-SW	CC-1-SW	NYSDEC Class C Surface Water Standards/ Guidance Values
DATE SAMPLED:		11/19/90	11/19/90	11/19/90	4/26/91	4/26/91	
UNITS:		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
COMPOUND	CRQL						
4-Nitrophenol	50	U	U	U	U	U	5S
Dibenzofuran	10	U	U	U	U	U	---
2,4-Dinitrotoluene	10	U	U	U	R	R	---
Diethylphthalate	10	U	U	U	U	U	---
4-Chlorophenyl-Phenylether	10	U	U	U	U	U	---
Fluorene	10	U	U	U	U	U	---
4-Nitroaniline	50	U	U	U	U	U	---
4,6-Dinitro-2-Methylphenol	50	U	U	U	U	U	5S
N-nitrosodiphenylamine(1)	10	U	U	U	U	U	---
4-Bromophenyl-Phenylether	10	U	U	U	U	U	---
Hexachlorobenzene	10	U	U	U	U	U	---
Pentachlorophenol	50	U	U	U	U	U	0.4S
Phenanthrene	10	U	U	U	U	U	---
Anthracene	10	U	U	U	U	U	---
Di-n-butylphthalate	10	U	U	U	U	U	---
Fluoranthene	10	U	U	U	U	U	---
Pyrene	10	U	U	U	U	U	---
Butylbenzylphthalate	10	U	U	U	U	U	---
3,3'-Dichlorobenzidine	20	U	U	U	UJ	UJ	---
Benzo(a)anthracene	10	U	U	U	U	U	---
Chrysene	10	U	U	U	U	U	---
Bis(2-ethylhexyl)phthalate	10	U	U	U	U	U	0.6S
Di-n-octylphthalate	10	U	U	U	U	U	---
Benzo(b)fluoranthene	10	U	U	U	U	U	---
Benzo(k)fluoranthene	10	U	U	U	U	U	---
Benzo(a)pyrene	10	U	U	U	U	U	0.0012G
Indeno(1,2,3-cd)pyrene	10	U	U	U	U	U	---
Dibenz(a,h)anthracene	10	U	U	U	U	U	---
Benzo(g,h,i)perylene	10	U	U	U	U	U	---

Qualifiers
U: Compound not detected
UJ: Compound not detected - the sample quantitation limit is an estimate
R: Value was rejected

Notes
CRQL: Contract Required Quantitation Limits
DUP: Duplicate sample
SW: Surface water - sample collected near water surface
S: Standard
G: Guidance value

Table 24
Becker Electronics Site
Catskill and Thorp Creeks Water Sampling
Pesticides/PCBs

SAMPLE LOCATION: DATE SAMPLED: UNITS:		TC-1-SW 4/26/91 µg/l	TC-2-SW 4/26/91 µg/l	TC-2-SW-DUP 4/26/91 µg/l	CC-1-SW 4/26/91 µg/l	CC-2-SW 4/26/91 µg/l	CC-EQB 4/26/91 µg/l	NYSDEC Class C Surface Water Standards/ Guidance Values µg/l
COMPOUND	CRQL							
alpha-BHC	0.05	U	U	U	U	U	U	0.01S
beta-BHC	0.05	U	U	U	U	U	U	0.01S
delta-BHC	0.05	U	U	U	U	U	U	0.01S
gamma-BHC(Lindane)	0.05	U	U	U	U	U	U	0.01S
Heptachlor	0.05	U	U	U	U	U	U	0.001S
Aldrin	0.05	U	U	U	U	U	U	0.001S
Heptachlor Epoxide	0.05	U	U	U	U	U	U	0.001S
Endosulfan I	0.05	U	U	U	U	U	U	0.009S
Dieldrin	0.1	U	U	U	U	U	U	0.001S
4,4'-DDE	0.1	U	U	U	U	U	U	0.001S
Endrin	0.1	U	U	U	U	U	U	0.002S
Endosulfan II	0.1	U	U	U	U	U	U	0.009S
4,4'-DDD	0.1	U	U	U	U	U	U	0.001S
Endosulfan Sulfate	0.1	U	U	U	U	U	U	0.009S
4,4'-DDT	0.1	U	U	U	U	U	U	0.001S
Methoxychlor	0.5	U	U	U	U	U	U	0.03S
Endrin Ketone	0.1	U	U	U	U	U	U	0.002S
alpha-Chlordane	0.5	U	U	U	U	U	U	0.002G
gamma-Chlordane	0.5	U	U	U	U	U	U	0.002G
Toxaphene	1	U	U	U	U	U	U	0.005S
Aroclor-1016	0.5	U	U	U	U	U	U	0.001S
Aroclor-1221	0.5	U	U	U	U	U	U	0.001S
Aroclor-1232	0.5	U	U	U	U	U	U	0.001S
Aroclor-1242	0.5	U	U	U	U	U	U	0.001S
Aroclor-1248	0.5	U	U	U	U	U	U	0.001S
Aroclor-1254	1	U	U	U	U	U	U	0.001S
Aroclor-1260	1	U	U	U	U	U	U	0.001S

Qualifier

U: Compound not detected

Notes

CRQL: Contract Required Quantitation Limits
SW: Surface Water - sample collected near water surface
DUP: Duplicate sample
EQB: Duplicate sample
S: Standard
G: Guidance vlaue

Table 25
Becker Electronics Site
Catskill and Thorp Creeks Water Sampling
Inorganic Constituents

SAMPLE LOCATION:		TC-1-SW	TC-2-SW	TC-2-SW-DUP	CC-1-SW	CC-2-SW	NYSDEC Class C Surface Water Standards/
DATE SAMPLED:		11/19/90	11/19/90	11/19/90	11/19/90	11/19/90	Guidance Values
UNITS:		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
ELEMENTS	CRDL						
ALUMINUM	200	R	UJ	R	R	R	100S
ANTIMONY	60	R	R	R	R	R	---
ARSENIC	10	U	0.5B	0.7B	U	0.7B	190S
BARIUM	200	UJ	UJ	UJ	UJ	UJ	---
BERYLLIUM	5	UJ	UJ	UJ	UJ	UJ	11S*
CADMIUM	5	UJ	UJ	UJ	UJ	UJ	0.9S*
CALCIUM	5000	R	UJ	R	R	R	---
CHROMIUM	10	UJ	UJ	UJ	UJ	UJ	156S*
COBALT	50	UJ	UJ	UJ	UJ	UJ	5S
COPPER	25	UJ	UJ	UJ	UJ	UJ	9S*
IRON	100	R	R	R	R	R	300S
LEAD	3	U	U	0.6BJ	1.8B	1.5B	2S*
MAGNESIUM	5000	2110BJ	UJ	1920BJ	2180BJ	1620BJ	---
MANGANESE	15	R	UJ	R	R	R	---
MERCURY	0.2	U	U	U	U	U	0.2G
NICKEL	40	UJ	UJ	UJ	UJ	UJ	74S*
POTASSIUM	5000	1250BJ	UJ	UJ	UJ	UJ	---
SELENIUM	5	U	U	U	U	U	1S
SILVER	10	R	R	R	R	R	0.1S
SODIUM	5000	5790J	UJ	4470BJ	5420J	4080BJ	---
THALLIUM	10	U	U	U	U	U	8S
VANADIUM	50	UJ	UJ	UJ	UJ	UJ	14S
ZINC	20	UJ	UJ	8BJ	7BJ	10BJ	30S

Qualifiers
J: Concentration was estimated
R: Value was rejected
U: Not detectable at the IDL
B: Value is between the IDL and CRDL
UJ: Compound not detected - the sample quantitation limit is an estimate

Notes
CRDL: Contract Required Detection Limits
DUP: Duplicate sample
SW: Surface Water - Sample collected near water surface
S: Standard
G: Guidance value
*: Values are calculated based on a hardness of 71 mg/l

Table 26
Becker Electronics Site
Catskill and Thorp Creeks Sediment Sampling
Volatile Organic Compounds

SAMPLE LOCATION:		TC-1-SED	TC-2-SED	TC-2-SED-DUP	CC-1-SED	CC-2-SED	CC-EQB	CC-TB	NYSDEC Sediment Criteria
DATE SAMPLED:		4/26/91	4/26/91	4/26/91	4/26/91	4/26/91	4/26/91	4/26/91	
DEPTH OF SAMPLE (FT):		0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	---	---	
UNITS:		µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/l	µg/l	µg/kg
COMPOUND	CRQL								
Chloromethane	10	U	U	U	U	U	U	U	---
Bromomethane	10	U	U	U	U	U	U	U	---
Vinyl Chloride	10	U	U	U	U	U	U	U	1 (H)
Chloroethane	10	U	U	U	U	U	U	U	---
Methylene Chloride	5	U	U	U	U	U	8U	7U	---
Acetone	10	U	U	U	U	U	U	U	---
Carbon Disulfide	5	U	U	U	U	U	U	U	---
1,1-Dichloroethene	5	U	U	U	U	U	U	U	0.35 (H)
1,1-Dichloroethane	5	U	U	U	U	U	U	U	---
1,2-Dichloroethene (total)	5	U	U	U	U	U	U	U	---
Chloroform	5	U	U	U	U	U	U	U	---
1,2-Dichloroethane	5	U	U	U	U	U	U	U	12 (H)
2-Butanone	10	U	U	U	U	U	U	U	---
1,1,1-Trichloroethane	5	U	U	U	U	U	U	U	---
Carbon Tetrachloride	5	U	U	U	U	U	U	U	10 (H)
Vinyl Acetate	10	U	U	U	U	U	U	U	---
Bromodichloromethane	5	U	U	U	U	U	U	U	---
1,2-Dichloropropane	5	U	U	U	U	U	U	U	---
cis-1,3-Dichloropropene	5	U	U	U	U	U	U	U	---
Trichloroethene	5	U	U	U	U	U	U	U	35 (H), 24 (G)
Dibromochloromethane	5	U	U	U	U	U	U	U	---
1,1,2-Trichloroethane	5	U	U	U	U	U	U	U	10 (H)
Benzene	5	U	U	U	U	U	U	U	10 (H), 9 (G)
trans-1,3-Dichloropropene	5	U	U	U	U	U	U	U	---
Bromoform	5	U	U	U	U	U	U	U	---
4-Methyl-2-pentanone	10	U	U	U	U	U	U	U	---
2-Hexanone	10	U	U	U	U	U	U	U	---
Tetrachloroethene	5	U	U	U	U	U	U	U	14 (H), 6(G)
1,1,2,2-Tetrachloroethane	5	U	U	U	U	U	U	U	5 (H)
Toluene	5	U	3J	U	U	U	U	U	---
Chlorobenzene	5	U	U	U	U	U	U	U	61 (A), 29 (S)
Ethylbenzene	5	U	U	U	U	U	U	U	---
Styrene	5	U	U	U	U	U	U	U	---
Total Xylenes	5	U	U	U	U	U	U	U	---

Qualifiers

U: Compound not detected
J: Concentration estimated

Notes

CRQL: Contract Required Quantitation Limits
DUP: Duplicate sample
SED: Sediment sample
EQB: Equipment blank sample
TB: Trip blank sample

(A): Criteria calculated based on Aquatic Toxicity basis
(H): Criteria calculated based on Human Health Residue basis
(G): Criteria calculated based on Koc value and Class C surface water guidance value
(S): Criteria calculated based on Koc value and Class C surface water standard

A value followed by a U or a UJ is an elevated detection limit due to blank contamination

\BECKER\VOL-S\VOL-SED.XLU (T-10,18,26)

Table 27
Becker Electronics Site
Catskill and Thorp Creeks Sediment Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION:		TC-1-SD	TC-2-SD	CC-1-SED	CC-2-SED	TC-2-SED	TC-2-SED-DUP	CC-EQB	NYSDEC Sediment Criteria
DATE SAMPLED:		11/19/90	11/19/90	4/26/91	4/26/91	4/26/91	4/26/91	4/26/91	
DEPTH OF SAMPLE (FT.):		0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	---	
UNITS:		µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/l	µg/kg
COMPOUND	CRQL								
Phenol	330	U	U	U	U	U	U	U	9 (A), 1 (S)
bis(2-Chloroethyl) ether	330	U	U	U	U	U	U	U	0.17 (H)
2-Chlorophenol	330	U	U	U	U	U	U	U	10 (A)
1,3-Dichlorobenzene	330	U	U	U	U	U	U	U	209 (A), 148 (S)
1,4-Dichlorobenzene	330	U	U	U	U	U	U	U	209 (A), 148 (S)
Benzyl Alcohol	330	U	U	U	U	U	U	U	---
1,2-Dichlorobenzene	330	U	U	U	U	U	U	U	209 (A), 148 (S)
2-Methylphenol	330	U	U	U	U	U	U	U	9 (A)
bis(2-Chloroisopropyl) ether	330	U	U	U	U	U	U	U	---
4-Methylphenol	330	U	U	U	U	U	U	U	9 (A)
N-Nitroso-di-n-propylamine	330	U	U	R	R	R	R	R	---
Hexachloroethane	330	U	U	U	U	U	U	U	---
Nitrobenzene	330	U	U	U	U	U	U	U	---
Isophorone	330	U	U	U	U	U	U	U	---
2-Nitrophenol	330	U	U	U	U	U	U	U	9 (A)
2,4-Dimethylphenol	330	U	U	U	U	U	U	U	9 (A)
Benzoic Acid	1600	UJ	UJ	U	U	U	U	U	---
bis(2-Chloroethoxy)methane	330	U	U	U	U	U	U	U	---
2,4-Dichlorophenol	330	U	U	U	U	U	U	U	10 (A), 7 (S)
1,2,4-Trichlorobenzene	330	U	U	U	U	U	U	U	1,583 (A), 800 (S)
Naphthalene	330	U	U	U	U	U	U	U	---
4-Chloroaniline	330	U	U	U	U	U	U	U	---
Hexachlorobutadiene	330	U	U	U	U	U	U	U	94 (A), 505 (S)
4-Chloro-3-Methylphenol	330	U	U	U	U	U	U	U	10 (A)
2-Methylnaphthalene	330	U	U	U	U	U	U	U	---
Hexachlorocyclopentadiene	330	U	U	U	U	U	U	U	77 (A), 38 (S)
2,4,6-Trichlorophenol	330	U	U	U	U	U	U	U	10 (A), 35 (S)
2,4,5-Trichlorophenol	1600	U	U	U	U	U	U	U	10 (A), 2 (S)
2-Chloronaphthalene	330	U	U	U	U	U	U	U	---
2-Nitroaniline	1600	U	U	U	U	U	U	U	---
Dimethylphthalate	330	U	U	U	U	U	U	U	---
Acenaphthylene	330	U	U	U	U	U	U	U	---
2,6-Dinitrotoluene	330	U	U	U	U	U	U	U	2 (H)
3-Nitroaniline	330	U	U	U	U	U	U	U	---
Acenaphthene	330	U	U	U	U	U	U	U	12,702 (A)
2,4-Dinitrophenol	1600	U	U	U	U	U	U	U	9 (A), 1 (S)

(continued on next page)

Table 27 (continued)
Becker Electronics Site
Catskill and Thorp Creeks Sediment Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION:		TC-1-SD	TC-2-SD	CC-1-SED	CC-2-SED	TC-2-SED	TC-2-SED-DUP	CC-EQB	NYSDEC Sediment Criteria
DATE SAMPLED:		11/19/90	11/19/90	4/26/91	4/26/91	4/26/91	4/26/91	4/26/91	
DEPTH OF SAMPLE (FT.):		0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	---	
UNITS:		µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/l	µg/kg
COMPOUND	CRQL								
4-Nitrophenol	1600	U	U	U	U	U	U	U	9 (A), 2 (S)
Dibenzofuran	330	U	U	U	U	U	U	U	---
2,4-Dinitrotoluene	330	U	U	R	R	R	R	R	---
Diethylphthalate	330	U	U	U	U	U	U	U	---
4-Chlorophenyl-Phenylether	330	U	U	U	U	U	U	U	---
Fluorene	330	U	U	U	U	U	U	U	---
4-Nitroaniline	1600	U	U	U	U	U	U	U	---
4,6-Dinitro-2-Methylphenol	1600	U	U	U	U	U	U	U	9 (A)
N-nitrosodiphenylamine	330	U	U	U	U	U	U	U	---
4-Bromophenyl-Phenylether	330	U	U	U	U	U	U	U	---
Hexachlorobenzene	330	U	U	U	U	U	U	U	131,683 (A)
Pentachlorophenol	1600	U	U	U	U	U	U	U	696 (A), 369 (S)
Phenanthrene	330	U	U	U	U	U	U	U	2,419 (A)
Anthracene	330	U	U	U	U	U	U	U	---
Di-n-butylphthalate	330	U	U	U	U	U	U	U	---
Fluoranthene	330	U	U	U	U	U	U	U	---
Pyrene	330	U	U	U	U	U	U	U	---
Butylbenzylphthalate	330	U	U	U	U	U	U	U	---
3,3'-Dichlorobenzidine	660	U	U	UJ	UJ	UJ	UJ	UJ	---
Benzo(a)anthracene	330	U	U	U	U	U	U	U	23 (H)
Chrysene	330	U	U	U	U	U	U	U	23 (H)
Bis(2-ethylhexyl)phthalate	330	U	U	U	U	U	U	U	2,083 (A), 75 (S)
Di-n-octylphthalate	330	U	U	U	U	U	U	U	---
Benzo(b)fluoranthene	330	U	U	U	U	U	U	U	23 (H)
Benzo(k)fluoranthene	330	U	U	U	U	U	U	U	23 (H)
Benzo(a)pyrene	330	U	U	U	U	U	U	U	23 (H), 115 (G)
Indeno(1,2,3-cd)pyrene	330	U	U	U	U	U	U	U	23 (H)
Dibenz(a,h)anthracene	330	U	U	U	U	U	U	U	---
Benzo(g,h,i)perylene	330	U	U	U	U	U	U	U	---

Qualifiers
U: Compound not detected
UJ: Compound not detected - the sample quantitation limit is an estimate
R: Value was rejected

Notes
CRQL: Contract Required Quantitation Limits
SD, SED: Sediment sample
DUP: Duplicate sample
EQB: Equipment blank sample

(A): Criteria calculated based on Aquatic Toxicity basis
(H): Criteria calculated based on Human Health Residue basis
(G): Criteria calculated based on Koc value and Class C surface water guidance value
(S): Criteria calculated based on Koc value and Class C surface water standard

Table 28
Becker Electronics Site
Catskill and Thorp Creeks Sediment Sampling
Pesticides/PCBs

