

FRASER RIVER
ACTION PLAN



INVENTORY AND
REVIEW OF
QUALITY
ASSURANCE/
QUALITY
CONTROL
DOCUMENTS



CANADA'S GREEN PLAN
LE PLAN VERT DU CANADA

Canada

DOE FRAP 1993-28



Environment
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Environnement
Canada

INVENTORY AND REVIEW OF QUALITY ASSURANCE/QUALITY CONTROL DOCUMENTS

DOE FRAP 1993-28

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July 1993

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1.0 INTRODUCTION AND BACKGROUND

A quality assurance/quality control (QA/QC) committee has been established under the auspices of the Environmental Quality Component of the Fraser River Action Plan (FRAP). This committee is mandated to provide guidance in the area of QA/QC for sampling programs in the Fraser River Basin to ensure: 1) production of high quality, reliable environmental data; 2) compatible data which will be readily exchangeable both between FRAP programs and amongst governmental agencies.

As a first step towards developing a QA/QC plan for the Fraser River Basin, the Committee wished to review current protocols as a basis for a comprehensive plan for future programs. Environmental Conservation contracted Axys Environmental Consultants to conduct this review. The study was intended to retrieve and review as many relevant documents as possible during the two-month period available.

Because of time constraints and delays or difficulty in obtaining certain documents, this report does not represent an exhaustive search and review of the abundant literature and documentation on the subject of environmental sampling QA/QC. The report does, however, provide a significant data base and framework for inclusion of additional documents as these become available.

In conjunction with this summary report, Axys Environmental Consulting developed a computer database system to create a catalogue of reviewed references. The system was implemented using in-house software to allow greater flexibility in searching the database. The program has the advantages that it requires no other software; allows rapid key word searches and may be easily updated. This database is available from Environment Canada as described in Appendix "A" of this document.

2.0 PROJECT OBJECTIVES

The objectives of this project were:

1. To retrieve as many current documents as possible on QA/QC within the time and budget available relating to the following aspects of environmental sampling programs for aquatic systems: sampling design, field sampling, laboratory analyses, and data management.
2. To review and summarize QA/QC protocols described in the documents retrieved.
3. To prepare a table summarizing the QA/QC information available for different variables and media, for the different aspects of a sampling program (sampling design, field sampling, laboratory analyses, and data management).
4. To prepare a glossary of QA/QC terminology, to be reviewed by the QA/QC Committee.

2.1 Document Retrieval

The search focused on domestic (Canadian) versus foreign sources and documented methods and protocols versus theoretical considerations. The search also focused on sampling and QA/QC in freshwater versus marine/estuarine environments. Documents by the U.S. Environmental Protection agency and its contractors from Puget Sound were included because of the similar scope of the Washington programs and the geographic proximity of the study areas.

Documents pertaining to QA/QC were sought via a number of methods. The Scientific Authority supplied numerous documents, the Axys library also contained many useful reference documents, and the remaining documents were found in local libraries and/or various agencies throughout North America.

Commercial and governmental databases were searched using CD-ROM technology. These databases are: National Technical Information Service (NTIS), WAVES (Fisheries and Oceans Canada), Aquatic Sciences and Fisheries Abstracts (ASFA) and AQUAREF (also

called Canadian Water Resources References by Environment Canada). Consultations were made with two librarians on search strategies before the searches were conducted. Key search words and phrases included: "Quality Control", "Quality Assurance", "Quality Assessment", "QA/QC", "Manual", "Field Sampling", "Design", and "Environmental". These key words were used in various combinations to further define the search. A summary of the searches performed on each database is presented in Appendix G.

More than 300 titles and abstracts were read as a result of "hits" from the database searches. Documents relevant to this project were identified and either retrieved and reviewed or included in a list of documents not retrieved but potentially relevant (Bibliography Section "C" - see explanation of bibliography structure below).

Other sources of documents included scientists at various agencies; catalogue searches of the University of Victoria McPherson Library (on-line VICTOR service) and the Institute of Ocean Sciences (IOS) library; the Joint Federal-Provincial Quality Assurance Working Group (QAWG) library; and references cited in retrieved documents.