SAMPLE LOCATION:		TC-1-SD	TC-2-SD	TC-2-SD-DUP	CC-1-SD	CC-2-SD	NYSDEC
DATE SAMPLED:		11/19/90	11/19/90	11/19/90	11/19/90	11/19/90	Sediment
DEPTH OF SAMPLE (FT):		0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	Criteria
UNITS:		µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
COMPOUND	CRQL						
alpha-BHC	8	U	U	U	U	U	1 (A), 0.66 (S)
beta-BHC	8	U	U	U	U	U	1 (A), 0.66 (S)
delta-BHC	8	U	U	U	U	U	1 (A), 1.15 (S)
gamma-BHC(Lindane)	8	U	U	U	U	U	1 (A), 0.19 (S)
Heptachlor	8	U	U	U	U	U	0.52 (A), 0.21 (S)
Aldrin	8	U	U	U	U	U	146 (A), 1.67 (S)
Heptachlor Epoxide	8	U	U	U	U	U	0.52 (A), 0.004 (S)
Endosulfan I	8	U	U	U	U	U	0.52 (A)
Dieldrin	16	U	U	U	U	U	146 (A), 0.03 (S)
4,4'-DDE	16	U	U	U	U	U	870 (A), 76.56 (S)
Endrin	16	U	U	U	U	U	14 (A)
Endosulfan II	16	U	U	U	U	U	0.52 (A)
4,4'-DDD	16	U	U	U	U	U	870 (A), 13.4 (S)
Endosulfan Sulfate	16	U	U	U	U	U	0.52 (A)
4,4'-DDT	16	U	U	U	U	U	870 (A), 4.23 (S)
Methoxychlor	80	U	U	U	U	U	10 (A)
Endrin Ketone	16	U	U	U	U	U	14 (A)
alpha-Chlordane	80	U	U	U	U	U	0.10 (A), 4.87(G)
gamma-Chlordane	80	U	U	U	U	U	0.10 (A), 4.87(G)
Toxaphene	160	U	U	U	U	U	0.17 (A), 0.08 (S)
Aroclor-1016	80	U	U	U	U	U	---
Aroclor-1221	80	U	U	U	U	U	---
Aroclor-1232	80	U	U	U	U	U	---
Aroclor-1242	80	U	U	U	U	U	---
Aroclor-1248	80	U	U	U	U	U	---
Aroclor-1254	160	U	U	U	U	U	4,802 (A), 0.74 (S)
Aroclor-1260	160	U	U	U	U	U	---

Qualifiers

U: Compound not detected

Notes

CRQL: Contract Required Quantitation Limits
SD: Sediment sample
DUP: Duplicate sample
(A): Criteria calculated based on Aquatic Toxicity basis
(H): Criteria calculated based on Human Health Residue basis
(G): Criteria calculated based on Koc value and Class C surface water guidance value
(S): Criteria calculated based on Koc value and Class C surface water standard

Table 29
Becker Electronics Site
Catskill and Thorp Creeks Sediment Sampling
Inorganic Constituents

SAMPLE LOCATION:		TC-1-SD	TC-2-SD	TC-2-SD-DUP	CC-1-SD	CC-2-SD	CC-EQB	NYSDEC Sediment Criteria	
DATE SAMPLED:		11/19/90	11/19/90	11/19/90	11/19/90	11/19/90	11/19/90		
DEPTH OF SAMPLE (FT.):		0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	---		
UNITS:		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	µg/l	mg/kg	
ELEMENTS	CRDL							Sediment Criteria	Limit of Tolerance*
ALUMINUM	40	11600J	11600J	13900J	9710J	15000J	557J	- - -	- - -
ANTIMONY	12	R	R	R	R	R	R	- - -	- - -
ARSENIC	2	5.3	4.8	5.1	4	6	0.6B	5	33
BARIUM	40	68.9J	75.5J	82.7J	83.3J	89.3J	UJ	- - -	- - -
BERYLLIUM	1	4.5J	4.5J	5.2J	3.7J	5.6J	UJ	- - -	- - -
CADMIUM	1	1.4J	1.3J	1.7J	0.88BJ	1.1BJ	UJ	0.8	10
CALCIUM	1000	R	R	R	R	R	12000J	- - -	- - -
CHROMIUM	2	21.1J	19.7J	19.4J	14.1J	24.8J	9BJ	26	111
COBALT	10	14.1J	13.4J	17.3J	11.4J	14.9J	UJ	- - -	- - -
COPPER	5	12.0J	9.5J	13.0J	16.7J	13.8J	UJ	19	114
IRON	20	28900J	28900J	32400J	24800J	36900J	1200J	24,000	40,000
LEAD	0.6	19.7J	13.9J	19.5J	16.1J	13.9J	1.1B	27	250
MAGNESIUM	1000	4520J	4080J	5000J	3360J	5130J	1990BJ	- - -	- - -
MANGANESE	3	517J	639J	685J	965J	738J	52J	428	1,100
MERCURY	0.1	0.12UJ	0.13U	0.14U	0.11U	0.14U	U	0.11	2
NICKEL	8	37.6J	33.7J	40.8J	31.6J	43.9J	UJ	22	90
POTASSIUM	1000	885BJ	1010BJ	1030BJ	578BJ	1420J	UJ	- - -	- - -
SELENIUM	1	0.29U	0.32U	0.35U	0.26U	0.34U	U	- - -	- - -
SILVER	2	R	R	R	R	R	R	- - -	- - -
SODIUM	1000	290UJ	319UJ	350UJ	266UJ	341UJ	4510BJ	- - -	- - -
THALLIUM	2	0.17U	0.18U	0.20U	0.15U	0.20U	U	- - -	- - -
VANADIUM	10	16.5J	17.4J	20.8J	13.2J	22.8J	UJ	- - -	- - -
ZINC	4	77.0J	80.8J	98.8J	61.5J	101J	9BJ	85	800

Qualifiers

J: Concentration was estimated
R: Value was rejected
U: Not detectable at the IDL
B: Value is between the IDL and CRDL
UJ: Compound not detected - the sample quantitation limit is an estimate

Notes

CRDL: Contract Required Detection Limits
EQB: Equipment blank sample
DUP: Duplicate sample
SD: Sediment sample
- - -: Not available
*: Concentration that would be detrimental to the majority of species, potentially eliminating most

Table 30
Becker Electronics Site
Surface Soil Sampling
Volatile Organic Compounds

SAMPLE LOCATION:		SS-1	SS-2	SS-3	SS-3-RE	SS-4	SS-5	SS-6	SS-8	SS-9	NYSDEC Soil Cleanup Criteria
DATE SAMPLED:		11/12/90	11/12/90	11/13/90	11/13/90	11/13/90	11/13/90	11/13/90	11/13/90	11/13/90	
DEPTH OF SAMPLE (FT.):		0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	
UNITS:		µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
COMPOUND	CRQL										
Chloromethane	10	U	U	UJ	UJ	U	U	U	U	U	5
Bromomethane	10	U	U	UJ	UJ	U	U	U	U	U	16
Vinyl Chloride	10	U	U	UJ	UJ	U	U	U	U	U	3
Chloroethane	10	U	U	UJ	UJ	U	U	U	U	U	6
Methylene Chloride	5	U	8U	23UJ	17UJ	8U	U	U	U	8U	1
Acetone	10	100U	25U	UJ	UJ	UJ	UJ	UJ	UJ	UJ	---
Carbon Disulfide	5	U	U	UJ	UJ	U	U	U	U	U	81
1,1-Dichloroethene	5	U	U	UJ	UJ	U	U	U	U	U	10
1,1-Dichloroethane	5	U	U	UJ	UJ	U	U	U	U	U	5
1,2-Dichloroethene(total)	5	U	U	UJ	UJ	U	U	U	U	U	7
Chloroform	5	U	U	UJ	UJ	U	U	U	U	U	7
1,2-Dichloroethane	5	U	U	UJ	UJ	U	U	U	U	U	2
2-Butanone	10	U	U	UJ	UJ	UJ	UJ	UJ	UJ	UJ	7
1,1,1-Trichloroethane	5	U	U	UJ	UJ	U	U	U	U	U	23
Carbon Tetrachloride	5	U	U	UJ	UJ	U	U	U	U	U	17
Vinyl Acetate	10	U	U	UJ	UJ	U	U	U	U	U	---
Bromodichloromethane	5	U	U	UJ	UJ	U	U	U	U	U	47
1,2-Dichloropropane	5	U	U	UJ	UJ	U	U	U	U	U	8
cis-1,3-Dichloropropene	5	U	U	UJ	UJ	U	U	U	U	U	7
Trichloroethene	5	U	U	UJ	UJ	U	U	U	U	U	19
Dibromochloromethane	5	U	U	UJ	UJ	U	U	U	U	U	47
1,1,2-Trichloroethane	5	U	U	UJ	UJ	U	U	U	U	U	8
Benzene	5	U	U	UJ	UJ	U	U	U	U	U	17
trans-1,3-Dichloropropene	5	U	U	UJ	UJ	U	U	U	U	U	7
Bromoform	5	U	U	UJ	UJ	U	U	U	U	U	174
4-Methyl-2-pentanone	10	U	U	UJ	UJ	U	U	U	U	U	---
2-Hexanone	10	U	U	UJ	UJ	U	U	U	U	U	---
Tetrachloroethene	5	U	U	UJ	UJ	U	U	U	U	U	55
1,1,2,2-Tetrachloroethane	5	U	U	UJ	UJ	U	U	U	U	U	18
Toluene	5	U	U	UJ	UJ	U	U	U	U	8	45
Chlorobenzene	5	U	U	UJ	UJ	U	U	U	U	U	50
Ethylbenzene	5	U	U	UJ	UJ	U	U	U	U	U	165
Styrene	5	U	U	UJ	UJ	U	U	U	U	U	---
Total Xylenes	5	U	U	UJ	UJ	U	U	U	U	U	36

Qualifiers
U: Compound not detected
UJ: Compound not detected - the sample quantitation limit is an estimate

Notes
CRQL: Contract Required Quantitation Limits
RE: Sample reanalyzed
ND: Not detectable

A value followed by a U or a UJ is an elevated detection limit due to blank contamination

Table 30 (Continued)
Becker Electronics Site
Surface Soil Sampling
Volatile Organic Compounds

SAMPLE LOCATION:		SS-10	SS-11	SS-11-RE	SS-13	SS-13-RE	SS-15	SS-16	SS-17	SS-17-RE	NYSDEC Soil Cleanup Criteria
DATE SAMPLED:		11/13/90	11/13/90	11/13/90	11/13/90	11/13/90	11/12/90	11/12/90	11/13/90	11/13/90	
DEPTH OF SAMPLE (FT.):		0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	
UNITS:		µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
COMPOUND	CRQL										
Chloromethane	10	U	U	R	U	R	U	U	U	R	5
Bromomethane	10	U	U	R	U	R	U	U	U	R	16
Vinyl Chloride	10	U	U	R	U	R	U	U	U	R	3
Chloroethane	10	U	U	R	U	R	U	U	U	R	6
Methylene Chloride	5	U	U	R	U	R	7U	U	U	R	1
Acetone	10	UJ	UJ	R	UJ	R	22U	U	48UJ	R	---
Carbon Disulfide	5	U	U	R	U	R	U	U	U	R	81
1,1-Dichloroethene	5	U	U	R	U	R	U	U	U	R	10
1,1-Dichloroethane	5	U	U	R	U	R	U	U	U	R	5
1,2-Dichloroethene(total)	5	U	U	R	U	R	U	U	U	R	7
Chloroform	5	U	U	R	U	R	U	U	U	R	7
1,2-Dichloroethane	5	U	U	R	U	R	U	U	U	R	2
2-Butanone	10	U	U	R	U	R	U	U	U	R	7
1,1,1-Trichloroethane	5	U	750J	470J	U	R	U	U	UJ	R	23
Carbon Tetrachloride	5	U	U	R	U	R	U	U	UJ	R	17
Vinyl Acetate	10	U	U	R	U	R	U	U	UJ	R	---
Bromodichloromethane	5	U	U	R	U	R	U	U	UJ	R	47
1,2-Dichloropropane	5	U	U	R	U	R	U	U	UJ	R	8
cis-1,3-Dichloropropene	5	U	U	R	U	R	U	U	UJ	R	7
Trichloroethene	5	U	22	R	U	R	U	U	UJ	R	19
Dibromochloromethane	5	U	U	R	U	R	U	U	UJ	R	47
1,1,2-Trichloroethane	5	U	U	R	U	R	U	U	UJ	R	8
Benzene	5	U	U	R	U	R	U	U	UJ	R	17
trans-1,3-Dichloropropene	5	U	U	R	U	R	U	U	UJ	R	7
Bromoform	5	U	U	R	U	R	U	U	UJ	R	174
4-Methyl-2-pentanone	10	U	U	R	UJ	R	U	U	UJ	R	---
2-Hexanone	10	U	U	R	UJ	R	U	U	UJ	R	---
Tetrachloroethene	5	U	U	R	UJ	R	U	U	UJ	R	55
1,1,2,2-Tetrachloroethane	5	U	U	R	UJ	R	U	U	UJ	R	18
Toluene	5	7	27	R	UJ	R	U	U	15J	R	45
Chlorobenzene	5	U	U	R	UJ	R	U	U	UJ	R	50
Ethylbenzene	5	U	U	R	UJ	R	U	U	UJ	R	165
Styrene	5	U	U	R	UJ	R	U	U	UJ	R	---
Total Xylenes	5	U	U	R	UJ	R	U	U	UJ	R	36

<u>Qualifiers</u>

J: Concentration estimated
U: Compound not detected
UJ: Compound not detected - the sample quantitation limit is an estimate
R: Value was rejected

<u>Notes</u>

CRQL: Contract Required Quantitation Limits
RE: Sample reanalyzed
ND: Not detectable

A value followed by a U or a UJ is an elevated detection limit due to blank contamination

Table 30 (Continued)
Becker Electronics Site
Surface Soil Sampling
Volatile Organic Compounds

SAMPLE LOCATION:		SS-19	SS-18	SS-7	SS-12	SS-14	SS-7-DUP	SS-EQB	SS-TB	NYSDEC Soil Cleanup Criteria
DATE SAMPLED:		11/13/90	11/12/90	4/25/91	4/25/91	4/25/91	4/25/91	4/25/91	4/25/91	
DEPTH OF SAMPLE (FT.):		0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	---	---	
UNITS:		µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/l	µg/l	µg/kg
COMPOUND	CRQL									
Chloromethane	10	U	U	U	U	U	U	U	U	5
Bromomethane	10	U	U	U	U	U	U	U	U	16
Vinyl Chloride	10	U	U	U	U	U	U	U	U	3
Chloroethane	10	U	U	U	U	U	U	U	U	6
Methylene Chloride	5	1800	14U	U	U	U	U	8U	U	1
Acetone	10	U	150U	U	U	U	U	U	U	---
Carbon Disulfide	5	U	U	U	U	U	U	U	U	81
1,1-Dichloroethene	5	U	U	U	U	U	U	U	U	10
1,1-Dichloroethane	5	U	8	U	U	U	U	U	U	5
1,2-Dichloroethene(total)	5	U	U	U	U	U	U	U	U	7
Chloroform	5	U	U	U	U	U	U	U	U	7
1,2-Dichloroethane	5	U	U	U	U	U	U	U	U	2
2-Butanone	10	U	56J	U	U	U	U	U	U	7
1,1,1-Trichloroethane	5	U	U	U	14	U	U	U	U	23
Carbon Tetrachloride	5	U	U	U	U	U	U	U	U	17
Vinyl Acetate	10	U	U	U	U	U	U	U	U	---
Bromodichloromethane	5	U	U	U	U	U	U	U	U	47
1,2-Dichloropropane	5	U	U	U	U	U	U	U	U	8
cis-1,3-Dichloropropene	5	U	U	U	U	U	U	U	U	7
Trichloroethene	5	U	U	U	U	U	U	U	U	19
Dibromochloromethane	5	U	U	U	U	U	U	U	U	47
1,1,2-Trichloroethane	5	U	U	U	U	U	U	U	U	8
Benzene	5	U	U	U	U	U	U	U	U	17
trans-1,3-Dichloropropene	5	U	U	U	U	U	U	U	U	7
Bromoform	5	U	U	U	U	U	U	U	U	174
4-Methyl-2-pentanone	10	U	9J	U	U	U	U	U	U	---
2-Hexanone	10	U	U	U	U	U	U	U	U	---
Tetrachloroethene	5	U	U	U	U	U	U	U	U	55
1,1,2,2-Tetrachloroethane	5	U	U	U	U	U	U	U	U	18
Toluene	5	U	22	U	U	U	9	U	U	45
Chlorobenzene	5	U	U	U	U	U	U	U	U	50
Ethylbenzene	5	U	U	U	U	U	U	U	U	165
Styrene	5	U	U	U	U	U	U	U	U	---
Total Xylenes	5	U	16	U	U	U	U	U	U	36

Qualifiers
J: Concentration estimated
U: Compound not detected

Notes
CRQL: Contract Required Quantitation Limits
RE: Sample reanalyzed
DUP: Duplicate sample
EQB: Equipment blank sample
TB: Trip blank sample
ND: Not detectable

A value followed by a U or a UJ is an elevated detection limit due to blank contamination

Table 31
Becker Electronics Site
Surface Soil Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION:		SS-3	SS-3-RE	SS-7	SS-7-RE	SS-8	SS-10	SS-13	SS-13-RE	NYSDEC Soil Cleanup Criteria
DATE SAMPLED:		11/13/90	11/13/90	11/13/90	11/13/90	11/13/90	11/13/90	11/13/90	11/13/90	
DEPTH OF SAMPLE (FT.):		0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	
UNITS:		µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
COMPOUND	CRQL									
Phenol	330	U	UJ	U	U	U	U	U	U	0.43
bis(2-Chloroethyl) ether	330	U	UJ	U	U	U	U	U	U	0.42
2-Chlorophenol	330	U	UJ	U	U	U	U	U	U	---
1,3-Dichlorobenzene	330	U	UJ	U	U	U	U	U	U	255
1,4-Dichlorobenzene	330	U	UJ	U	U	U	U	U	U	240
Benzyl Alcohol	330	U	UJ	U	U	U	U	U	U	---
1,2-Dichlorobenzene	330	U	UJ	U	U	U	U	U	U	240
2-Methylphenol	330	U	UJ	U	U	U	U	U	U	---
bis(2-Chloroisopropyl) ether	330	U	UJ	U	U	U	U	U	U	9
4-Methylphenol	330	U	UJ	U	U	U	U	U	U	---
N-Nitroso-di-n-propylamine	330	U	UJ	U	U	U	U	U	U	---
Hexachloroethane	330	U	UJ	U	U	U	U	U	U	3,000
Nitrobenzene	330	U	UJ	U	U	U	U	U	U	5
Isophorone	330	U	UJ	U	U	U	U	U	U	---
2-Nitrophenol	330	U	UJ	U	U	U	U	U	U	---
2,4-Dimethylphenol	330	U	UJ	U	U	U	U	U	U	---
Benzoic Acid	1600	U	UJ	U	U	U	U	U	U	75
bis(2-Chloroethoxy)methane	330	U	UJ	U	U	U	U	U	U	---
2,4-Dichlorophenol	330	U	UJ	U	U	U	U	U	U	11
1,2,4-Trichlorobenzene	330	U	UJ	U	U	U	U	U	U	1,380
Naphthalene	330	U	UJ	U	U	U	U	U	U	390
4-Chloroaniline	330	U	UJ	U	U	U	U	U	U	---
Hexachlorobutadiene	330	U	UJ	U	U	U	U	U	U	4,350
4-Chloro-3-Methylphenol	330	U	UJ	U	U	U	U	U	U	---
2-Methylnaphthalene	330	U	UJ	U	U	U	U	U	U	1,105
Hexachlorocyclopentadiene	330	U	UJ	U	U	U	U	U	U	720
2,4,6-Trichlorophenol	330	U	UJ	U	U	U	U	U	U	60
2,4,5-Trichlorophenol	1600	U	UJ	U	U	U	U	U	U	3
2-Chloronaphthalene	330	U	UJ	U	U	U	U	U	U	221
2-Nitroaniline	1600	U	UJ	U	U	U	U	U	U	---
Dimethylphthalate	330	U	UJ	U	U	U	U	U	U	---
Acenaphthylene	330	U	UJ	U	U	U	U	U	U	3,750
2,6-Dinitrotoluene	330	U	UJ	U	U	U	U	U	U	14
3-Nitroaniline	330	UJ	UJ	U	U	U	U	U	U	---
Acenaphthene	330	U	UJ	U	U	U	U	U	U	2,760
2,4-Dinitrophenol	1600	U	UJ	UJ	UJ	UJ	UJ	U	U	0.50

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Table 31 (continued)
Becker Electronics Site
Surface Soil Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION:		SS-3	SS-3-RE	SS-7	SS-7-RE	SS-8	SS-10	SS-13	SS-13-RE	NYSDEC Soil
DATE SAMPLED:		11/13/90	11/13/90	11/13/90	11/13/90	11/13/90	11/13/90	11/13/90	11/13/90	Cleanup
DEPTH OF SAMPLE (FT.):		0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	Criteria
UNITS:		µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
COMPOUND	CRQL									
4-Nitrophenol	1600	U	UJ	U	U	U	U	U	U	0.64
Dibenzofuran	330	U	UJ	U	U	U	U	U	U	---
2,4-Dinitrotoluene	330	U	UJ	U	U	U	U	U	U	7
Diethylphthalate	330	U	UJ	U	U	U	U	U	U	213
4-Chlorophenyl-Phenylether	330	U	UJ	U	U	U	U	U	U	---
Fluorene	330	U	UJ	U	U	U	U	U	U	10,950
4-Nitroaniline	1600	U	UJ	U	U	U	U	U	U	---
4,6-Dinitro-2-Methylphenol	1600	U	UJ	U	U	U	U	UJ	UJ	---
N-nitrosodiphenylamine	330	U	UJ	U	U	U	U	UJ	UJ	---
4-Bromophenyl-Phenylether	330	U	UJ	U	U	U	U	UJ	UJ	---
Hexachlorobenzene	330	U	UJ	U	U	U	U	UJ	UJ	41
Pentachlorophenol	1600	U	UJ	U	U	U	U	UJ	UJ	1,590
Phenanthrene	330	U	UJ	U	U	U	U	UJ	UJ	21,000
Anthracene	330	U	UJ	U	U	U	U	UJ	UJ	21,000
Di-n-butylphthalate	330	U	UJ	U	U	U	U	UJ	UJ	255,000
Fluoranthene	330	U	UJ	U	U	U	U	UJ	UJ	57,000
Pyrene	330	U	UJ	U	U	U	U	120J	130J	57,000
Butylbenzylphthalate	330	U	UJ	U	U	U	U	UJ	UJ	6,548
3,3'-Dichlorobenzidine	660	U	UJ	U	U	U	U	UJ	UJ	233
Benzo(a)anthracene	330	U	UJ	U	U	U	U	UJ	UJ	83
Chrysene	330	U	UJ	U	U	U	U	UJ	170J	12
Bis(2-ethylhexyl)phthalate	330	14000J	13000J	U	U	U	690U	1400UJ	1400UJ	10,838
Di-n-octylphthalate	330	2600J	500J	UJ	UJ	U	340J	UJ	UJ	3,578
Benzo(b)fluoranthene	330	UJ	UJ	UJ	UJ	U	U	UJ	UJ	33
Benzo(k)fluoranthene	330	UJ	UJ	UJ	UJ	U	U	UJ	UJ	33
Benzo(a)pyrene	330	UJ	UJ	UJ	UJ	U	U	UJ	UJ	ND
Indeno(1,2,3-cd)pyrene	330	UJ	UJ	UJ	UJ	U	U	UJ	UJ	96
Dibenz(a,h)anthracene	330	UJ	UJ	UJ	UJ	U	U	UJ	UJ	4,950,000
Benzo(g,h,i)perylene	330	UJ	UJ	UJ	UJ	U	U	UJ	UJ	2,400,000

Qualifiers

J: Concentration was estimated
U: Compound not detected

A value followed by a U or a UJ is an elevated detection limit du to blank contamination

UJ: Compound not detected - the sample quantitation limit is an estimate

Notes

CRQL: Contract Required Quantitation Limits
RE: Sample reanalyzed
ND: Not Detectable

Table 31 (continued)
Becker Electronics Site
Surface Soil Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION:		SS-14	SS-14-RE	SS-17	SS-17-RE	SS-19	SS-19-RE	NYSDEC Soil
DATE SAMPLED:		11/13/90	11/13/90	11/13/90	11/13/90	11/13/90	11/13/90	Cleanup
DEPTH OF SAMPLE (FT.):		0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	Criteria
UNITS:		µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
COMPOUND	CRQL							
Phenol	330	U	U	U	U	U	U	0.43
bis(2-Chloroethyl) ether	330	U	U	U	U	U	U	0.42
2-Chlorophenol	330	U	U	U	U	U	U	---
1,3-Dichlorobenzene	330	U	U	U	U	U	U	255
1,4-Dichlorobenzene	330	U	U	U	U	U	U	240
Benzyl Alcohol	330	U	U	U	U	U	U	---
1,2-Dichlorobenzene	330	U	U	U	U	U	U	240
2-Methylphenol	330	U	U	U	U	U	U	---
bis(2-Chloroisopropyl) ether	330	U	U	U	U	U	U	9
4-Methylphenol	330	U	U	U	U	U	U	---
N-Nitroso-di-n-propylamine	330	U	U	U	U	U	U	---
Hexachloroethane	330	U	U	U	U	U	U	3,000
Nitrobenzene	330	U	U	U	U	U	U	5
Isophorone	330	U	U	U	U	U	U	---
2-Nitrophenol	330	U	U	U	U	U	U	---
2,4-Dimethylphenol	330	U	U	U	U	U	U	---
Benzoic Acid	1600	U	U	U	U	U	U	75
bis(2-Chloroethoxy)methane	330	U	U	U	U	U	U	---
2,4-Dichlorophenol	330	U	U	U	U	U	U	11
1,2,4-Trichlorobenzene	330	U	U	U	U	U	U	1,380
Naphthalene	330	U	U	U	U	U	U	390
4-Chloroaniline	330	U	U	U	U	U	U	---
Hexachlorobutadiene	330	U	U	U	U	U	U	4,350
4-Chloro-3-Methylphenol	330	U	U	U	U	U	U	---
2-Methylnaphthalene	330	U	U	U	U	420J	U	1,105
Hexachlorocyclopentadiene	330	U	U	U	U	U	U	720
2,4,6-Trichlorophenol	330	U	U	U	U	U	U	60
2,4,5-Trichlorophenol	1600	U	U	U	U	U	U	3
2-Chloronaphthalene	330	U	U	U	U	U	U	221
2-Nitroaniline	1600	U	U	U	U	U	U	---
Dimethylphthalate	330	U	U	U	U	U	U	---
Acenaphthylene	330	U	U	U	U	U	U	3,750
2,6-Dinitrotoluene	330	U	U	U	U	U	U	14
3-Nitroaniline	330	U	U	U	U	U	U	---
Acenaphthene	330	U	U	U	U	U	U	2,760
2,4-Dinitrophenol	1600	U	U	U	UJ	U	UJ	0.50

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Table 31 (continued)
Becker Electronics Site
Surface Soil Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION:		SS-14	SS-14-RE	SS-17	SS-17-RE	SS-19	SS-19-RE	NYSDEC Soil Cleanup Criteria
DATE SAMPLED:		11/13/90	11/13/90	11/13/90	11/13/90	11/13/90	11/13/90	
DEPTH OF SAMPLE (FT.):		0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	
UNITS:		µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
COMPOUND	CRQL							
4-Nitrophenol	1600	U	UJ	U	U	U	U	0.64
Dibenzofuran	330	U	UJ	U	U	U	U	---
2,4-Dinitrotoluene	330	U	UJ	U	U	U	U	7
Diethylphthalate	330	U	UJ	U	U	U	U	213
4-Chlorophenyl-Phenylether	330	U	UJ	U	U	U	U	---
Fluorene	330	U	UJ	U	U	U	U	10,950
4-Nitroaniline	1600	U	UJ	U	U	U	U	---
4,6-Dinitro-2-Methylphenol	1600	UJ	UJ	U	U	U	U	---
N-nitrosodiphenylamine	330	UJ	UJ	U	U	U	U	---
4-Bromophenyl-Phenylether	330	UJ	UJ	U	U	U	U	---
Hexachlorobenzene	330	UJ	UJ	U	U	U	U	41
Pentachlorophenol	1600	UJ	UJ	U	U	U	U	1,590
Phenanthrene	330	UJ	UJ	U	U	350J	U	21,000
Anthracene	330	UJ	UJ	U	U	U	U	21,000
Di-n-butylphthalate	330	UJ	UJ	660U	U	U	U	255,000
Fluoranthene	330	UJ	UJ	U	U	U	U	57,000
Pyrene	330	UJ	UJ	UJ	U	U	U	57,000
Butylbenzylphthalate	330	UJ	UJ	2100J	1800	260J	U	6,548
3,3'-Dichlorobenzidine	660	UJ	UJ	UJ	U	U	U	233
Benzo(a)anthracene	330	UJ	UJ	UJ	U	U	U	83
Chrysene	330	UJ	UJ	UJ	U	U	U	12
Bis(2-ethylhexyl)phthalate	330	370UJ	390UJ	19000J	26000	9600J	14000J	10,838
Di-n-octylphthalate	330	UJ	UJ	3900J	4400J	6900J	7400J	3,578
Benzo(b)fluoranthene	330	UJ	UJ	UJ	U	UJ	U	33
Benzo(k)fluoranthene	330	UJ	UJ	UJ	U	UJ	U	33
Benzo(a)pyrene	330	UJ	UJ	UJ	U	UJ	U	ND
Indeno(1,2,3-cd)pyrene	330	UJ	UJ	UJ	U	UJ	U	96
Dibenz(a,h)anthracene	330	UJ	UJ	UJ	U	UJ	U	4,950,000
Benzo(g,h,i)perylene	330	UJ	UJ	UJ	U	UJ	U	2,400,000

Qualifiers

J: Concentration was estimated
U: Compound not detected

A value followed by a U or a UJ is an elevated detection limit du to blank contamination

UJ: Compound not detected - the sample quantitation limit is an estimate

Notes

CRQL: Contract Required Quantitation Limits
RE: Sample reanalyzed
ND: Not Detectable

Table 31 (continued)
Becker Electronics Site
Surface Soil Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION:		SS-19-DUP	SS-1	SS-2	SS-4	SS-5	SS-6	NYSDEC Soil Cleanup Criteria
DATE SAMPLED:		11/13/90	4/25/91	4/25/91	4/25/91	4/25/91	4/25/91	
DEPTH OF SAMPLE (FT.):		0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	
UNITS:		µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
COMPOUND	CRQL							
Phenol	330	U	U	54J	U	U	U	0.43
bis(2-Chloroethyl) ether	330	U	U	U	U	U	U	0.42
2-Chlorophenol	330	U	U	U	U	U	U	---
1,3-Dichlorobenzene	330	U	U	U	U	U	U	255
1,4-Dichlorobenzene	330	U	U	U	200J	79J	U	240
Benzyl Alcohol	330	U	U	U	U	U	U	---
1,2-Dichlorobenzene	330	U	U	U	U	U	U	240
2-Methylphenol	330	U	U	U	U	U	U	---
bis(2-Chloroisopropyl) ether	330	U	U	U	U	U	U	9
4-Methylphenol	330	U	U	U	U	U	U	---
N-Nitroso-di-n-propylamine	330	U	U	U	U	U	U	---
Hexachloroethane	330	U	U	U	U	U	U	3,000
Nitrobenzene	330	U	U	U	U	U	U	5
Isophorone	330	U	U	U	U	U	U	---
2-Nitrophenol	330	U	U	U	U	U	U	---
2,4-Dimethylphenol	330	U	U	U	U	U	U	---
Benzoic Acid	1600	U	U	U	U	U	U	75
bis(2-Chloroethoxy)methane	330	U	U	U	U	U	U	---
2,4-Dichlorophenol	330	U	U	U	U	U	U	11
1,2,4-Trichlorobenzene	330	U	U	U	U	U	U	1,380
Naphthalene	330	U	U	U	U	U	U	390
4-Chloroaniline	330	U	U	U	U	U	U	---
Hexachlorobutadiene	330	U	U	U	U	U	U	4,350
4-Chloro-3-Methylphenol	330	U	U	U	U	U	U	---
2-Methylnaphthalene	330	440J	U	U	U	U	U	1,105
Hexachlorocyclopentadiene	330	U	U	U	U	U	U	720
2,4,6-Trichlorophenol	330	U	U	U	U	U	U	60
2,4,5-Trichlorophenol	1600	U	U	U	U	U	U	3
2-Chloronaphthalene	330	U	U	U	U	U	U	221
2-Nitroaniline	1600	U	U	U	U	U	U	---
Dimethylphthalate	330	U	U	U	U	U	U	---
Acenaphthylene	330	U	U	U	U	U	U	3,750
2,6-Dinitrotoluene	330	U	U	U	U	U	U	14
3-Nitroaniline	330	U	U	U	U	U	U	---
Acenaphthene	330	U	U	U	U	U	U	2,760
2,4-Dinitrophenol	1600	U	U	U	U	U	U	0.50

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Table 31 (continued)
Becker Electronics Site
Surface Soil Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION:		SS-19-DUP	SS-1	SS-2	SS-4	SS-5	SS-6	NYSDEC Soil Cleanup Criteria
DATE SAMPLED:		11/13/90	4/25/91	4/25/91	4/25/91	4/25/91	4/25/91	
DEPTH OF SAMPLE (FT.):		0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	
UNITS:		µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
COMPOUND	CRQL							
4-Nitrophenol	1600	U	U	U	U	U	U	0.64
Dibenzofuran	330	U	U	U	U	U	U	---
2,4-Dinitrotoluene	330	U	U	U	U	U	U	7
Diethylphthalate	330	U	U	U	U	U	U	213
4-Chlorophenyl-Phenylether	330	U	U	U	U	U	U	---
Fluorene	330	U	U	U	U	U	U	10,950
4-Nitroaniline	1600	U	U	U	U	U	U	---
4,6-Dinitro-2-Methylphenol	1600	U	U	U	U	U	U	---
N-nitrosodiphenylamine	330	U	U	U	U	U	U	---
4-Bromophenyl-Phenylether	330	U	U	U	U	U	U	---
Hexachlorobenzene	330	U	U	U	U	U	U	41
Pentachlorophenol	1600	U	U	U	U	U	U	1,590
Phenanthrene	330	U	U	100J	U	U	U	21,000
Anthracene	330	280J	U	U	U	U	U	21,000
Di-n-butylphthalate	330	U	U	U	U	U	U	255,000
Fluoranthene	330	U	U	140J	U	U	U	57,000
Pyrene	330	U	U	100J	U	U	U	57,000
Butylbenzylphthalate	330	U	U	U	U	U	U	6,548
3,3'-Dichlorobenzidine	660	U	U	U	U	U	U	233
Benzo(a)anthracene	330	U	U	U	U	U	U	83
Chrysene	330	U	U	68J	U	U	U	12
Bis(2-ethylhexyl)phthalate	330	4700J	3100J	4600	U	6400J	5500	10,838
Di-n-octylphthalate	330	1200J	U	U	U	550	240J	3,578
Benzo(b)fluoranthene	330	U	U	130J	U	U	U	33
Benzo(k)fluoranthene	330	U	U	U	U	U	U	33
Benzo(a)pyrene	330	U	U	63J	U	U	U	ND
Indeno(1,2,3-cd)pyrene	330	U	U	U	U	U	U	96
Dibenz(a,h)anthracene	330	U	U	U	U	U	U	4,950,000
Benzo(g,h,i)perylene	330	U	U	U	U	U	U	2,400,000

Qualifiers
J: Concentration was estimated
U: Compound not detected

A value followed by a U or a UJ
is an elevated detection limit du
to blank contamination

Notes
CRQL: Contract Required Quantitation Limits
DUP: Duplicate sample
ND: Not Detectable

Table 31 (continued)
Becker Electronics Site
Surface Soil Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION:		SS-9	SS-9-RE	SS-11	SS-EQB	SS-12	SS-15	SS-16	SS-18	SS-2-DUP	NYSDEC Soil Cleanup Criteria
DATE SAMPLED:		4/25/91	4/25/91	4/25/91	4/25/91	4/25/91	4/25/91	4/25/91	4/25/91	4/25/91	
DEPTH OF SAMPLE (FT.):		0-0.5	0-0.5	0-0.5	---	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	
UNITS:		µg/kg	µg/kg	µg/kg	µg/l	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
COMPOUND	CRQL										
Phenol	330	U	U	U	U	U	U	U	U	U	0.43
bis(2-Chloroethyl) ether	330	U	U	U	U	U	U	U	U	U	0.42
2-Chlorophenol	330	U	U	U	U	U	U	U	U	U	---
1,3-Dichlorobenzene	330	U	U	U	U	U	U	U	U	U	255
1,4-Dichlorobenzene	330	130J	130J	U	U	U	U	U	U	U	240
Benzyl Alcohol	330	U	U	U	U	U	U	U	U	U	---
1,2-Dichlorobenzene	330	U	U	U	U	U	U	U	U	U	240
2-Methylphenol	330	U	U	U	U	U	U	U	U	U	---
bis(2-Chloroisopropyl) ether	330	U	U	U	U	U	U	U	U	U	9
4-Methylphenol	330	U	U	U	U	U	U	U	U	U	---
N-Nitroso-di-n-propylamine	330	U	U	U	U	U	U	U	U	U	---
Hexachloroethane	330	U	U	U	U	U	U	U	U	U	3,000
Nitrobenzene	330	U	U	U	U	U	U	U	U	U	5
Isophorone	330	U	U	U	U	U	U	U	U	U	---
2-Nitrophenol	330	U	U	U	U	U	U	U	U	U	---
2,4-Dimethylphenol	330	U	U	U	U	U	U	U	U	U	---
Benzoic Acid	1600	U	U	130J	U	15000J	U	U	140J	540J	75
bis(2-Chloroethoxy)methane	330	U	U	U	U	U	U	U	U	U	---
2,4-Dichlorophenol	330	U	U	U	U	U	U	U	U	U	11
1,2,4-Trichlorobenzene	330	U	U	U	U	U	U	U	U	U	1,380
Naphthalene	330	U	U	U	U	U	U	U	U	75J	390
4-Chloroaniline	330	U	U	U	U	U	U	U	U	U	---
Hexachlorobutadiene	330	U	U	U	U	U	U	U	U	U	4,350
4-Chloro-3-Methylphenol	330	U	U	U	U	U	U	U	U	U	---
2-Methylnaphthalene	330	U	U	U	U	U	54J	U	U	230J	1,105
Hexachlorocyclopentadiene	330	U	U	U	U	U	U	U	U	U	720
2,4,6-Trichlorophenol	330	U	U	U	U	U	U	U	U	U	60
2,4,5-Trichlorophenol	1600	U	U	U	U	U	U	U	U	U	3
2-Chloronaphthalene	330	U	U	U	U	U	U	U	U	U	221
2-Nitroaniline	1600	U	U	U	U	U	U	U	U	U	---
Dimethylphthalate	330	U	U	U	U	U	U	U	U	U	---
Acenaphthylene	330	U	U	U	U	U	U	U	U	U	3,750
2,6-Dinitrotoluene	330	U	U	U	U	U	U	U	U	U	14
3-Nitroaniline	330	U	U	U	U	U	U	U	U	U	---
Acenaphthene	330	U	U	U	U	U	U	U	U	330J	2,760
2,4-Dinitrophenol	1600	U	U	U	U	U	U	U	U	U	0.50

(continued on next page)