2.2 Document Review

A summary format for reviewing each document is presented in Appendix A. The purpose of the summary format was to ensure that each document was reviewed in a consistent manner. A list of valid **Fields** and **Descriptors** was compiled and used to summarize each document. Most of these terms are unambiguous in their meaning, however, some terms have varying definitions between disciplines. The definitions used for summarizing the documents are provided in Table 1 both as a reference and to ensure consistent entry of future documents by other users.

Summaries generated from the electronic database will differ slightly from the format presented in Appendix B. The Type of Program field has been dropped as it was deemed to be of little relevance. The fields for Category, Aquatic Environment, Medium and Variable have become Logical fields with either True or False Value. A True Value indicates that the document contains information related to the indicated field. For example, A T, or True Value for Trace Metals under the Variable field indicates that the document contains information relating to Trace Metals.

Table 1. Fields, descriptors and definitions used to summarize the reviewed

Fields, descriptors and definitions used to summarize the reviewed documents.

FIELD	VALID DESCRIPTORS	DEFINITION
CATEGORY	STUDY DESIGN	These are the main CATEGORIES. Further division is by SUBCATEGORY - see Appendix B.
	FIELD SAMPLING	
	LABORATORY ANALYSIS	
	DATA MANAGEMENT	
MEDIA	WATER - RECEIVING	Includes rivers, lakes, etc.
	WATER - EFFLUENT	Any effluent stream
	SEDIMENT - SUSPENDED	Sediments suspended in the water column
	SEDIMENT - BED	Substrate, sampled by grab or core, etc.
	FISH	All fish (and tissues) including benthic species such as flounder and sole
	BENTHOS	Any organism associated with the substrate excluding fish. e.g., crabs and shellfish and plants both vascular (e.g. eel grasses) and non-vascular (e.g. algae)
	WILDLIFE	A catch-all primarily used for birds and mammals
	PRECIPITATION	Rain and snow
	OTHER	Air, ice and other
VARIABLES	GENERAL	those measurements oftentimes ancillary to actual parameter of interest e.g. pH, DO, C, S, T, turbidity, etc.
	ORGANICS	Chlorinated pesticides, PCBs, dioxins and furans, etc.
	TRACE METALS	Metals at concentrations of less than 1 ppm
	NUTRIENTS	Substances, elements or compounds necessary for growth and development of flora and fauna excluding metals
	BOD/COD	Biochemical Oxygen Demand/Chemical Oxygen Demand
	VOLATILES	Components of a sample readily lost by evaporation
	BIO-CHEMICAL	MFOs, lipids, metabolites, hormones
	BIOLOGICAL	Condition factors, gonadal/somatic indices, toxicity tests
	MICROBIOLOGY	Bacteriology, e.g., fecal coliforms
	BULK PROPERTIES	contains physical type properties of media sampled e.g. grain size, suspended sediments
GEOGRAPHICAL AREA		Any geographical area is valid, North America has been used extensively
AQUATIC ENVIRONMENT	RIVERS, LAKES, MARINE, ESTUARINE	
UTILITY RATING	K	K indicates that this is unknown and will be assessed by the end user

Table 1 (cont.).

FIELD	VALID DESCRIPTORS	DEFINITION
CITATION		
TITLE		
AUTHOR		
YEAR		
SOURCE		Either used as report number, e.g. EPS 1/RM/28 or location for those books not copied due to copyright law
AUTHOR AFFILIATION		Such as government agency or company name
PAGES		Number of pages in document or page numbers if partial, e.g. journal article. Format is often that from database search, e.g., # preface pages in italics, followed by text page numbers
SUMMARY		Brief overview of document, e.g. "How-to methods manual with worked examples"
COMMENTS	K	UnKnown, field left for future use by the end user
SUBCATEGORY	See Appendix listings	
GLOSSARY	YES or NO	Indicates whether or not document contains a glossary

The highest level of organization is CATEGORY which separates the documents into logical phases of an environmental study: study design, field sampling, laboratory analysis, and data management. These CATEGORIES are further broken down into SUBCATEGORIES to aid in searching for particular topics of interest (see Appendix C). SUBCATEGORIES do not appear on the electronic database, but could be added to the Summary or Comments fields at a later date.