Table 31 (continued)
Becker Electronics Site
Surface Soil Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION:		SS-9	SS-9-RE	SS-11	SS-EQB	SS-12	SS-15	SS-16	SS-18	SS-2-DUP	NYSDEC Soil Cleanup Criteria
DATE SAMPLED:		4/25/91	4/25/91	4/25/91	4/25/91	4/25/91	4/25/91	4/25/91	4/25/91	4/25/91	
DEPTH OF SAMPLE (FT.):		0-0.5	0-0.5	0-0.5	---	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	
UNITS:		µg/kg	µg/kg	µg/kg	µg/l	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
COMPOUND	CRQL										
4-Nitrophenol	1600	U	U	U	U	U	U	U	U	U	0.64
Dibenzofuran	330	U	U	U	U	U	62J	U	U	250J	---
2,4-Dinitrotoluene	330	U	U	U	U	U	U	U	U	U	7
Diethylphthalate	330	U	U	U	U	U	21J	U	U	U	213
4-Chlorophenyl-Phenylether	330	U	U	U	U	U	U	U	U	U	---
Fluorene	330	U	U	U	U	U	72J	U	U	240J	10,950
4-Nitroaniline	1600	U	U	U	U	U	U	U	U	U	---
4,6-Dinitro-2-Methylphenol	1600	U	UJ	U	U	U	U	U	U	U	---
N-nitrosodiphenylamine	330	U	UJ	U	U	U	U	U	U	U	---
4-Bromophenyl-Phenylether	330	U	UJ	U	U	U	U	U	U	U	---
Hexachlorobenzene	330	U	UJ	U	U	U	U	U	U	U	41
Pentachlorophenol	1600	U	UJ	U	U	U	U	U	U	U	1,590
Phenanthrene	330	U	UJ	U	U	U	490	U	U	1500	21,000
Anthracene	330	U	UJ	U	U	U	80J	U	U	190J	21,000
Di-n-butylphthalate	330	U	UJ	U	U	3800J	21J	U	100J	U	255,000
Fluoranthene	330	U	UJ	U	U	U	410	U	U	1100	57,000
Pyrene	330	U	UJ	U	U	U	360J	U	U	890	57,000
Butylbenzylphthalate	330	U	UJ	U	U	U	190J	U	54J	U	6,548
3,3'-Dichlorobenzidine	660	U	UJ	U	U	U	U	U	U	U	233
Benzo(a)anthracene	330	U	UJ	U	U	U	190J	U	U	420J	83
Chrysene	330	U	UJ	U	U	U	240J	U	U	490	12
Bis(2-ethylhexyl)phthalate	330	1400J	1800J	U	U	45000J	1500	31000	11000J	5600	10,838
Di-n-octylphthalate	330	68J	84J	U	U	U	U	1000J	340J	46J	3,578
Benzo(b)fluoranthene	330	UJ	UJ	U	U	U	420	U	UJ	830	33
Benzo(k)fluoranthene	330	UJ	UJ	U	U	U	U	U	UJ	U	33
Benzo(a)pyrene	330	UJ	UJ	U	U	U	230J	U	UJ	440J	ND
Indeno(1,2,3-cd)pyrene	330	UJ	UJ	U	U	U	220J	U	UJ	370J	96
Dibenz(a,h)anthracene	330	UJ	UJ	U	U	U	U	U	UJ	U	4,950,000
Benzo(g,h,i)perylene	330	UJ	UJ	U	U	U	260J	U	UJ	400J	2,400,000

Qualifiers

J: Concentration was estimated
U: Compound not detected

A value followed by a U or a UJ is an elevated detection limit du to blank contamination

UJ: Compound not detected - the sample quantitation limit is an estimate

Notes

CRQL: Contract Required Quantitation Limits
RE: Sample reanalyzed
DUP: Duplicate sample
EQB: Equipment blank sample
ND: Not Detectable

Table 32
Becker Electronics Site
Surface Soil Sampling
Pesticides/PCBs

SAMPLE LOCATION:		SS-1	SS-2	SS-3	SS-4	SS-5	SS-6	SS-7	NYSDEC Soil
DATE SAMPLED:		11/12/90	11/12/90	11/13/90	11/13/90	11/13/90	11/13/90	11/13/90	Cleanup
DEPTH OF SAMPLE (FT.):		0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	Criteria
UNITS:		µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
COMPOUND	CRQL								
alpha-BHC	8	U	U	U	U	U	U	U	ND
beta-BHC	8	U	U	U	U	U	U	U	ND
delta-BHC	8	U	U	U	U	U	U	U	ND
gamma-BHC(Lindane)	8	U	U	U	U	U	U	U	ND
Heptachlor	8	U	U	U	U	U	U	U	ND
Aldrin	8	U	U	U	U	U	U	U	ND
Heptachlor Epoxide	8	U	U	U	U	U	U	U	ND
Endosulfan I	8	U	U	U	U	U	U	U	---
Dieldrin	16	U	U	U	U	U	U	U	ND
4,4'-DDE	16	U	U	U	U	U	U	U	ND
Endrin	16	U	U	U	U	U	U	U	ND
Endosulfan II	16	U	U	U	U	U	U	U	---
4,4'-DDD	16	U	U	U	U	U	U	U	ND
Endosulfan Sulfate	16	U	U	U	U	U	U	U	---
4,4'-DDT	16	U	U	U	U	U	U	U	ND
Methoxychlor	80	U	U	U	U	U	U	U	420
Endrin Ketone	16	U	U	U	U	U	U	U	420
alpha-Chlordane	80	U	U	U	U	U	U	U	ND
gamma-Chlordane	80	U	U	U	U	U	U	U	---
Toxaphene	160	U	U	U	U	U	U	U	---
Aroclor-1016	80	U	U	U	U	U	U	U	---
Aroclor-1221	80	U	U	U	U	U	U	U	---
Aroclor-1232	80	U	U	U	U	U	U	U	---
Aroclor-1242	80	U	U	U	U	U	U	U	---
Aroclor-1248	80	U	U	U	U	U	U	U	---
Aroclor-1254	160	U	U	U	U	U	U	U	128
Aroclor-1260	160	U	U	U	U	U	U	U	---

Qualifiers

U: Compound not detected

Notes

CRQL: Contract Required Quantitation Limit
DUP: Duplicate sample
ND: Not Detectable

Table 32 (continued)
Becker Electronics Site
Surface Soil Sampling
Pesticides/PCBs

SAMPLE LOCATION:		SS-8	SS-9	SS-9-DL	SS-10	SS-11	SS-12	SS-13	NYSDEC Soil
DATE SAMPLED:		11/13/90	11/13/90	11/13/90	11/13/90	11/13/90	11/13/90	11/13/90	Cleanup
DEPTH OF SAMPLE (FT.):		0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	Criteria
UNITS:		µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
COMPOUND	CRQL								
alpha-BHC	8	U	U	U	U	U	U	U	ND
beta-BHC	8	U	U	U	U	U	U	U	ND
delta-BHC	8	U	U	U	U	U	U	U	ND
gamma-BHC(Lindane)	8	U	U	U	U	U	U	U	ND
Heptachlor	8	U	U	U	U	U	U	U	ND
Aldrin	8	U	U	U	U	U	U	U	ND
Heptachlor Epoxide	8	U	U	U	U	U	U	U	ND
Endosulfan I	8	U	U	U	U	U	U	U	---
Dieldrin	16	U	U	U	U	U	U	U	ND
4,4'-DDE	16	U	U	U	U	U	U	U	ND
Endrin	16	U	U	U	U	U	U	U	ND
Endosulfan II	16	U	U	U	U	U	U	U	---
4,4'-DDD	16	U	U	U	U	U	U	U	ND
Endosulfan Sulfate	16	U	U	U	U	U	U	U	---
4,4'-DDT	16	U	U	U	U	U	U	U	ND
Methoxychlor	80	U	U	U	U	U	U	U	420
Endrin Ketone	16	U	U	U	U	U	U	U	420
alpha-Chlordane	80	U	U	U	U	U	U	U	ND
gamma-Chlordane	80	U	U	U	U	U	U	U	---
Toxaphene	160	U	U	U	U	U	U	U	---
Aroclor-1016	80	U	U	U	U	U	U	U	---
Aroclor-1221	80	U	U	U	U	U	U	U	---
Aroclor-1232	80	U	U	U	U	U	U	U	---
Aroclor-1242	80	U	U	U	U	U	U	U	---
Aroclor-1248	80	U	U	U	U	U	U	U	---
Aroclor-1254	160	U	U	U	U	U	U	U	128
Aroclor-1260	160	U	U	U	U	U	U	U	---

Qualifiers
U: Compound not detected

Notes
CRQL: Contract Required Quantitation Limit
DUP: Duplicate sample
ND: Not Detectable
DL: Dilution

Table 32 (continued)
Becker Electronics Site
Surface Soil Sampling
Pesticides/PCBs

SAMPLE LOCATION:		SS-14	SS-15	SS-16	SS-17	SS-18	SS-19	SS-19-DUP	NYSDEC Soil
DATE SAMPLED:		11/13/90	11/12/90	11/12/90	11/13/90	11/12/90	11/13/90	11/13/90	Cleanup
DEPTH OF SAMPLE (FT.):		0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	Criteria
UNITS:		µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
COMPOUND	CRQL								
alpha-BHC	8	U	U	U	U	U	U	U	ND
beta-BHC	8	U	U	U	U	U	U	U	ND
delta-BHC	8	U	U	U	U	U	U	U	ND
gamma-BHC(Lindane)	8	U	U	U	U	U	U	U	ND
Heptachlor	8	U	U	U	U	U	U	U	ND
Aldrin	8	U	U	U	U	U	U	U	ND
Heptachlor Epoxide	8	U	U	U	U	U	U	U	ND
Endosulfan I	8	U	U	U	U	U	U	U	---
Dieldrin	16	U	U	U	U	U	U	U	ND
4,4'-DDE	16	U	U	U	U	U	U	U	ND
Endrin	16	U	U	U	U	U	U	U	ND
Endosulfan II	16	U	U	U	U	U	U	U	---
4,4'-DDD	16	U	U	U	U	U	U	U	ND
Endosulfan Sulfate	16	U	U	U	U	U	U	U	---
4,4'-DDT	16	U	U	U	U	U	U	U	ND
Methoxychlor	80	U	U	U	U	U	U	U	420
Endrin Ketone	16	U	U	U	U	U	U	U	420
alpha-Chlordane	80	U	U	U	U	U	U	U	ND
gamma-Chlordane	80	U	U	U	U	U	U	U	---
Toxaphene	160	U	U	U	U	U	U	U	---
Aroclor-1016	80	U	U	U	U	U	U	U	---
Aroclor-1221	80	U	U	U	U	U	U	U	---
Aroclor-1232	80	U	U	U	U	U	U	U	---
Aroclor-1242	80	U	U	U	U	U	U	U	---
Aroclor-1248	80	U	U	U	U	U	U	U	---
Aroclor-1254	160	U	U	U	U	U	U	U	128
Aroclor-1260	160	U	U	U	U	U	U	U	---

<u>Qualifiers</u>
U: Compound not detected

<u>Notes</u>
CRQL: Contract Required Quantitation Limit
DUP: Duplicate sample
ND: Not Detectable

Table 33
Becker Electronics Site
Surface Soil Sampling
Inorganic Constituents

SAMPLE LOCATION: DATE SAMPLED: DEPTH OF SAMPLE (FT.): UNITS:		SS-1 11/12/90 0-0.5 mg/kg	SS-2 11/12/90 0-0.5 mg/kg	SS-3 11/13/90 0-0.5 mg/kg	SS-4 11/13/90 0-0.5 mg/kg	SS-5 11/13/90 0-0.5 mg/kg	SS-6 11/13/90 0-0.5 mg/kg	SS-7 11/13/90 0-0.5 mg/kg	Natural Background Levels in Soil (1) mg/kg	35
ELEMENTS	CRDL									
ALUMINUM	40	15300J	11000J	9540J	10600J	7940J	16200J	10500J	1000 - 25000*	
ANTIMONY	12	R	R	R	R	R	R	R	- - -	
ARSENIC	2	4.5J	4.4J	6	3.8	1.6BJ	0.80B	0.81B	<0.1 - 6.5*	
BARIUM	40	107J	72.9J	763J	78.8J	56.8BJ	109J	306J	250 - 350*	350 - 450
BERYLLIUM	1	4.0J	2.9J	2.3J	3.1J	2.9J	6.3J	4.0J	0 - 0.9*	1.0 - 1.8
CADMIUM	1	1.4J	0.80BJ	42.9J	0.78BJ	0.87UJ	1.4J	0.87UJ	0.0001 - 1.0**	.2 - 1.8
CALCIUM	1000	1470J	1390J	51100J	1490J	2010J	3990J	2080J	150 - 6500*	
CHROMIUM	2	28.5J	14.9J	205J	15.8J	12.5J	29.1J	24.0J	1.5 - 25*	
COBALT	10	11.0BJ	9.0BJ	26.0J	10.9BJ	8.1BJ	19.1J	11.6BJ	2.5 - 6*	
COPPER	5	160.0J	14.6J	106J	11.9J	31.3J	16.2J	28.3J	<1 - 15*	
IRON	20	24400J	17300J	15100J	19900J	16900J	37300J	24500J	17500 - 25000*	
LEAD	0.6	R	R	404	11.7	5	8.4	6	1 - 12.5*	
MAGNESIUM	1000	3590J	2630J	6120J	2690J	2930J	5700J	3640J	1700 - 6000*	
MANGANESE	3	686J	414J	2590J	313J	179J	265J	199J	400 - 600*	
MERCURY	0.1	1.2J	0.13U	0.23U	0.13U	0.14U	0.14U	0.14U	0.042 - 0.066*	
NICKEL	8	30.2J	22.8J	33.8J	26.2J	23.8J	56.7J	34.7J	6 - 12.5*	11 - 27
POTASSIUM	1000	1460J	1270BJ	1940BJ	741BJ	1140BJ	1840J	1350BJ	12500 - 17500*	
SELENIUM	1	0.34UJ	0.32UJ	0.55U	0.31U	0.35U	0.34U	0.35U	<0.1 - 0.125*	
SILVER	2	R	R	R	R	R	R	R	- - -	
SODIUM	1000	342UJ	321UJ	776BJ	314UJ	351UJ	345UJ	350UJ	6000 - 8000*	
THALLIUM	2	0.20U	0.19U	0.32U	0.18U	0.20U	0.20U	0.20U	- - -	
VANADIUM	10	28.8J	17.2J	23.7J	15.8J	13.3BJ	25.6J	16.8J	25 - 60*	
ZINC	4	472J	90.5J	390J	97.7J	97.4J	109J	263J	37 - 60*	60 - 80

Qualifiers
J: Concentration was estimated
R: Value was rejected
U: Not detectable at the IDL
B: Value is between the IDL and CRDL
UJ: Compound not detected - the sample quantitation limit is an estimate

Notes
CRDL: Contract Required Detection Limits
- - -: Not available
*: Soils in the Albany area
**: 26 Massachusetts soils and 15 northeastern soils
(1): Source: Background Concentration of 20 Elements in Soil with Special Regard for New York State, NYSDEC

Table 33 (continued)
Becker Electronics Site
Surface Soil Sampling
Inorganic Constituents

SAMPLE LOCATION:		SS-8	SS-9	SS-10	SS-11	SS-12	SS-13	SS-14	Natural Background Levels in Soil (1)
DATE SAMPLED:		11/13/90	11/13/90	11/13/90	11/13/90	11/13/90	11/13/90	11/13/90	
DEPTH OF SAMPLE (FT.):		0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	
UNITS:		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
ELEMENTS	CRDL								
ALUMINUM	40	8950J	14700J	15000J	10300J	11200J	12100J	2140J	1000 - 25000*
ANTIMONY	12	R	R	R	R	R	R	R	- - -
ARSENIC	2	5.1J	0.77B	0.59B	4.4	6.5	4.4	2.2	<0.1 - 6.5*
BARIUM	40	89.5J	334J	112J	94.2J	62.1J	80.8J	154J	250 - 350*
BERYLLIUM	1	3.1J	5.6J	5.9J	7.3J	4.6J	4.5J	0.66BJ	0 - 0.9*
CADMIUM	1	0.79UJ	1.2J	1.5J	1.9J	1.2J	4.5J	0.66UJ	0.0001 - 1.0**
CALCIUM	1000	2340J	2530J	11600J	4380J	6940J	30500J	299000J	150 - 6500*
CHROMIUM	2	16.0J	28.1J	26.5J	24.3J	23.5J	21.4J	3.9J	1.5 - 25*
COBALT	10	11.3BJ	16.0J	18.1J	16.3J	14.1J	14.0J	2.6UJ	2.5 - 6*
COPPER	5	47.6J	18.6J	10.4J	53.5J	38.6J	26.0J	10.9J	<1 - 15*
IRON	20	19300J	33600J	34900J	49100J	28600J	26600J	4720J	17500 - 25000*
LEAD	0.6	14.2J	12.4J	6.6J	54.5J	27.7J	17.2J	5.5J	1 - 12.5*
MAGNESIUM	1000	3040J	5240J	5520J	3750J	4390J	5760J	11200J	1700 - 6000*
MANGANESE	3	442J	192J	465J	672J	585J	508J	150J	400 - 600*
MERCURY	0.1	0.13U	0.12U	0.12U	0.12U	0.12U	0.11U	0.11U	0.042 - 0.066*
NICKEL	8	28.3J	50.1J	53.2J	48.7J	38.6J	38.4J	6.6BJ	6 - 12.5*
POTASSIUM	1000	919BJ	1860J	1660J	1190BJ	886BJ	1560J	734BJ	12500 - 17500*
SELENIUM	1	0.31UJ	0.28U	0.30U	0.29U	0.29UJ	0.27U	0.26UJ	<0.1 - 0.125*
SILVER	2	R	R	R	R	R	R	R	- - -
SODIUM	1000	317UJ	281UJ	300UJ	295UJ	294UJ	273UJ	264UJ	6000 - 8000*
THALLIUM	2	0.18U	0.16U	0.17U	0.17U	0.17U	0.16U	0.15UJ	- - -
VANADIUM	10	13.4J	22.7J	24.3J	17.0J	16.3J	21.0J	10.7BJ	25 - 60*
ZINC	4	93.2J	157J	104J	280J	328J	115J	104J	37 - 60*

Qualifiers

J: Concentration was estimated
R: Value was rejected
U: Not detectable at the IDL
B: Value is between the IDL and CRDL
UJ: Compound not detected - the sample quantitation limit is an estimate

Notes

CRDL: Contract Required Detection Limits
- - -: Not available
*: Soils in the Albany area
**: 26 Massachusetts soils and 15 northeastern soils
(1): Source: Background Concentration of 20 Elements in Soil with Special Regard for New York State, NYSDEC

Table 33 (continued)
Becker Electronics Site
Surface Soil Sampling
Inorganic Constituents

SAMPLE LOCATION:		SS-15	SS-16	SS-17	SS-18	SS-19	SS-19-DUP	SS-EQB	Natural Background Levels
DATE SAMPLED:		11/12/90	11/12/90	11/13/90	11/12/90	11/13/90	11/13/90	11/12/90	
DEPTH OF SAMPLE (FT.):		0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	---	in Soil (1)
UNITS:		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	µg/l	mg/kg
ELEMENTS	CRDL								
ALUMINUM	40	10700J	14700J	8700J	13300J	9350J	8850J	R	1000 - 25000*
ANTIMONY	12	R	R	R	R	R	R	R	- - -
ARSENIC	2	4.6J	2.7J	4.1	0.79BJ	5	3	U	<0.1 - 6.5*
BARIUM	40	65.7J	85.2J	194J	52.2BJ	65.1J	58.6J	UJ	250 - 350*
BERYLLIUM	1	3.3J	4.5J	4.1J	4.2J	3.7J	3.2J	UJ	0 - 0.9*
CADMIUM	1	1.4J	1.60J	5.1J	0.85BJ	1.2BJ	0.90BJ	UJ	0.0001 - 1.0**
CALCIUM	1000	12600J	8920J	131000J	1030BJ	6540J	4890J	UJ	150 - 6500*
CHROMIUM	2	17.3J	24.9J	24.9J	22.5J	22.7J	17.0J	UJ	1.5 - 25*
COBALT	10	10BJ	14.6J	15.7BJ	14.4J	11.8BJ	10.2BJ	UJ	2.5 - 6*
COPPER	5	21.0J	34.2J	330J	48.6J	21.2J	12.9J	UJ	<1 - 15*
IRON	20	20400J	25800J	25300J	24800J	22100J	20200J	64BJ	17500 - 25000*
LEAD	0.6	R	R	74.4J	R	24.3J	130J	1.2B	1 - 12.5*
MAGNESIUM	1000	4720J	5080J	9010J	4860J	3800J	3420J	UJ	1700 - 6000*
MANGANESE	3	472J	503J	423J	183J	474J	416J	UJ	400 - 600*
MERCURY	0.1	0.12U	0.11U	0.17U	0.11U	0.16U	0.11U	U	0.042 - 0.066*
NICKEL	8	24.3J	38.4J	36.5J	39.1J	31.8J	29.0J	UJ	6 - 12.5*
POTASSIUM	1000	1180J	1820J	1240BJ	1110J	1040BJ	939BJ	UJ	12500 - 17500*
SELENIUM	1	0.28UJ	0.27UJ	0.41U	0.25UJ	0.37U	0.27U	U	<0.1 - 0.125*
SILVER	2	R	R	R	R	R	R	R	- - -
SODIUM	1000	283UJ	272UJ	413UJ	257UJ	377UJ	274UJ	UJ	6000 - 8000*
THALLIUM	2	0.16U	0.16U	0.24U	0.15U	0.22U	0.16U	U	- - -
VANADIUM	10	17.5J	22.2J	18.8J	17.6J	15.9J	14.3J	UJ	25 - 60*
ZINC	4	88.6J	663J	505J	960J	188J	111J	42J	37 - 60*

Qualifiers
J: Concentration was estimated
R: Value was rejected
U: Not detectable at the IDL
B: Value is between the IDL and CRDL
UJ: Compound not detected - the sample quantitation limit is an estimate

Notes
CRDL: Contract Required Detection Limits
EQB: Equipment blank sample
DUP: Duplicate sample
- - -: Not available
*: Soils in the Albany area
**: 26 Massachusetts soils and 15 northeastern soils
(1): Source: Background Concentration of 20 Elements in Soil with Special Regard for New York State, NYSDEC

Table 34
Becker Electronics Site
Soil Boring Sampling
Volatile Organic Compounds

SAMPLE LOCATION:		BL-1	BL-1-RE	BL-EQB	BL-2	BL-2	NYSDEC Soil
DATE SAMPLED:		12/3/90	12/3/90	12/5/90	5/6/91	5/6/91	Cleanup
DEPTH OF SAMPLE (FT.):		3-5	3-5	---	2-4	4-6	Criteria
UNITS:		µg/kg	µg/kg	µg/l	µg/kg	µg/kg	µg/kg
COMPOUND	CRQL						
Chloromethane	10	R	R	U	U	U	5
Bromomethane	10	R	R	U	U	U	16
Vinyl Chloride	10	R	R	U	U	U	3
Chloroethane	10	R	R	U	U	U	6
Methylene Chloride	5	R	R	10U	U	U	1
Acetone	10	R	R	U	U	U	---
Carbon Disulfide	5	R	R	U	U	U	81
1,1-Dichloroethene	5	R	R	U	U	U	10
1,1-Dichloroethane	5	R	R	U	U	U	5
1,2-Dichloroethene(total)	5	R	R	U	U	U	7
Chloroform	5	R	R	U	U	U	7
1,2-Dichloroethane	5	R	R	U	U	U	2
2-Butanone	10	R	R	U	U	U	7
1,1,1-Trichloroethane	5	R	R	U	U	U	23
Carbon Tetrachloride	5	R	R	U	U	U	17
Vinyl Acetate	10	R	R	U	U	U	---
Bromodichloromethane	5	R	R	U	U	U	47
1,2-Dichloropropane	5	R	R	U	U	U	8
cis-1,3-Dichloropropene	5	R	R	U	U	U	7
Trichloroethene	5	R	R	U	U	U	19
Dibromochloromethane	5	R	R	U	U	U	47
1,1,2-Trichloroethane	5	R	R	U	U	U	8
Benzene	5	R	R	U	U	U	17
trans-1,3-Dichloropropene	5	R	R	U	U	U	7
Bromoform	5	R	R	U	U	U	174
4-Methyl-2-pentanone	10	R	R	U	U	U	---
2-Hexanone	10	R	R	U	U	U	---
Tetrachloroethene	5	R	R	U	U	U	55
1,1,2,2-Tetrachloroethane	5	R	R	U	U	U	18
Toluene	5	R	R	U	U	U	45
Chlorobenzene	5	R	R	U	U	U	50
Ethylbenzene	5	R	R	U	U	U	165
Styrene	5	R	R	U	U	U	---
Total Xylenes	5	R	R	U	U	U	36

<u>Qualifiers</u>

U: Compound not detected
R: Value was rejected

<u>Notes</u>

CRQL: Contract Required Quantitation Limits
RE: Sample reanalyzed
EQB: Equipment blank sample
TB: Trip blank sample
ND: Not Detectable

A value followed by a U or a UJ is an elevated detection limit due to blank contamination

Table 34 (Continued)
Becker Electronics Site
Soil Boring Sampling
Volatile Organic Compounds

SAMPLE LOCATION:		BL-3	BL-4	BL-2-DUP	BL-TB	TB	NYSDEC Soil
DATE SAMPLED:		5/1/91	5/1/91	5/6/91	5/6/91	5/2/91	Cleanup
DEPTH OF SAMPLE (FT.):		0-2	2-4	2-4	---	---	Criteria
UNITS:		µg/kg	µg/kg	µg/kg	µg/l	µg/l	µg/kg
COMPOUND	CRQL						
Chloromethane	10	U	U	U	U	U	5
Bromomethane	10	U	U	U	U	U	16
Vinyl Chloride	10	U	U	U	U	U	3
Chloroethane	10	U	U	U	U	U	6
Methylene Chloride	5	U	U	U	U	U	1
Acetone	10	U	U	U	U	U	---
Carbon Disulfide	5	U	U	U	U	U	81
1,1-Dichloroethene	5	U	U	U	U	U	10
1,1-Dichloroethane	5	U	U	U	U	U	5
1,2-Dichloroethene(total)	5	U	U	U	U	U	7
Chloroform	5	U	U	U	U	U	7
1,2-Dichloroethane	5	U	U	U	U	U	2
2-Butanone	10	U	U	U	U	U	7
1,1,1-Trichloroethane	5	U	U	U	U	U	23
Carbon Tetrachloride	5	U	U	U	U	U	17
Vinyl Acetate	10	U	U	U	U	U	---
Bromodichloromethane	5	U	U	U	U	U	47
1,2-Dichloropropane	5	U	U	U	U	U	8
cis-1,3-Dichloropropene	5	U	U	U	U	U	7
Trichloroethene	5	U	U	U	U	U	19
Dibromochloromethane	5	U	U	U	U	U	47
1,1,2-Trichloroethane	5	U	U	U	U	U	8
Benzene	5	U	U	U	U	U	17
trans-1,3-Dichloropropene	5	U	U	U	U	U	7
Bromoform	5	U	U	U	U	U	174
4-Methyl-2-pentanone	10	U	U	U	U	U	---
2-Hexanone	10	U	U	U	U	U	---
Tetrachloroethene	5	U	U	U	U	U	55
1,1,2,2-Tetrachloroethane	5	U	U	U	U	U	18
Toluene	5	U	U	U	U	U	45
Chlorobenzene	5	U	U	U	U	U	50
Ethylbenzene	5	U	U	U	U	U	165
Styrene	5	U	U	U	U	U	---
Total Xylenes	5	U	U	U	U	U	36

Qualifiers
U: Compound not detected

Notes
CRQL: Contract Required Quantitation Limits
DUP: Duplicate sample
TB: Trip blank sample
ND: Not Detectable

Table 35
Becker Electronics Site
Soil Boring Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION:		BL-1	BL-2	BL-2	BL-3	BL-4	BL-2-DUP	NYSDEC Soil Cleanup Criteria
DATE SAMPLED:		5/6/91	5/6/91	5/6/91	5/1/91	5/1/91	5/6/91	
DEPTH OF SAMPLE (FT.):		3-5	2-4	4-6	0-2	2-4	2-4	
UNITS:		µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
COMPOUND	CRQL							
Phenol	330	U	U	U	U	U	U	0.43
bis(2-Chloroethyl) ether	330	U	U	U	U	U	U	0.42
2-Chlorophenol	330	U	U	U	U	U	U	---
1,3-Dichlorobenzene	330	U	U	U	U	U	U	255
1,4-Dichlorobenzene	330	U	U	U	U	U	U	240
Benzyl Alcohol	330	U	U	U	U	U	U	---
1,2-Dichlorobenzene	330	U	U	U	U	U	U	240
2-Methylphenol	330	U	U	U	U	U	U	---
bis(2-Chloroisopropyl) ether	330	U	U	U	U	U	U	9
4-Methylphenol	330	U	U	U	U	U	U	---
N-Nitroso-di-n-propylamine	330	U	U	U	U	U	U	---
Hexachloroethane	330	U	U	U	U	U	U	3,000
Nitrobenzene	330	U	U	U	U	U	U	5
Isophorone	330	U	U	U	U	U	U	---
2-Nitrophenol	330	U	U	U	U	U	U	---
2,4-Dimethylphenol	330	U	U	U	U	U	U	---
Benzoic Acid	1600	U	U	U	U	U	U	75
bis(2-Chloroethoxy)methane	330	U	U	U	U	U	U	---
2,4-Dichlorophenol	330	U	U	U	U	U	U	11
1,2,4-Trichlorobenzene	330	U	U	U	U	U	U	1,380
Naphthalene	330	U	U	U	U	U	U	390
4-Chloroaniline	330	U	U	U	U	U	U	---
Hexachlorobutadiene	330	U	U	U	U	U	U	4,350
4-Chloro-3-Methylphenol	330	U	U	U	U	U	U	---
2-Methylnaphthalene	330	U	U	U	U	U	U	1,105
Hexachlorocyclopentadiene	330	U	U	U	U	U	U	720
2,4,6-Trichlorophenol	330	U	U	U	U	U	U	60
2,4,5-Trichlorophenol	1600	U	U	U	U	U	U	3
2-Chloronaphthalene	330	U	U	U	U	U	U	221
2-Nitroaniline	1600	U	U	U	U	U	U	---
Dimethylphthalate	330	U	U	U	U	U	U	---
Acenaphthylene	330	U	U	U	U	U	U	3,750
2,6-Dinitrotoluene	330	U	U	U	U	U	U	14
3-Nitroaniline	330	U	U	U	U	U	U	---
Acenaphthene	330	U	U	U	U	U	U	2,760
2,4-Dinitrophenol	1600	U	U	U	U	U	U	0.50

(continued on next page)

Table 35 (continued)
Becker Electronics Site
Soil Boring Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION:		BL-1	BL-2	BL-2	BL-3	BL-4	BL-2-DUP	NYSDEC Soil Cleanup Criteria
DATE SAMPLED:		5/6/91	5/6/91	5/6/91	5/3/91	5/3/91	5/6/91	
DEPTH OF SAMPLE (FT.):		3-5	2-4	4-6	0-2	2-4	2-4	
UNITS:		µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
COMPOUND	CRQL							
4-Nitrophenol	1600	U	U	U	U	U	U	0.64
Dibenzofuran	330	U	U	U	U	U	U	---
2,4-Dinitrotoluene	330	U	U	U	U	U	U	7
Diethylphthalate	330	U	U	U	U	U	U	213
4-Chlorophenyl-Phenylether	330	U	U	U	U	U	U	---
Fluorene	330	U	U	U	U	U	U	10,950
4-Nitroaniline	1600	U	U	U	U	U	U	---
4,6-Dinitro-2-Methylphenol	1600	U	U	U	U	U	U	---
N-nitrosodiphenylamine	330	U	U	U	U	U	U	---
4-Bromophenyl-Phenylether	330	U	U	U	U	U	U	---
Hexachlorobenzene	330	U	U	U	U	U	U	41
Pentachlorophenol	1600	U	U	U	U	U	U	1,590
Phenanthrene	330	U	U	U	U	U	U	21,000
Anthracene	330	U	U	U	U	U	U	21,000
Di-n-butylphthalate	330	U	U	U	U	U	U	255,000
Fluoranthene	330	U	U	U	U	U	U	57,000
Pyrene	330	U	U	U	U	U	U	57,000
Butylbenzylphthalate	330	U	170J	U	U	U	U	6,548
3,3'-Dichlorobenzidine	660	UJ	UJ	UJ	U	U	UJ	233
Benzo(a)anthracene	330	U	U	U	U	U	U	83
Chrysene	330	U	U	U	U	U	U	12
Bis(2-ethylhexyl)phthalate	330	84J	1600	630	910	U	6700J	10,838
Di-n-octylphthalate	330	U	1900	1300	180J	U	140J	3,578
Benzo(b)fluoranthene	330	U	U	U	U	U	U	33
Benzo(k)fluoranthene	330	U	U	U	U	U	U	33
Benzo(a)pyrene	330	U	U	U	U	U	U	ND
Indeno(1,2,3-cd)pyrene	330	U	U	U	U	U	U	96
Dibenz(a,h)anthracene	330	U	U	U	U	U	U	4,950,000
Benzo(g,h,i)perylene	330	U	U	U	U	U	U	2,400,000

Qualifiers

J: Concentration was estimated
U: Compound not detected
UJ: Compound not detected - the sample quantitation limit is an estimate

Notes

CRQL: Contract Required Quantitation Limits
DUP: Duplicate sample
ND: Not Detectable

Table 36
Becker Electronics Site
Soil Boring Sampling
Pesticides/PCBs

SAMPLE LOCATION:		BL-1	BL-2	BL-2	BL-3	BL-4	NYSDEC Soil
DATE SAMPLED:		12/3/90	11/14/90	11/14/90	11/14/90	11/14/90	Cleanup
DEPTH OF SAMPLE (FT.):		3-5	2-4	4-6	0-2	2-4	Criteria
UNITS:		µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
COMPOUND	CRQL						
alpha-BHC	8	U	U	U	U	U	ND
beta-BHC	8	U	U	U	U	U	ND
delta-BHC	8	U	U	U	U	U	ND
gamma-BHC(Lindane)	8	U	U	U	U	U	ND
Heptachlor	8	U	U	U	U	U	ND
Aldrin	8	U	U	U	U	U	ND
Heptachlor Epoxide	8	U	U	U	U	U	ND
Endosulfan I	8	U	U	U	U	U	---
Dieldrin	16	U	U	U	U	U	ND
4,4'-DDE	16	U	U	U	U	U	ND
Endrin	16	U	U	U	U	U	ND
Endosulfan II	16	U	U	U	U	U	---
4,4'-DDD	16	U	U	U	U	U	ND
Endosulfan Sulfate	16	U	U	U	U	U	---
4,4'-DDT	16	U	U	U	U	U	ND
Methoxychlor	80	U	U	U	U	U	420
Endrin Ketone	16	U	U	U	U	U	420
alpha-Chlordane	80	U	U	U	U	U	ND
gamma-Chlordane	80	U	U	U	U	U	---
Toxaphene	160	U	U	U	U	U	---
Aroclor-1016	80	U	U	U	U	U	---
Aroclor-1221	80	U	U	U	U	U	---
Aroclor-1232	80	U	U	U	U	U	---
Aroclor-1242	80	U	U	U	U	U	---
Aroclor-1248	80	U	U	U	U	U	---
Aroclor-1254	160	U	U	U	U	U	128
Aroclor-1260	160	U	U	U	U	U	---

Qualifiers
U: Compound not detected

Notes
CRQL: Contract Required Quantitation Limit
ND: Not Detecable

Table 37
Becker Electronics Site
Soil Boring Sampling
Inorganic Constituents

SAMPLE LOCATION:		BL-1	BL-3	BL-4	BL-2	BL-2	BL-EQB	BL-1-EQB	Natural Background Levels in Soil (1)
DATE SAMPLED:		12/3/90	11/14/90	11/14/90	11/14/90	11/14/90	11/15/90	12/5/90	
DEPTH OF SAMPLE (FT.):		3-5	0-2	2-4	2-4	4-6	---	---	
UNITS:		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	µg/l	µg/l	mg/kg
ELEMENTS	CRDL								
ALUMINUM	40	8700J	12300J	12000J	11500J	7400J	R	UJ	1000 - 25000*
ANTIMONY	12	R	R	R	R	R	R	R	- - -
ARSENIC	2	4.7J	R	R	R	R	U	U	<0.1 - 6.5*
BARIUM	40	82.7J	98.3J	92.1J	90.8J	63.8J	UJ	UJ	250 - 350*
BERYLLIUM	1	2.7J	6.2J	4.7J	4.5J	2.9J	UJ	UJ	0 - 0.9*
CADMIUM	1	0.9BJ	1.0J	0.86BJ	0.90BJ	0.68UJ	UJ	UJ	0.0001 - 1.0**
CALCIUM	1000	1760J	2340J	5020J	4050J	8010J	665BJ	UJ	150 - 6500*
CHROMIUM	2	12.0J	22.4J	18.2J	18.7J	14.5J	UJ	UJ	1.5 - 25*
COBALT	10	9.3BJ	15.3J	15.2J	14.9J	9.3BJ	UJ	UJ	2.5 - 6*
COPPER	5	14.1J	5.4J	4.3BJ	9.7J	10J	UJ	UJ	<1 - 15*
IRON	20	18400J	36000J	28300J	27700J	17900J	125J	UJ	17500 - 25000*
LEAD	0.6	7.7	5.2J	5.0J	7	11.7J	U	R	1 - 12.5*
MAGNESIUM	1000	2770J	3500J	4120J	4320J	2920J	UJ	UJ	1700 - 6000*
MANGANESE	3	325J	111J	149J	338J	498J	6BJ	UJ	400 - 600*
MERCURY	0.1	0.11U	0.10U	0.11U	0.11U	0.11U	U	U	0.042 - 0.066*
NICKEL	8	23.6J	51.1J	43.8J	41.0J	28.1J	UJ	UJ	6 - 12.5*
POTASSIUM	1000	1100BJ	2090J	1400J	1140J	819BJ	UJ	UJ	12500 - 17500*
SELENIUM	1	0.27U	0.25UJ	0.26UJ	0.27UJ	0.27UJ	U	U	<0.1 - 0.125*
SILVER	2	R	R	R	R	R	R	R	- - -
SODIUM	1000	275UJ	251UJ	260UJ	273UJ	274UJ	UJ	UJ	6000 - 8000*
THALLIUM	2	0.16U	0.14U	0.15U	0.16U	0.16U	U	U	- - -
VANADIUM	10	12.0J	20.7J	17.6J	16.7J	11.3J	UJ	UJ	25 - 60*
ZINC	4	68.6J	92.5J	72.3J	75.7J	R	54J	5BJ	37 - 60*