Descriptors for MEDIA and VARIABLES were selected to reflect the level of detail necessary for separating the documents without overwhelming the user and making the summary tables difficult to use. Examples of the VARIABLES encountered in reviewing the documents contained in the database at the time of contract completion are presented in Table 2. Note that these groupings are

Table 2. List of VARIABLES used in database with examples from reviewed documents.

VARIABLE	EXAMPLE
GENERAL	pH, Salinity (S), Conductivity (C), Temperature (T), Colour, Transparency, turbidity, Dissolved Oxygen, Flow (Velocity), hardness, Total Volatile Solids, Total Organic Carbon, Total Organic Halides (TOX), Total Sulphides, Chloride, fluoride, iodide, sulfate, major ions
ORGANICS	pesticides, herbicides, insecticides, PCBs, dioxins, furans, acenaphthene, naphthalene, anthracene, phenanthrene, fluorene, fluoranthene, oil and grease, organotin (i.e., tributyltin, dibutyltin)
TRACE METALS	antimony, arsenic, beryllium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, zinc
NUTRIENTS	Nitrogen (ammonia, Total Kjeldahl, nitrate-nitrite), orthophosphate-phosphorus, silicate, total phosphorus
BOD/COD	Biochemical Oxygen Demand, Chemical Oxygen Demand
VOLATILES	chlorinated aliphatic volatile organic compounds, halogenated and nonhalogenated volatile organic compounds
BIOCHEMICAL	Mixed Function Oxygenases (MFOs), lipids, Metabolites (ATP), hormones, paralytic shellfish poisoning toxins
BIOLOGICAL	Condition factors (weight/length + indices), chlorophyll <i>a</i> and other pigments, phytoplankton, toxicity tests/bioassays, lesions, tumours, gross abnormalities, histology/pathology, tissue samples, parasites, stomach contents, aging samples (e.g., otoliths, scales)
MICROBIOLOGY	Total Coliforms, fecal coliforms, bacteriology, Escherichia coli, streptococci, clostridium perfringens, heterotrophic bacteria, enterococci, Vibrio spp., Aeromonas spp., Yersinia spp.
BULK PROPERTIES	Total Suspended Solids, settleable solids, floating particulates, grain size

somewhat arbitrary and may not be agreed upon by some experts. However, they provide an ordering of the database to give ease of access. As new documents are added, these tables should be amended as necessary.

A total of 65 documents were reviewed. These documents are also listed

bibliographically in Appendix G, Section "A" (see Sec. 2.5 for a description of the bibliography).

References were numbered beginning at 1. However, some references that were not reviewed, but are of potential interest, were entered. These non-reviewed entries are coded starting at 501 to differentiate them from the reviewed documents.

A "K" in any of the Fields indicates unKnown. As the COMMENTS fields were left empty for future rating by the Scientific Authority, these will all have a "K". In some cases, an N/A was used to indicate Not Applicable, e.g. the field Geographical Area is often N/A for references discussing Laboratory Analysis.

2.3 Summary Tables

The summary tables serve two purposes. First, a visual assessment of the available documents is readily made and information gaps can be identified. Second, the tables provide means of searching for documents in the various CATEGORIES by PROGRAM type, in various MEDIA, and for type of VARIABLE. Searches of this sort are also readily accomplished using the electronic database.

The summary tables are presented in Appendix E.

References 52 through 59 inclusive, were not entered in the Summary Tables due to their summary nature.

2.4 Glossary of Terms

A glossary of terms is presented in Appendix F. In some cases, more than one definition is provided for each term to show the variety of ways in which these terms are used in the current literature. The Reference number for each definition is thus provided to allow the reader to determine its origin. Glossary entries were compiled only from documents that were reviewed. In some cases, the glossaries were identical for a number of documents in which case only the one that was used was referenced. The EPS RM series on toxicity testing, for example, fall into this category.