<u>Qualifiers</u>

J: Concentration was estimated
R: Value was rejected
U: Not detectable at the IDL
B: Value is between the IDL and CRDL
UJ: Compound not detected - the sample quantitation limit is an estimate

<u>Notes</u>

CRDL: Contract Required Detection Limits
EQB: Equipment blank sample
- - -: Not available
*: Soils in the Albany area
**: 26 Massachusetts soils and 15 northeastern soils
(1): Source: Background Concentration of 20 Elements in Soil with Special Regard for New York State, NYSDEC

Table 38
Becker Electronics Site
Septic Tank Water Sampling
Volatile Organic Compounds

SAMPLE LOCATION: DATE SAMPLED: UNITS:		ST-1-SW 11/7/90 µg/l	ST-3-SW 11/8/90 µg/l	ST-2-DPW 5/7/91 µg/l	ST-2-DPW-RE 5/7/91 µg/l	ST-TB 5/7/91 µg/l	NYSDEC Class GA Groundwater Standards/ Guidance Values µg/l
COMPOUND	CRQL						
Chloromethane	10	U	U	U	U	U	5S
Bromomethane	10	U	U	U	U	U	5S
Vinyl Chloride	10	U	U	U	U	U	2S
Chloroethane	10	U	U	U	U	U	5S
Methylene Chloride	5	U	U	U	U	U	5S
Acetone	10	U	U	U	U	U	---
Carbon Disulfide	5	U	U	U	U	U	---
1,1-Dichloroethene	5	U	U	U	U	U	5S
1,1-Dichloroethane	5	9	U	31	23	U	5S
1,2-Dichloroethene(total)	5	U	U	U	U	U	5S
Chloroform	5	U	U	U	U	U	7S
1,2-Dichloroethane	5	U	U	U	U	U	5S
2-Butanone	10	U	U	R	R	R	---
1,1,1-Trichloroethane	5	27	U	49	34	U	5S
Carbon Tetrachloride	5	U	U	U	U	U	5S
Vinyl Acetate	10	U	U	U	U	U	---
Bromodichloromethane	5	U	U	U	U	U	50G
1,2-Dichloropropane	5	U	U	U	U	U	5S
cis-1,3-Dichloropropene	5	U	U	U	U	U	5S
Trichloroethene	5	U	U	U	U	U	5S
Dibromochloromethane	5	U	U	U	U	U	50G
1,1,2-Trichloroethane	5	U	U	U	U	U	5S
Benzene	5	U	U	U	U	U	0.7S
trans-1,3-Dichloropropene	5	U	U	U	U	U	5S
Bromoform	5	U	U	U	U	U	50G
4-Methyl-2-pentanone	10	U	U	U	U	U	---
2-Hexanone	10	U	U	U	U	U	50G
Tetrachloroethene	5	U	U	U	U	U	5S
1,1,2,2-Tetrachloroethane	5	U	U	U	U	U	5S
Toluene	5	U	U	U	U	U	5S
Chlorobenzene	5	U	U	U	U	U	5S
Ethylbenzene	5	U	U	U	U	U	5S
Styrene	5	U	U	U	U	U	5S
Total Xylenes	5	U	U	U	U	U	5S

Qualifiers

J: Concentration was estimated
U: Compound not detected
UJ: Compound not detected - the sample quantitation limit is an estimate
R: Value was rejected

Notes

CRQL: Contract Required Quantitation Limits
RE: Sample reanalyzed
DPW: Septic Tank Discharge Pipe Water sample
TB: Trip Blank sample
S: Standard
G: Guidance value
ND: Not Detectable

Table 39
Becker Electronics Site
Septic Tank Water Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION:		ST-1-SW	ST-2-DPW	ST-3-SW	ST-EQB	NYSDEC Class GA Groundwater Standards/ Guidance Values
DATE SAMPLED:		5/6/91	5/7/91	5/7/91	5/8/91	
UNITS:		µg/l	µg/l	µg/l	µg/l	µg/l
COMPOUND	CRQL					
Phenol	10	U	U	U	U	1S
bis(2-Chloroethyl) ether	10	U	U	U	U	1S
2-Chlorophenol	10	U	U	U	U	1S
1,3-Dichlorobenzene	10	U	U	U	U	5S
1,4-Dichlorobenzene	10	U	U	U	U	4.7Sa
Benzyl Alcohol	10	U	U	U	U	---
1,2-Dichlorobenzene	10	U	U	U	U	4.7Sa
2-Methylphenol	10	U	U	U	U	1S
bis(2-Chloroisopropyl) ether	10	U	U	U	U	5S
4-Methylphenol	10	U	U	U	U	1S
N-Nitroso-di-n-propylamine	10	U	U	U	U	---
Hexachloroethane	10	U	U	U	U	5S
Nitrobenzene	10	U	U	U	U	5S
Isophorone	10	U	U	U	U	50G
2-Nitrophenol	10	U	U	U	U	1S
2,4-Dimethylphenol	10	U	U	U	U	1S
Benzoic Acid	50	U	U	U	U	---
bis(2-Chloroethoxy)methane	10	U	U	U	U	5S
2,4-Dichlorophenol	10	U	U	U	U	1S
1,2,4-Trichlorobenzene	10	U	U	U	U	5S
Naphthalene	10	U	U	U	U	10G
4-Chloroaniline	10	U	U	U	U	5S
Hexachlorobutadiene	10	U	U	U	U	5S
4-Chloro-3-Methylphenol	10	U	U	U	U	1S
2-Methylnaphthalene	10	U	U	U	U	---
Hexachlorocyclopentadiene	10	U	U	U	U	5S
2,4,6-Trichlorophenol	10	U	U	U	U	1S
2,4,5-Trichlorophenol	50	U	U	U	U	1S
2-Chloronaphthalene	10	U	U	U	U	10G
2-Nitroaniline	50	U	U	U	U	5S
Dimethylphthalate	10	U	U	U	U	50G
Acenaphthylene	10	U	U	U	U	---
2,6-Dinitrotoluene	10	U	U	U	U	5S
3-Nitroaniline	50	U	U	U	U	5S
Acenaphthene	10	U	U	U	U	20G
2,4-Dinitrophenol	50	U	U	U	U	1S

(continued next page)

Table 39 (continued)
Becker Electronics Site
Septic Tank Water Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION:		ST-1-SW	ST-2-DPW	ST-3-SW	ST-EQB	NYSDEC Class GA Groundwater Standards/ Guidance Values
DATE SAMPLED:		5/6/91	5/7/91	5/7/91	5/8/91	
UNITS:		µg/l	µg/l	µg/l	µg/l	µg/l
COMPOUND	CRQL					
4-Nitrophenol	50	U	U	U	U	1S
Dibenzofuran	10	U	U	U	U	---
2,4-Dinitrotoluene	10	U	U	U	U	5S
Diethylphthalate	10	U	U	U	U	50G
4-Chlorophenyl-Phenylether	10	U	U	U	U	---
Fluorene	10	U	U	U	U	50G
4-Nitroaniline	50	U	U	U	U	5S
4,6-Dinitro-2-Methylphenol	50	U	U	U	U	1S
N-nitrosodiphenylamine(1)	10	U	U	U	U	50G
4-Bromophenyl-Phenylether	10	U	U	U	U	---
Hexachlorobenzene	10	U	U	U	U	0.35S
Pentachlorophenol	50	U	U	U	U	1S
Phenanthrene	10	U	U	U	U	50G
Anthracene	10	U	U	U	U	50G
Di-n-butylphthalate	10	U	U	U	U	50S
Fluoranthene	10	U	U	U	U	50G
Pyrene	10	U	U	U	U	50G
Butylbenzylphthalate	10	U	U	U	U	50G
3,3'-Dichlorobenzidine	20	U	U	U	U	5S
Benzo(a)anthracene	10	U	U	U	U	0.002G
Chrysene	10	U	U	U	U	0.002G
Bis(2-ethylhexyl)phthalate	10	U	U	U	U	50S
Di-n-octylphthalate	10	U	U	U	U	50G
Benzo(b)fluoranthene	10	U	U	U	U	0.002G
Benzo(k)fluoranthene	10	U	U	U	U	0.002G
Benzo(a)pyrene	10	U	U	U	U	ND S
Indeno(1,2,3-cd)pyrene	10	U	U	U	U	0.002G
Dibenz(a,h)anthracene	10	U	U	U	U	---
Benzo(g,h,i)perylene	10	U	U	U	U	---

Qualifiers
U: Compound not detected

Notes
CRQL: Contrct Required Quantitation Limits
EQB: Equipment blank sample
DPW: Septic tank discharge pipe water sample
S: Standard
G: Guidance value
a: Value applies to the sum of 1,2 and 1,4 isomers
ND: Not Detectable

Table 40
Becker Electronics Site
Septic Tank Water Sampling
Pesticides/PCBs

SAMPLE LOCATION:		ST-1-SW	ST-3-SW	ST-EQB	NYSDEC Class GA* Groundwater Standards/ Guidance Values
DATE SAMPLED:		11/7/91	5/7/91	5/8/91	
UNITS:		µg/l	µg/l	µg/l	µg/l
COMPOUND	CRQL				
alpha-BHC	0.05	U	U	U	ND S
beta-BHC	0.05	U	U	U	ND S
delta-BHC	0.05	U	U	U	ND S
gamma-BHC(Lindane)	0.05	U	U	U	ND S
Heptachlor	0.05	U	U	U	ND S
Aldrin	0.05	U	U	U	ND S
Heptachlor Epoxide	0.05	U	U	U	ND S
Endosulfan I	0.05	U	U	U	---
Dieldrin	0.1	U	U	U	ND S
4,4'-DDE	0.1	U	U	U	ND S
Endrin	0.1	U	U	U	ND S
Endosulfan II	0.1	U	U	U	---
4,4'-DDD	0.1	U	U	U	ND S
Endosulfan Sulfate	0.1	U	U	U	---
4,4'-DDT	0.1	U	U	U	ND S
Methoxychlor	0.5	1.0	U	U	35S
Endrin Ketone	0.1	U	U	U	ND S
alpha-Chlordane	0.5	U	U	U	0.1S
gamma-Chlordane	0.5	U	U	U	0.1S
Toxaphene	1	U	U	U	ND S
Aroclor-1016	0.5	U	U	U	0.1S
Aroclor-1221	0.5	U	U	U	0.1S
Aroclor-1232	0.5	U	U	U	0.1S
Aroclor-1242	0.5	U	U	U	0.1S
Aroclor-1248	0.5	U	U	U	0.1S
Aroclor-1254	1	U	U	U	0.1S
Aroclor-1260	1	U	U	U	0.1S

Qualifier
U: Compound not detected

Notes
CRQL: Contract Required Quantitation Limits
S: Standard
EQB: Equipment blank sample
ND: Not Detectable

Table 41
Becker Electronics Site
Septic Tank Water Sampling
Inorganic Constituents

SAMPLE LOCATION:		ST-1-SW	ST-3-SW	ST-1-SW-EQB	ST-3-SW-EQB	NYSDEC Class GA Groundwater Standards/ Guidance Values
DATE SAMPLED:		11/7/90	11/8/90	11/7/90	11/8/90	
UNITS:		µg/l	µg/l	µg/l	µg/l	µg/l
ELEMENTS	CRDL					
ALUMINUM	200	309J	R	UJ	R	---
ANTIMONY	60	R	R	R	R	3G
ARSENIC	10	0.8B	U	U	U	25S
BARIUM	200	142BJ	UJ	UJ	UJ	1000S
BERYLLIUM	5	UJ	UJ	UJ	UJ	3G
CADMIUM	5	UJ	UJ	UJ	UJ	10S
CALCIUM	5000	54400J	18200J	UJ	UJ	---
CHROMIUM	10	UJ	8BJ	UJ	UJ	50S
COBALT	50	UJ	UJ	UJ	UJ	---
COPPER	25	UJ	9BJ	UJ	29J	200S
IRON	100	1720J	R	99BJ	523J	300S
LEAD	3	20.7J	2.2B	0.4BJ	0.8B	25S
MAGNESIUM	5000	3690BJ	1040BJ	UJ	UJ	35000G
MANGANESE	15	81J	49J	3BJ	6BJ	300S
MERCURY	0.2	U	U	U	U	2S
NICKEL	40	UJ	UJ	UJ	UJ	---
POTASSIUM	5000	1730BJ	UJ	UJ	UJ	---
SELENIUM	5	U	U	U	U	10S
SILVER	10	R	R	R	R	50S
SODIUM	5000	4830BJ	UJ	UJ	UJ	20000S
THALLIUM	10	U	U	U	U	4G
VANADIUM	50	UJ	UJ	UJ	UJ	---
ZINC	20	850J	R	UJ	199J	300S

Qualifiers

J: Concentration was estimated
R: Value was rejected
U: Not detectable at the IDL
B: Value is between the IDL and CRDL
UJ: Compound not detected - the sample quantitation limit is an estimate

Notes

CRDL: Contract Required Detection Limits
EQB: Equipment blank sample
S: Standard
G: Guidance value

Table 42
Becker Electronics Site
Septic Tank Sediment/ Sludge Sampling
Volatile Organic Compounds

SAMPLE LOCATION:		ST-1-SD	ST-3-SD	ST-2-SED	ST-SED-EQB	ST-TB	TB	NYSDEC Soil Cleanup Criteria
DATE SAMPLED:		11/7/90	11/8/90	5/7/91	5/8/91	5/8/91	5/7/91	
UNITS:		µg/kg	µg/kg	µg/kg	µg/l	µg/l	µg/l	µg/kg
COMPOUND	CRQL							
Chloromethane	10	U	U	U	U	U	U	5
Bromomethane	10	U	U	U	U	U	U	16
Vinyl Chloride	10	U	U	U	U	U	U	3
Chloroethane	10	U	U	380	U	U	U	6
Methylene Chloride	5	U	U	U	U	U	U	1
Acetone	10	92U	U	330U	U	U	U	---
Carbon Disulfide	5	U	U	U	U	U	U	81
1,1-Dichloroethene	5	U	U	U	U	U	U	10
1,1-Dichloroethane	5	U	U	76	U	U	U	5
1,2-Dichloroethene(total)	5	U	U	U	U	U	U	7
Chloroform	5	U	U	U	U	U	U	7
1,2-Dichloroethane	5	U	U	U	U	U	U	2
2-Butanone	10	U	U	U	R	R	R	7
1,1,1-Trichloroethane	5	U	U	53J	U	U	U	23
Carbon Tetrachloride	5	U	U	U	U	U	U	17
Vinyl Acetate	10	U	U	U	U	U	U	---
Bromodichloromethane	5	U	U	U	U	U	U	47
1,2-Dichloropropane	5	U	U	U	U	U	U	8
cis-1,3-Dichloropropene	5	U	U	U	U	U	U	7
Trichloroethene	5	U	U	U	U	U	U	19
Dibromochloromethane	5	U	U	U	U	U	U	47
1,1,2-Trichloroethane	5	U	U	U	U	U	U	8
Benzene	5	U	UJ	U	U	U	U	17
trans-1,3-Dichloropropene	5	U	U	U	U	U	U	7
Bromoform	5	U	U	U	U	U	U	174
4-Methyl-2-pentanone	10	U	U	U	U	U	U	---
2-Hexanone	10	U	U	U	U	U	U	---
Tetrachloroethene	5	U	U	U	U	U	U	55
1,1,2,2-Tetrachloroethane	5	U	U	U	U	U	U	18
Toluene	5	U	320J	54J	U	U	U	45
Chlorobenzene	5	U	UJ	U	U	U	U	50
Ethylbenzene	5	U	UJ	U	U	U	U	165
Styrene	5	U	UJ	U	U	U	U	---
Total Xylenes	5	U	UJ	U	U	U	U	36

Qualifiers

J: Concentration estimated
U: Compound not detected
UJ: Compound not detected - the sample quantitation limit is an estimate
R: Value was rejected

Notes

CRQL: Contract Required Quantitation Limits
EQB: Equipment blank sample
TB: Trip blank sample
ST-3-SD values correspond to sample designated as ST-3-SD(RE)
ND: Not Detectable

A value followed by a U or a UJ is an elevated detection limit due to blank contamination

Table 43
Becker Electronics Site
Septic Tank Sediment/Sludge Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION:		ST-1-SED	ST-1-SED-RE	ST-2-SED	ST-2-SED-RE	ST-3-SED	ST-3-SED-RE	ST-SED-EQB	NYSDEC Soil Cleanup Criteria
DATE SAMPLED:		5/6/91	5/6/91	5/7/91	5/7/91	5/7/91	5/7/91	5/8/91	
UNITS:		µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/l	µg/kg
COMPOUND	CRQL								
Phenol	330	UJ	U	U	U	UJ	U	U	0.43
bis(2-Chloroethyl) ether	330	UJ	U	U	U	UJ	U	U	0.42
2-Chlorophenol	330	UJ	U	U	U	UJ	U	U	---
1,3-Dichlorobenzene	330	UJ	U	U	U	UJ	U	U	255
1,4-Dichlorobenzene	330	540J	170J	U	U	8000J	8600J	U	240
Benzyl Alcohol	330	UJ	U	U	U	UJ	U	U	---
1,2-Dichlorobenzene	330	UJ	U	U	U	UJ	U	U	240
2-Methylphenol	330	UJ	U	U	U	UJ	U	U	---
bis(2-Chloroisopropyl) ether	330	UJ	U	U	U	UJ	U	U	9
4-Methylphenol	330	UJ	U	U	U	UJ	U	U	---
N-Nitroso-di-n-propylamine	330	UJ	U	U	U	UJ	U	U	---
Hexachloroethane	330	UJ	U	U	U	UJ	U	U	3,000
Nitrobenzene	330	UJ	U	U	U	UJ	U	U	5
Isophorone	330	UJ	U	U	U	UJ	U	U	---
2-Nitrophenol	330	UJ	U	U	U	UJ	U	U	---
2,4-Dimethylphenol	330	UJ	U	U	U	UJ	U	U	---
Benzoic Acid	1600	UJ	UJ	11000J	U	UJ	U	U	75
bis(2-Chloroethoxy)methane	330	UJ	U	U	U	UJ	U	U	---
2,4-Dichlorophenol	330	UJ	U	U	U	UJ	U	U	11
1,2,4-Trichlorobenzene	330	UJ	U	U	U	UJ	U	U	1,380
Naphthalene	330	UJ	U	U	U	UJ	U	U	390
4-Chloroaniline	330	UJ	U	U	U	UJ	U	U	---
Hexachlorobutadiene	330	UJ	U	U	U	UJ	U	U	4,350
4-Chloro-3-Methylphenol	330	UJ	U	U	U	UJ	U	U	---
2-Methylnaphthalene	330	UJ	U	1100J	590J	UJ	U	U	1,105
Hexachlorocyclopentadiene	330	UJ	U	U	U	UJ	U	U	720
2,4,6-Trichlorophenol	330	UJ	U	U	U	UJ	U	U	60
2,4,5-Trichlorophenol	1600	UJ	U	U	U	UJ	U	U	3
2-Chloronaphthalene	330	UJ	U	U	U	UJ	U	U	221
2-Nitroaniline	1600	UJ	U	U	U	UJ	U	U	---
Dimethylphthalate	330	UJ	U	U	U	UJ	U	U	---
Acenaphthylene	330	UJ	U	U	U	UJ	U	U	3,750
2,6-Dinitrotoluene	330	UJ	U	U	U	UJ	U	U	14
3-Nitroaniline	330	UJ	U	U	U	UJ	U	U	---
Acenaphthene	330	UJ	U	U	U	680J	U	U	2,760
2,4-Dinitrophenol	1600	UJ	UJ	UJ	U	U	U	U	0.50

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Table 43 (continued)
Becker Electronics Site
Septic Tank Sediment/Sludge Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION: DATE SAMPLED: UNITS:		ST-1-SED 5/6/91 µg/kg	ST-1-SED-RE 5/6/91 µg/kg	ST-2-SED 5/7/91 µg/kg	ST-2-SED-RE 5/7/91 µg/kg	ST-3-SED 5/7/91 µg/kg	ST-3-SED-RE 5/7/91 µg/kg	ST-SED-EQB 5/8/91 µg/l	NYSDEC Soil Cleanup Criteria µg/kg
COMPOUND	CRQL								
4-Nitrophenol	1600	UJ	UJ	U	U	UJ	U	U	0.64
Dibenzofuran	330	UJ	U	U	U	UJ	U	U	---
2,4-Dinitrotoluene	330	UJ	U	U	U	UJ	U	U	7
Diethylphthalate	330	UJ	U	U	U	UJ	U	U	213
4-Chlorophenyl-Phenylether	330	UJ	U	U	U	UJ	U	U	---
Fluorene	330	UJ	U	U	U	UJ	U	U	10,950
4-Nitroaniline	1600	UJ	U	U	U	UJ	U	U	---
4,6-Dinitro-2-Methylphenol	1600	UJ	U	U	UJ	UJ	UJ	U	---
N-nitrosodiphenylamine	330	UJ	U	U	UJ	UJ	UJ	U	---
4-Bromophenyl-Phenylether	330	UJ	U	U	UJ	UJ	UJ	U	---
Hexachlorobenzene	330	UJ	U	U	UJ	UJ	UJ	U	41
Pentachlorophenol	1600	UJ	U	U	UJ	UJ	UJ	U	1,590
Phenanthrene	330	UJ	R	U	UJ	UJ	UJ	U	21,000
Anthracene	330	UJ	U	U	UJ	UJ	UJ	U	21,000
Di-n-butylphthalate	330	320J	160J	U	650J	UJ	UJ	U	255,000
Fluoranthene	330	450J	200J	U	UJ	940J	UJ	U	57,000
Pyrene	330	260J	UJ	UJ	U	370J	UJ	U	57,000
Butylbenzylphthalate	330	480J	370J	UJ	U	UJ	UJ	U	6,548
3,3'-Dichlorobenzidine	660	UJ	UJ	UJ	U	UJ	UJ	U	233
Benzo(a)anthracene	330	UJ	UJ	UJ	U	UJ	UJ	U	83
Chrysene	330	UJ	140J	UJ	U	UJ	UJ	U	12
Bis(2-ethylhexyl)phthalate	330	11000J	6700J	33000J	38000	65000J	170000J	U	10,838
Di-n-octylphthalate	330	UJ	190J	UJ	U	1700J	UJ	U	3,578
Benzo(b)fluoranthene	330	UJ	UJ	UJ	U	UJ	UJ	U	33
Benzo(k)fluoranthene	330	UJ	UJ	UJ	U	UJ	UJ	U	33
Benzo(a)pyrene	330	UJ	UJ	UJ	U	UJ	UJ	U	ND
Indeno(1,2,3-cd)pyrene	330	UJ	UJ	UJ	U	UJ	UJ	U	96
Dibenz(a,h)anthracene	330	UJ	UJ	UJ	U	UJ	UJ	U	4,950,000
Benzo(g,h,i)perylene	330	UJ	UJ	UJ	U	UJ	UJ	U	2,400,000

Qualifiers

J: Concentration was estimated
U: Compound not detected
UJ: Compound not detected - the sample quantitation limit is an estimate
R: Value was rejected

Notes

CRQL: Contract Required Quantitation Limits
RE: Sample reanalyzed
EQB: Equipment blank sample
ND: Not Detectable

Table 44
Becker Electronics Site
Septic Tank Sediment/Sludge Sampling
Pesticides/PCBs

SAMPLE LOCATION: DATE SAMPLED: UNITS:		ST-1-SD 11/7/90 µg/kg	ST-2-SD 12/5/90 µg/kg	ST-2-SD-DL 12/5/90 µg/kg	ST-3-SD 11/8/90 µg/kg	NYSDEC Soil Cleanup Criteria µg/kg
COMPOUND	CRQL					[1]
alpha-BHC	8	U	UJ	UJ	U	ND
beta-BHC	8	U	UJ	UJ	U	ND
delta-BHC	8	U	UJ	UJ	U	ND
gamma-BHC(Lindane)	8	U	UJ	UJ	U	ND
Heptachlor	8	U	UJ	UJ	U	ND
Aldrin	8	U	UJ	UJ	U	ND
Heptachlor Epoxide	8	U	UJ	UJ	U	ND
Endosulfan I	8	U	UJ	UJ	U	---
Dieldrin	16	U	UJ	UJ	U	ND
4,4'-DDE	16	U	UJ	UJ	U	ND
Endrin	16	U	UJ	UJ	U	ND
Endosulfan II	16	U	UJ	UJ	U	---
4,4'-DDD	16	U	UJ	UJ	U	ND
Endosulfan Sulfate	16	U	UJ	UJ	U	---
4,4'-DDT	16	U	UJ	UJ	U	ND
Methoxychlor	80	U	UJ	UJ	U	420
Endrin Ketone	16	U	UJ	UJ	U	420
alpha-Chlordane	80	U	UJ	UJ	U	ND
gamma-Chlordane	80	U	UJ	UJ	U	---
Toxaphene	160	U	UJ	UJ	U	---
Aroclor-1016	80	U	UJ	UJ	U	---
Aroclor-1221	80	U	UJ	UJ	U	---
Aroclor-1232	80	U	UJ	UJ	U	---
Aroclor-1242	80	U	UJ	UJ	U	---
Aroclor-1248	80	U	UJ	UJ	U	---
Aroclor-1254	160	U	UJ	UJ	U	128
Aroclor-1260	160	U	UJ	UJ	U	---

Qualifiers
U: Compound not detected
UJ: Compound not detected - the sample quantitation limit is an estimate

Notes
CRQL: Contract Required Quantitation Limit
ND: Not Detectable
DL: Dilution

Table 45
Becker Electronics Site
Septic Tank Sediment/Sludge Sampling
Inorganic Constituents

SAMPLE LOCATION: DATE SAMPLED: UNITS:		ST-1-SD 11/7/90 mg/kg	ST-2-SD 12/5/90 mg/kg	ST-3-SD (1) 11/8/90 µg/l	ST-1-SD-EQB 11/7/90 µg/l	ST-3-SD-EQB 11/8/90 µg/l	Natural Background Levels in Soil (2) mg/kg
ELEMENTS	CRDL						
ALUMINUM	40	9820J	6120J	R	UJ	R	1000 - 25000*
ANTIMONY	12	R	R	R	R	R	- - -
ARSENIC	2	5.8	2.6BJ	166BJ	U	U	<0.1 - 6.5*
BARIUM	40	277J	1400J	3250J	UJ	UJ	250 - 350*
BERYLLIUM	1	5.1J	7.0J	57J	UJ	UJ	0 - 0.9*
CADMIUM	1	3.9J	8.0J	118J	UJ	UJ	0.0001 - 1.0**
CALCIUM	1000	28000J	17000J	27800J	933BJ	UJ	150 - 6500*
CHROMIUM	2	23.4J	70.1J	1240J	UJ	UJ	1.5 - 25*
COBALT	10	16.2J	14.9BJ	253J	UJ	UJ	2.5 - 6*
COPPER	5	117J	189J	34200J	UJ	29J	<1 - 15*
IRON	20	31800J	56700J	361000J	204J	523J	17500 - 25000*
LEAD	0.6	23.4J	59.7J	4000J	4.3	0.8B	1 - 12.5*
MAGNESIUM	1000	3720J	3120J	68600J	UJ	UJ	1700 - 6000*
MANGANESE	3	411J	15000J	3920J	3BJ	6BJ	400 - 600*
MERCURY	0.1	0.23J	0.25U	2J	U	U	0.042 - 0.066*
NICKEL	8	42.6J	41.3J	926J	UJ	UJ	6 - 12.5*
POTASSIUM	1000	676BJ	1160BJ	11200J	UJ	UJ	12500 - 17500*
SELENIUM	1	0.36U	0.60U	UJ	U	U	<0.1 - 0.125*
SILVER	2	R	R	R	R	R	- - -
SODIUM	1000	364UJ	876BJ	2970BJ	UJ	UJ	6000 - 8000*
THALLIUM	2	0.21U	0.35U	UJ	U	U	- - -
VANADIUM	10	16.2J	12.4BJ	767J	UJ	UJ	25 - 60*
ZINC	4	1580J	9150J	224000J	15BJ	199J	37 - 60*

Qualifiers

J: Concentration was estimated
R: Value was rejected
U: Not detectable at the IDL
B: Value is between the IDL and CRDL
UJ: Compound not detetcted - the sample quantitation limit is an estimate

Notes

CRDL: Contract Required Detection Limits
EQB: Equipment blank sample
- - -: Not available
*: Soils in the Albany area
**: 26 Massachusetts soils and 15 northeastern soils
(1): ST-3-SD prepared as water sample
(2): Source: Background Concentration of 20 Elements in Soil with Special Regard for New York State, NYSDEC

Table 46
Becker Electronics Site
Septic Tank Test Pit Soil Sampling
Volatile Organic Compounds

SAMPLE LOCATION:		ST-3-SL	ST-3-SL-DUP	ST-3-SL-EQB	ST-2-SL	ST-SL-EQB	TB	ST-TB	ST-1-SL	NYSDEC Soil Cleanup Criteria
DATE SAMPLED:		11/8/90	11/8/90	11/8/90	5/7/91	5/8/91	5/7/91	5/8/91	11/7/90	
DEPTH OF SAMPLE (FT):		3.5	3.5	---	3.0	---	---	---	5.0	
UNITS:		µg/kg	µg/kg	µg/l	µg/kg	µg/l	µg/l	µg/l	µg/kg	µg/kg
COMPOUND	CRQL									
Chloromethane	10	U	U	U	U	U	U	U	U	5
Bromomethane	10	U	U	U	U	U	U	U	U	16
Vinyl Chloride	10	U	U	U	U	U	U	U	U	3
Chloroethane	10	U	U	U	U	U	U	U	U	6
Methylene Chloride	5	U	U	U	U	U	U	U	U	1
Acetone	10	29U	16U	U	U	U	U	U	38U	---
Carbon Disulfide	5	U	U	U	U	U	U	U	U	81
1,1-Dichloroethene	5	U	U	U	U	U	U	U	U	10
1,1-Dichloroethane	5	U	U	U	U	U	U	U	U	5
1,2-Dichloroethene(total)	5	U	U	U	U	U	U	U	U	7
Chloroform	5	U	U	U	U	U	U	U	U	7
1,2-Dichloroethane	5	U	U	U	U	U	U	U	U	2
2-Butanone	10	U	U	U	U	R	R	R	U	7
1,1,1-Trichloroethane	5	U	U	U	3J	U	U	U	U	23
Carbon Tetrachloride	5	U	U	U	U	U	U	U	U	17
Vinyl Acetate	10	U	U	U	U	U	U	U	U	---
Bromodichloromethane	5	U	U	U	U	U	U	U	U	47
1,2-Dichloropropane	5	U	U	U	U	U	U	U	U	8
cis-1,3-Dichloropropene	5	U	U	U	U	U	U	U	U	7
Trichloroethene	5	U	U	U	U	U	U	U	U	19
Dibromochloromethane	5	U	U	U	U	U	U	U	U	47
1,1,2-Trichloroethane	5	U	U	U	U	U	U	U	U	8
Benzene	5	U	U	U	U	U	U	U	U	17
trans-1,3-Dichloropropene	5	U	U	U	U	U	U	U	U	7
Bromoform	5	U	U	U	U	U	U	U	U	174
4-Methyl-2-pentanone	10	U	U	U	U	U	U	U	U	---
2-Hexanone	10	U	U	U	U	U	U	U	U	---
Tetrachloroethene	5	U	U	U	U	U	U	U	U	55
1,1,2,2-Tetrachloroethane	5	U	U	U	U	U	U	U	U	18
Toluene	5	U	U	U	U	U	U	U	U	45
Chlorobenzene	5	U	U	U	U	U	U	U	U	50
Ethylbenzene	5	U	U	U	U	U	U	U	U	165
Styrene	5	U	U	U	U	U	U	U	U	---
Total Xylenes	5	U	U	U	U	U	U	U	U	36

Qualifiers

J: Concentration estimated
U: Compound not detected
R: Value was rejected

Notes

CRQL: Contract Required Quantitation Limits
DUP: Duplicate sample
EQB: Equipment blank sample
TB: Trip blank sample
ND: Not Detectable

A value followed by a U or a UJ is an elevated detection limit due to blank contamination

\BECKER\VOL-S\VOL-SOIL.XLU (T-30,34,42,46)

Table 47
Becker Electronics Site
Septic Tank Test Pit Soil Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION:		ST-1-SL	ST-1-SL-RE	ST-2-SL	ST-3-SL	ST-3-SL-DUP	ST-SL-EQB	NYSDEC Soil Cleanup Criteria
DATE SAMPLED:		5/6/91	5/6/91	5/7/91	5/7/91	5/7/91	5/8/91	
		5.0	5.0	3.0	3.5	3.5	---	
UNITS:		µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/l	µg/kg
COMPOUND	CRQL							
Phenol	330	UJ	U	U	U	U	U	0.43
bis(2-Chloroethyl) ether	330	UJ	U	U	U	U	U	0.42
2-Chlorophenol	330	UJ	U	U	U	U	U	---
1,3-Dichlorobenzene	330	UJ	U	U	U	U	U	255
1,4-Dichlorobenzene	330	UJ	U	U	U	U	U	240
Benzyl Alcohol	330	UJ	U	U	U	U	U	---
1,2-Dichlorobenzene	330	UJ	U	U	U	U	U	240
2-Methylphenol	330	UJ	U	U	U	U	U	---
bis(2-Chloroisopropyl) ether	330	UJ	U	U	U	U	U	9
4-Methylphenol	330	UJ	U	U	U	U	U	---
N-Nitroso-di-n-propylamine	330	UJ	U	U	U	U	U	---
Hexachloroethane	330	UJ	U	U	U	U	U	3,000
Nitrobenzene	330	UJ	U	U	U	U	U	5
Isophorone	330	UJ	U	U	U	U	U	---
2-Nitrophenol	330	UJ	U	U	U	U	U	---
2,4-Dimethylphenol	330	UJ	U	U	U	U	U	---
Benzoic Acid	1600	UJ	310J	U	U	UJ	U	75
bis(2-Chloroethoxy)methane	330	UJ	U	U	U	U	U	---
2,4-Dichlorophenol	330	UJ	U	U	U	U	U	11
1,2,4-Trichlorobenzene	330	UJ	U	U	U	U	U	1,380
Naphthalene	330	UJ	U	U	U	U	U	390
4-Chloroaniline	330	UJ	U	U	U	U	U	---
Hexachlorobutadiene	330	UJ	U	U	U	U	U	4,350
4-Chloro-3-Methylphenol	330	UJ	U	U	U	U	U	---
2-Methylnaphthalene	330	UJ	25J	U	U	U	U	1,105
Hexachlorocyclopentadiene	330	UJ	U	U	U	U	U	720
2,4,6-Trichlorophenol	330	UJ	U	U	U	U	U	60
2,4,5-Trichlorophenol	1600	UJ	U	U	U	U	U	3
2-Chloronaphthalene	330	UJ	U	U	U	U	U	221
2-Nitroaniline	1600	UJ	U	U	U	U	U	---
Dimethylphthalate	330	UJ	U	U	U	U	U	---
Acenaphthylene	330	UJ	U	U	U	U	U	3,750
2,6-Dinitrotoluene	330	UJ	U	U	U	U	U	14
3-Nitroaniline	330	UJ	U	U	U	U	U	---
Acenaphthene	330	UJ	U	U	U	U	U	2,760
2,4-Dinitrophenol	1600	UJ	UJ	U	U	U	U	0.50

(continued on next page)

Table 47 (continued)
Becker Electronics Site
Septic Tank Test Pit Soil Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION:		ST-1-SL	ST-1-SL-RE	ST-2-SL	ST-3-SL	ST-3-SL-DUP	ST-SL-EQB	NYSDEC Soil Cleanup Criteria
DATE SAMPLED:		5/6/91	5/6/91	5/7/91	5/7/91	5/7/91	5/8/91	
		5.0	5.0	3.0	3.5	3.5	---	
UNITS:		µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/l	µg/kg
COMPOUND	CRQL							
4-Nitrophenol	1600	UJ	U	U	U	U	U	0.64
Dibenzofuran	330	UJ	U	U	U	U	U	---
2,4-Dinitrotoluene	330	UJ	U	U	U	U	U	7
Diethylphthalate	330	UJ	U	U	U	U	U	213
4-Chlorophenyl-Phenylether	330	UJ	U	U	U	U	U	---
Fluorene	330	UJ	U	U	U	U	U	10,950
4-Nitroaniline	1600	UJ	U	U	U	U	U	---
4,6-Dinitro-2-Methylphenol	1600	UJ	U	U	U	U	U	---
N-nitrosodiphenylamine	330	UJ	U	U	U	U	U	---
4-Bromophenyl-Phenylether	330	UJ	U	U	U	U	U	---
Hexachlorobenzene	330	UJ	U	U	U	U	U	41
Pentachlorophenol	1600	UJ	U	U	U	U	U	1,590
Phenanthrene	330	UJ	R	U	47J	U	U	21,000
Anthracene	330	UJ	U	U	U	U	U	21,000
Di-n-butylphthalate	330	50J	47J	U	U	U	U	255,000
Fluoranthene	330	UJ	120J	U	62J	U	U	57,000
Pyrene	330	110J	UJ	U	50J	U	U	57,000
Butylbenzylphthalate	330	UJ	R	U	U	U	U	6,548
3,3'-Dichlorobenzidine	660	UJ	UJ	UJ	UJ	U	U	233
Benzo(a)anthracene	330	UJ	UJ	U	U	U	U	83
Chrysene	330	UJ	R	U	U	U	U	12
Bis(2-ethylhexyl)phthalate	330	11000J	8400J	U	120J	230J	U	10,838
Di-n-octylphthalate	330	UJ	610J	U	U	U	U	3,578
Benzo(b)fluoranthene	330	UJ	140J	U	U	U	U	33
Benzo(k)fluoranthene	330	UJ	UJ	U	U	U	U	33
Benzo(a)pyrene	330	UJ	UJ	U	U	U	U	ND
Indeno(1,2,3-cd)pyrene	330	UJ	UJ	U	U	U	U	96
Dibenz(a,h)anthracene	330	UJ	UJ	U	U	U	U	4,950,000
Benzo(g,h,i)perylene	330	UJ	UJ	U	U	U	U	2,400,000

Qualifiers

J: Concentration was estimated
U: Compound not detected
UJ: Compound not detected - the sample quantitation limit is an estimate
R: Value was rejected

Notes

CRQL: Contract Required Quantitation Limits
RE: Sample reanalyzed
DUP: Duplicate sample
EQB: Equipment blank sample
ND: Not Detectable

Table 48
Becker Electronics Site
Septic Tank Test Pit Soil Sampling
Pesticides/PCBs