2.5 Bibliography

The bibliography is divided into four categories based upon the status of each document:

- A - reviewed
- B - retrieved and not reviewed
- C - not retrieved, and
- D - draft format

Category A documents are those that were reviewed and entered into the database. Category B documents were retrieved but not reviewed for a number of reasons. These reasons are listed in the STATUS comment after each reference and includes reasons such as document retrieved too late to include, document appeared to be slightly off-topic given a cursory read only, time constraints prevented inclusion, or low priority document. Those documents listed in category C were not retrieved - the STATUS comment indicates why not. In some instances, a partial search was performed, in others, no time was available for searching. Lastly, some documents would have to be purchased and no funds were allocated towards this task. Category D documents are those that are in Draft Format and may be added to the database in the future. Comments associated with the Category D documents indicate whether or not follow up is required to access these documents when they become available.

APPENDIX A

On Obtaining the Electronic Database

The electronic database usable on MS-DOS compatible computers is freely available from Environment Canada, Pacific and Yukon Region, either by mail or from the Environment Canada Bulletin Board.

From the Bulletin Board:

Environment Canada maintains an electronic bulletin board for data and information distribution, in addition providing a forum for discussion on environmentally relevant topics. To access this service, the modem parameters are:

Phone No.	(604) 666-2607
Baud	1200-9600
Data Bits	8
Stop Bits	2
Parity	None

The QA/QC database resides in the "Fraser River" Conference, under the file name "QAQC.EXE". Transfer this file by modem using any appropriate protocols for binary file transfers. This compressed file containing both the database and instructions for use may be extracted by typing "QAQC <enter>" at the DOS prompt.

By Mail:

The database may be obtained by mail from:

Environment Canada
224 West Esplanade
North Vancouver, B.C.
CANADA V7M 3H7
attn: J. Stroh

In the request include:

- 1) the name of the program
- 2) a brief description of the program
- 3) one 5.25" 1.2mB or 3.5" 760K formatted diskette

APPENDIX B

Summary Format for QA/QC Documents

REFERENCE No.:

CATEGORY:

TYPE OF PROGRAM:

MEDIA:

VARIABLE(S):

GEOGRAPHICAL AREA:

AQUATIC ENVIRONMENT:

UTILITY RATING:

CITATION:

TITLE:

AUTHOR:

YEAR:

SOURCE:

AUTHOR AFFILIATION:

PAGES:

SUMMARY:

COMMENTS:

APPENDIX C

Categories and Subcategories for Summary of QA/QC Information

1. Study Design

- 1.1 - data quality objectives
- 1.2 - experimental design principles (controls, replicates)
- 1.3 - statistical design (e.g. sample size)
- 1.4 - site locations
- 1.5 - time of sampling (season and diurnal)
- 1.6 - selection of species / variables

2. Field Sampling

- 2.1 - requirements for sample containers, cleaning, etc.
- 2.2 - field collection protocols/methods
- 2.3 - field QA/QC procedures
- 2.4 - sample preservation, transportation, handling
- 2.5 - audits
- 2.6 - action plan to resolve problems
- 2.7 - sample location / positioning
- 2.8 - field safety

3. Laboratory Analyses

- 3.1 - analytical methodology and sample preparation
- 3.2 - storage conditions, holding times,
- 3.3 - acceptable criteria for precision and accuracy
- 3.4 - acceptable detection limits
- 3.5 - audits
- 3.6 - intralaboratory QA/QC procedures
- 3.7 - interlaboratory QA/QC procedures
- 3.8 - action plan to resolve problems
- 3.9 - instrument calibration
- 3.10 - laboratory safety

4. Data Management

- 4.1 - data recording, screening, validation and verification,
- 4.2 - data interpretation
- 4.3 - data presentation, reporting, custody,
- 4.4 - management of data bases
- 4.5 - audits
- 4.6 - action plan to resolve problems

APPENDIX D

Summary Tables for QA/QC Documents

Notes on Using QA/QC Document Summary Tables

TABLE A - Study Design is organized to allow the user to select those documents in the library that pertain to the design of an environmental study be it monitoring, survey, regulatory or legal. This table is organized by the MEDIA to be sampled and the SUBCATEGORY of the Study Design. These groupings will allow the user to pose a question such as:

What are the documents that provide information on determining the number of replicates needed to properly sample receiving water?