SAMPLE LOCATION:		ST-1-SL	ST-2-SL	ST-3-SL	ST-3-SL-DUP	ST-EQB	ST-SL-EQB	NYSDEC Soil Cleanup Criteria
DATE SAMPLED:		11/7/90	12/5/90	11/8/90	11/8/90	12/5/91	11/8/90	
DEPTH OF SAMPLE (FT):		5.0	3.0	3.5	3.5	--	--	
UNITS:		µg/kg	µg/kg	µg/kg	µg/kg	µg/l	µg/l	µg/kg
COMPOUND	CRQL							
alpha-BHC	8	U	U	UJ	UJ	U	U	ND
beta-BHC	8	U	U	UJ	UJ	U	U	ND
delta-BHC	8	U	U	UJ	UJ	U	U	ND
gamma-BHC(Lindane)	8	U	U	UJ	UJ	U	U	ND
Heptachlor	8	U	U	UJ	UJ	U	U	ND
Aldrin	8	U	U	UJ	UJ	U	U	ND
Heptachlor Epoxide	8	U	U	UJ	UJ	U	U	ND
Endosulfan I	8	U	U	UJ	UJ	U	U	---
Dieldrin	16	U	U	UJ	UJ	U	U	ND
4,4'-DDE	16	U	U	UJ	UJ	U	U	ND
Endrin	16	U	U	UJ	UJ	U	U	ND
Endosulfan II	16	U	U	UJ	UJ	U	U	---
4,4'-DDD	16	U	U	UJ	UJ	U	U	ND
Endosulfan Sulfate	16	U	U	UJ	UJ	U	U	---
4,4'-DDT	16	U	U	UJ	UJ	U	U	ND
Methoxychlor	80	U	U	UJ	UJ	U	U	420
Endrin Ketone	16	U	U	UJ	UJ	U	U	420
alpha-Chlordane	80	U	U	UJ	UJ	U	U	ND
gamma-Chlordane	80	U	U	UJ	UJ	U	U	---
Toxaphene	160	U	U	UJ	UJ	U	U	---
Aroclor-1016	80	U	U	UJ	UJ	U	U	---
Aroclor-1221	80	U	U	UJ	UJ	U	U	---
Aroclor-1232	80	U	U	UJ	UJ	U	U	---
Aroclor-1242	80	U	U	UJ	UJ	U	U	---
Aroclor-1248	80	U	U	UJ	UJ	U	U	---
Aroclor-1254	160	U	U	UJ	UJ	U	U	128
Aroclor-1260	160	U	U	UJ	UJ	U	U	---

Qualifiers

U: Compound not detected

UJ: Compound not detected - the sample quantitation limit is an estiimate

Notes

CRQL: Contract Required Quantitation Limit
DUP: Duplicate sample
ND: Not Detectable
EQB: Equipment blank sample

Table 49
Becker Electronics Site
Septic Tank Test Pit Soil Sampling
Inorganic Constituents

SAMPLE LOCATION:		ST-1-SL	ST-2-SL	ST-3-SL	ST-3-SL-DUP	ST-2-SL-EQB	ST-3-SL-EQB	Natural Background Levels in Soil (1)
DATE SAMPLED:		11/7/90	12/5/90	11/8/90	11/8/90	12/5/90	11/8/90	
DEPTH OF SAMPLE (FT):		5.0	3.0	3.5	3.5	--	--	
UNITS:		mg/kg	mg/kg	mg/kg	mg/kg	µg/l	µg/l	mg/kg
ELEMENTS	CRDL							
ALUMINUM	40	14800J	5260J	13600J	11000J	UJ	R	1000 - 25000*
ANTIMONY	12	R	R	R	R	R	R	- - -
ARSENIC	2	5.3	4.2J	3.4J	3.4J	U	U	<0.1 - 6.5*
BARIUM	40	270J	54.2J	113J	173J	UJ	UJ	250 - 350*
BERYLLIUM	1	5.0J	1.9J	3.5J	3.6J	UJ	UJ	0 - 0.9*
CADMIUM	1	1.2J	2.9J	1.0BJ	1.1BJ	UJ	UJ	0.0001 - 1.0**
CALCIUM	1000	4320J	1460J	1520J	1840J	UJ	UJ	150 - 6500*
CHROMIUM	2	27.0J	15.3J	38.4J	51.4J	UJ	UJ	1.5 - 25*
COBALT	10	21.2J	6.1BJ	9.3BJ	10.3BJ	UJ	UJ	2.5 - 6*
COPPER	5	79.0J	13.2J	13.1J	25.7J	UJ	14BJ	<1 - 15*
IRON	20	31000J	11400J	21700J	20900J	63BJ	481J	17500 - 25000*
LEAD	0.6	14.9J	19.0J	R	R	R	U	1 - 12.5*
MAGNESIUM	1000	4580J	1770J	3140J	2740J	UJ	UJ	1700 - 6000*
MANGANESE	3	980J	252J	324J	369J	UJ	9BJ	400 - 600*
MERCURY	0.1	0.12U	0.13U	0.13U	0.14U	U	U	0.042 - 0.066*
NICKEL	8	42.5J	16.4J	24.1J	24.3J	UJ	UJ	6 - 12.5*
POTASSIUM	1000	855BJ	561BJ	970BJ	620BJ	UJ	UJ	12500 - 17500*
SELENIUM	1	0.30U	0.32U	0.30UJ	0.34UJ	U	UJ	<0.1 - 0.125*
SILVER	2	R	R	R	R	R	R	- - -
SODIUM	1000	303UJ	320UJ	304UJ	338UJ	UJ	UJ	6000 - 8000*
THALLIUM	2	0.18U	0.19U	0.18U	0.20U	U	U	- - -
VANADIUM	10	22.8J	11.1BJ	21.4J	17.3J	UJ	UJ	25 - 60*
ZINC	4	348J	46.7J	174J	416J	UJ	82J	37 - 60*

Qualifiers

J: Concentration was estimated
R: Value was rejected
U: Not detectable at the IDL
B: Value is between the IDL and CRDL
UJ: Compound not detetcted - the sample quantitation limit is an estimate

Notes

CRDL: Contract Required Detection Limits
EQB: Equipment blank sample
DUP: Duplicate sample
- - -: Not available
*: Soils in the Albany area
**: 26 Massachusetts soils and 15 northeastern soils
(1): Source: Background Concentration of 20 Elements in Soil with Special Regard for New York State, NYSDEC

Table 50
Becker Electronics Site
Discharge Pipe Sediment Sampling
Volatile Organic Compounds

LOCATION NUMBER: DATE SAMPLED: UNITS:		PP-1 11/19/90 µg/kg	PP-1-RE 11/19/90 µg/kg	NYSDEC Soil Cleanup Criteria µg/kg
COMPOUND	**CRQL**			
Chloromethane	10	R	R	5
Bromomethane	10	R	R	16
Vinyl Chloride	10	R	R	3
Chloroethane	10	R	R	6
Methylene Chloride	5	R	R	1
Acetone	10	R	R	---
Carbon Disulfide	5	R	R	81
1,1-Dichloroethene	5	R	R	10
1,1-Dichloroethane	5	R	R	5
1,2-Dichloroethene(total)	5	R	R	7
Chloroform	5	R	R	7
1,2-Dichloroethane	5	R	R	2
2-Butanone	10	R	R	7
1,1,1-Trichloroethane	5	R	R	23
Carbon Tetrachloride	5	R	R	17
Vinyl Acetate	10	R	R	---
Bromodichloromethane	5	R	R	47
1,2-Dichloropropane	5	R	R	8
cis-1,3-Dichloropropene	5	R	R	7
Trichloroethene	5	R	R	19
Dibromochloromethane	5	R	R	47
1,1,2-Trichloroethane	5	R	R	8
Benzene	5	R	R	17
trans-1,3-Dichloropropene	5	R	R	7
Bromoform	5	R	R	174
4-Methyl-2-pentanone	10	R	R	---
2-Hexanone	10	R	R	---
Tetrachloroethene	5	R	R	55
1,1,2,2-Tetrachloroethane	5	R	R	18
Toluene	5	R	R	45
Chlorobenzene	5	R	R	50
Ethylbenzene	5	R	R	165
Styrene	5	R	R	---
Total Xylenes	5	R	R	36

Qualifiers

R: Sample was rejected

Notes

CRQL: Contract Required Quantitation Limits
RE: Sample reanalyzed
ND: Not Detectable
PP: Discharge Pipe from building

Table 51
Becker Electronics Site
Discharge Pipe Sediment Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION: DATE SAMPLED: UNITS:		PP-1 5/7/91 --- µg/kg	PP-1-RE 5/7/91 --- µg/kg	NYSDEC Soil Cleanup Criteria µg/kg
COMPOUND	CRQL			
Phenol	330	U	U	0.43
bis(2-Chloroethyl) ether	330	U	U	0.42
2-Chlorophenol	330	U	U	---
1,3-Dichlorobenzene	330	U	U	255
1,4-Dichlorobenzene	330	U	U	240
Benzyl Alcohol	330	U	U	---
1,2-Dichlorobenzene	330	U	U	240
2-Methylphenol	330	U	U	---
bis(2-Chloroisopropyl) ether	330	U	U	9
4-Methylphenol	330	U	U	---
N-Nitroso-di-n-propylamine	330	U	U	---
Hexachloroethane	330	U	U	3,000
Nitrobenzene	330	U	U	5
Isophorone	330	U	U	---
2-Nitrophenol	330	U	U	---
2,4-Dimethylphenol	330	U	U	---
Benzoic Acid	1600	290J	U	75
bis(2-Chloroethoxy)methane	330	U	U	---
2,4-Dichlorophenol	330	U	U	11
1,2,4-Trichlorobenzene	330	U	U	1,380
Naphthalene	330	U	U	390
4-Chloroaniline	330	U	U	---
Hexachlorobutadiene	330	U	U	4,350
4-Chloro-3-Methylphenol	330	U	U	---
2-Methylnaphthalene	330	590J	U	1,105
Hexachlorocyclopentadiene	330	U	U	720
2,4,6-Trichlorophenol	330	U	U	60
2,4,5-Trichlorophenol	1600	U	U	3
2-Chloronaphthalene	330	U	U	221
2-Nitroaniline	1600	U	U	---
Dimethylphthalate	330	U	U	---
Acenaphthylene	330	U	U	3,750
2,6-Dinitrotoluene	330	U	U	14
3-Nitroaniline	330	U	U	---
Acenaphthene	330	U	U	2,760
2,4-Dinitrophenol	1600	U	U	0.50

(continued on next page)

Table 51 (continued)
Becker Electronics Site
Discharge Pipe Sediment Sampling
Semivolatile Organic Compounds

SAMPLE LOCATION:		PP-1	PP-1-RE	NYSDEC Soil Cleanup Criteria
DATE SAMPLED:		5/7/91	5/7/91	
		---	---	
UNITS:		µg/kg	µg/kg	µg/kg
COMPOUND	CRQL			
4-Nitrophenol	1600	U	U	0.64
Dibenzofuran	330	U	U	---
2,4-Dinitrotoluene	330	U	U	7
Diethylphthalate	330	U	U	213
4-Chlorophenyl-Phenylether	330	U	U	---
Fluorene	330	U	U	10,950
4-Nitroaniline	1600	U	U	---
4,6-Dinitro-2-Methylphenol	1600	U	UJ	---
N-nitrosodiphenylamine	330	U	UJ	---
4-Bromophenyl-Phenylether	330	U	UJ	---
Hexachlorobenzene	330	U	UJ	41
Pentachlorophenol	1600	U	UJ	1,590
Phenanthrene	330	U	UJ	21,000
Anthracene	330	U	UJ	21,000
Di-n-butylphthalate	330	6200	UJ	255,000
Fluoranthene	330	U	UJ	57,000
Pyrene	330	UJ	U	57,000
Butylbenzylphthalate	330	UJ	U	6,548
3,3'-Dichlorobenzidine	660	UJ	U	233
Benzo(a)anthracene	330	UJ	U	83
Chrysene	330	UJ	U	12
Bis(2-ethylhexyl)phthalate	330	38000J	6500	10,838
Di-n-octylphthalate	330	UJ	U	3,578
Benzo(b)fluoranthene	330	UJ	U	33
Benzo(k)fluoranthene	330	UJ	U	33
Benzo(a)pyrene	330	UJ	U	ND
Indeno(1,2,3-cd)pyrene	330	UJ	U	96
Dibenz(a,h)anthracene	330	UJ	U	4,950,000
Benzo(g,h,i)perylene	330	UJ	U	2,400,000

Qualifiers
J: Concentration was estimated
U: Compound not detected
UJ: Compound not detected - the sample quantitation limit is an estimate

Notes
CRQL: Contract Required Quantitation Limits
RE: Sample reanalyzed
PP: Discharge pipe from building
ND: Not Detectable

Table 52
Becker Electronics Site
Discharge Pipe Sediment Sampling
Pesticides/PCBs

SAMPLE LOCATION:		PP-1	PP-1-RE	NYSDEC Soil Cleanup Criteria
DATE SAMPLED:		11/19/90	11/19/90	
UNITS:		µg/kg	µg/kg	µg/kg
COMPOUND	CRQL			
alpha-BHC	8	U	U	ND
beta-BHC	8	U	U	ND
delta-BHC	8	U	U	ND
gamma-BHC(Lindane)	8	U	U	ND
Heptachlor	8	U	U	ND
Aldrin	8	U	U	ND
Heptachlor Epoxide	8	U	U	ND
Endosulfan I	8	U	U	---
Dieldrin	16	U	U	ND
4,4'-DDE	16	U	U	ND
Endrin	16	U	U	ND
Endosulfan II	16	U	U	---
4,4'-DDD	16	R	U	ND
Endosulfan Sulfate	16	U	U	---
4,4'-DDT	16	U	U	ND
Methoxychlor	80	U	U	420
Endrin Ketone	16	U	U	420
alpha-Chlordane	80	U	U	ND
gamma-Chlordane	80	U	U	---
Toxaphene	160	U	U	---
Aroclor-1016	80	U	U	---
Aroclor-1221	80	U	U	---
Aroclor-1232	80	U	U	---
Aroclor-1242	80	U	U	---
Aroclor-1248	80	U	U	---
Aroclor-1254	160	U	U	128
Aroclor-1260	160	U	U	---

Qualifiers

U: Compound not detected
R: Value was rejected

Notes

CRQL: Contract Required Quantitation Limit
ND: Not Detectable
RE: Sample reanalyzed
PP: Discharge pipe from building

Table 53
Becker Electronics Site
Discharge Pipe Sediment Sampling
Inorganic Constituents

			Natural
SAMPLE LOCATION:		PP-1	Background
DATE SAMPLED:		11/19/90	Levels in Soil (1)
UNITS:		mg/kg	mg/kg
ELEMENTS	CRDL		
ALUMINUM	40	3330J	1000 - 25000*
ANTIMONY	12	R	- - -
ARSENIC	2	14.6	<0.1 - 6.5*
BARIUM	40	4380J	250 - 350*
BERYLLIUM	1	28.5J	0 - 0.9*
CADMIUM	1	13.1J	0.0001 - 1.0**
CALCIUM	1000	86900J	150 - 6500*
CHROMIUM	2	257J	1.5 - 25*
COBALT	10	30.7J	2.5 - 6*
COPPER	5	1140J	<1 - 15*
IRON	20	240000J	17500 - 25000*
LEAD	0.6	181J	1 - 12.5*
MAGNESIUM	1000	6210J	1700 - 6000*
MANGANESE	3	12800J	400 - 600*
MERCURY	0.1	0.16J	0.042 - 0.066*
NICKEL	8	112J	6 - 12.5*
POTASSIUM	1000	1440J	12500 - 17500*
SELENIUM	1	1.3U	<0.1 - 0.125*
SILVER	2	R	- - -
SODIUM	1000	8020J	6000 - 8000*
THALLIUM	2	0.28BJ	- - -
VANADIUM	10	9.4BJ	25 - 60*
ZINC	4	29400J	37 - 60*

Qualifiers
J: Concentration was estimated
R: Value was rejected
U: Not detectable at the IDL
B: Value is between the IDL and CRDL

Notes
CRDL: Contract Required Detection Limits
- - -: Not available
*: Soils in the Albany area
**: 26 Massachusetts soils and 15 northeastern soils
(1): Source: Background Concentration of 20 Elements in Soil with Special Regard for New York State, NYSDEC

Table 54
Becker Electronics Site
SPDES Permit Sampling*
Volatile Organic Compounds

LOCATION NUMBER: DATE SAMPLED: UNITS:		SPDES-1 5/2/91 µg/l	SPDES-2 5/7/91 µg/l	SPDES Discharge Limitations** µg/l
COMPOUND	CRQL			
Chloromethane	10	U	U	---
Bromomethane	10	U	U	---
Vinyl Chloride	10	U	U	---
Chloroethane	10	U	U	---
Methylene Chloride	5	U	U	---
Acetone	10	U	U	---
Carbon Disulfide	5	U	U	---
1,1-Dichloroethene	5	U	U	---
1,1-Dichloroethane	5	U	U	10
1,2-Dichloroethene(total)	5	U	U	---
Chloroform	5	U	U	10
1,2-Dichloroethane	5	U	U	---
2-Butanone	10	U	R	---
1,1,1-Trichloroethane	5	U	U	10
Carbon Tetrachloride	5	U	U	10
Vinyl Acetate	10	U	U	---
Bromodichloromethane	5	U	U	---
1,2-Dichloropropane	5	U	U	---
cis-1,3-Dichloropropene	5	U	U	---
Trichloroethene	5	U	U	10
Dibromochloromethane	5	U	U	---
1,1,2-Trichloroethane	5	U	U	---
Benzene	5	U	U	---
trans-1,3-Dichloropropene	5	U	U	---
Bromoform	5	U	U	---
4-Methyl-2-pentanone	10	U	U	---
2-Hexanone	10	U	U	---
Tetrachloroethene	5	U	U	10
1,1,2,2-Tetrachloroethane	5	U	U	---
Toluene	5	U	U	10
Chlorobenzene	5	U	U	---
Ethylbenzene	5	U	U	---
Styrene	5	U	U	---
Total Xylenes	5	U	U	10

Qualifiers

J: Concentration was estimated
U: Compound not detected
UJ: Compound not detected - the sample quantitation limit is an estimate
R: Value was rejected

Notes

*: Samples obtained from discharge pipe after carbon filter units
**: SPDES Discharge Limitations as stated in NYSDEC Memorandum dated 12/7/90 regarding SPDES Permit for the Becker site

Table 55
Becker Electronics Site
SPDES Permit Sampling*
Inorganic Constituents

SAMPLE LOCATION:		SPDES-1	SPDES-2	SPDES Discharge Limitations**
DATE SAMPLED:		5/2/91	5/7/91	
UNITS:		µg/l	µg/l	µg/l
ELEMENTS	CRDL			
ALUMINUM	200	UJ	UJ	500
BARIUM	200	14BJ	95BJ	1400
CHROMIUM	10	UJ	UJ	360
COPPER	25	6BJ	6BJ	2000
IRON	100	152J	UJ	4800
LEAD	3	0.7BJ	1BJ	500
MAGNESIUM	5000	9450J	10100J	4000
MANGANESE	15	6BJ	34J	5000
NICKEL	40	UJ	UJ	1200
ZINC	20	22J	40J	1900

Notes

*: Samples obtained from discharge pipe after carbon filter units

**: SPDES Discharge Limitations as stated in NYSDEC Memorandum dated 12/7/90 regarding SPDES Permit for the Becker Electronics Site.

Qualifiers

J: Concentration was estimated
U: Not detectable at the IDL
B: Value is between the IDL and CRDL
UJ: Compound not detected - the sample quantitation limit is an estimate