TABLES B1 and B2 - Field Sampling is spread over two tables to aid the user in finding specific information. Starting with TABLE B1, a search is made for documents organized by MEDIA and VARIABLE, allowing questions to be answered such as:

What documents deal with Field Sampling for organics in fish?

The search may be alternately started, or further refined, by using TABLE B2 to pose questions such as:

What are the protocols for cleaning sample containers if sampling for organics?

TABLE C - Laboratory Analysis is organized by SUBCATEGORY and VARIABLE as these are the most relevant groupings to Laboratory analysis. These groupings would permit a user to pose questions such as:

What documents exist for determining Detection Limits for Trace Metal analysis?

TABLE D - Data Management. Questions likely to be posed in relation to Data Management include:

How should data be Recorded and Presented?

TABLE A. TOPIC: ENVIRONMENTAL STUDY DESIGN

Summary of references containing information relevant to Study Design broken down by MEDIA and SUBCATEGORY.

MEDIA:	WATER		SEDIMENT		FISH	BENTHOS	WILDLIFE	PRECIPITATION	OTHER (AIR, ICE, etc.)	GENERAL
	Rec.*	Efflu.*	Sus.*	Bed						
SUBCATEGORY:										
DATA QUALITY OBJECTIVES	35,49	35		35,49	35,42, 46	16,42,46,48,50	42			32,36,45
EXPERIMENTAL DESIGN PRINCIPLES (CONTROLS, REPLICATES, ETC.)	6,35,49	6,35		35,49	4,35,42,46	4,16,42,46,48,50	42			8,32,36
STATISTICAL DESIGN (SAMPLE SIZE, ETC.)	6,35,49	6,35		35,49	35,42, 46	16,42,46,47,48,50	42			8,32,36
SAMPLE LOCATION	6,35,49	6,35		35,49	4,35,42,46	4,16,42,46,47,48,50	42			36,1.4
SAMPLE TIMING	35,49	35		35,49	4,35,42,46	4,42,46,47,48,50	42			36
SELECTION OF VARIABLES/SPECIES	35	35		35	4,35,42,46	4,42,46,48,50	42			36

*Rec. = Receiving
 Efflu. = Effluent
 Sus. = Suspended

TABLE B1. TOPIC: FIELD SAMPLING.

Summary of references containing information relevant to Field Sampling broken down by MEDIA and VARIABLE.

MEDIA:	WATER		SEDIMENT		FISH	BENTHOS	WILDLIFE	PRECIPITATION	OTHER (AIR, ICE, Etc.)
	Rec.*	Effl.*	Susp.*	Bed					
VARIABLE:									
GENERAL (pH, DO, C, T, turbidity, etc.)	1,6,17,35,36,41,49	1,6,17,35,36,41	17	17,41,35,49	35,41,42	41,42	41,42	17	
ORGANICS	2,5,6,17,36,41	1,2,5,6,17,28,35,36,41	17	1,17,41,35	1,35,42	1,41	41	17	
TRACE METALS	2,5,6,17,36,41	2,5,6,17,36,41	17	17,41, 49	1,41	1,41	1,41	17	
NUTRIENTS	1,6,17,34,36,41	1,6,17,36,41	17	1,17,41,35	41,42	41,42	41,42		
BOD/COD	1,6,41	1,6,41		1,41	41	41	41		
VOLATILES	1,2,5,6,41	1,2,5,6,41		1,41	41	41	41		
BIO-CHEMICAL									
BIOLOGICAL	1,15,17,41	15,17,41	17	1,15,17,41,35	41,42,46	16,41,42,46,47,48,50	41,42		
MICROBIOLOGY	1,6,17	1,6			42	42	42		
BULK PROPERTIES (grain size, susp. solids, etc.)				1					

*Rec. = Receiving
Efflu. = Effluent

Sus. = Suspended

TABLE B2. TOPIC: FIELD SAMPLING.

Summary of references containing information relevant to Field Sampling broken down by MEDIA and SUBCATEGORY.

VARIABLE:	GENERAL	ORGANICS	TRACE METALS	NUTRIENTS	BOD/COD	VOLATILES	BIO - CHEMICAL	BIOLOGICAL	MICRO- BIOLOGY	BULK PROPERTIES
SUBCATEGORY										
SAMPLE CONTAINERS/EQUIPMENT/ CLEANING	1,2,6,17,36 ,39,41,42,3 5,49	1,2,5,6,17, 27,28,36,41 35	1,2,5,6, 17,36,39,4 1,49	1,6,34, 35,36,39,4 1	1,6,41	1,2,5,6,41		1,15,16,17, 30,32,41, 42,46,47, 48,50	1,6,17, 32,42	1,17,35
COLLECTION/METHODS	1,6,17, 35,36,39,4 1,42,49	1,5,6,17, 27,28,35, 36,41	1,5,6,17, 36,39,41,4 9	1,6,34, 36,39,41	1,6,41	1,5,6,41		1,15,16,17, 30,32,35, 41,42,46, 47,48,50	1,6,17, 32,42	1,17
QA/QC PROCEDURES	1,6,17, 35,36,39,4 1,42	1,6,17, 35,36,41	1,6,17, 36,39,41	1,6,36, 39,41	1,6,41	1,6,41		1,16,17,32,35 ,41,42, 46,48,50	1,6,32, 42	1,17
SAMPLE PRESERVATION, TRANSPORTATION, HANDLING	1,6,17, 35,36,39,4 1,42,49	1,6,17,18, 28,36,41 35	1,6,17, 36,39,41,4 9	1,6,34, 35,36,39,4 1	1,6,41	1,6,41		1,15,16,17,32 ,41,42, 46,48,50	1,6,17, 32,42	1,17,35
AUDITS	36,41	36,41	36,41	36,41	41	41		32,41,50	32	
ACTION PLAN TO RESOLVE PROBLEMS	1,41,42	1,41	1,41	1,41	1,41	1,41		1,41,42	1,42	1
POSITIONING (e.g. Loran, GPS, sextant)	1,6,17, 36,39,41,4 2	1,6,36,41	1,6,36,41	1,6,36, 39,41	1,6,41	1,6,41		1,41,42,46	1,6,42	1

TABLE C. TOPIC: LABORATORY ANALYSIS

Summary of references containing information relevant to **LABORATORY ANALYSIS** broken down by **SUBCATEGORY** and **VARIABLE**.

SUBCATEGORY:	METHODS & SAMPLE PREPARATION	STORAGE & SAMPLE RECEIVING	PRECISION & ACCURACY	DETECTION LIMITS	AUDITS	QA/QC	ACTION PLANS
VARIABLE:							
GENERAL	9,10,11,35, 41,42,49	9,10,11,41, 35,42	9,10,11,35, 41	9,10,35,41	41	9,10,35,41,42	41,42
ORGANICS	1,2,5,10,11, 13,18,27,28, 29,35,41	1,2,5,10,11,13, 18,27,28,29,35 ,41	2,5,10,11, 18,27,28,29,35 ,41	2,3,5,10,18	18,41	1,2,5,10,13, 18,27,28,35, 41	1,41
TRACE METALS	1,2,5,9,10,11,13, 41,49	1,2,5,9,10, 11,13,35,41	2,5,9,10,11	2,3,5,9,10, 41	41	1,2,5,9,10,13,41	1,41
NUTRIENTS	1,9,10,11,35,41	1,9,10,11, 34,35,41,42	9,11	9,10,41	41	1,9,10,35,41, 42	1,41,42
BOD/COD	1,10,11,41	1,10,11,41	10,11	10,41	41	1,10,41	1,41
VOLATILES	1,2,5,10,11, 41	1,2,5,10,11,41	2,5,10,11	2,3,5,10,41	41	1,2,5,10,41	1,41
BIO-CHEMICAL							
BIOLOGICAL	1,12,15,16, 19,35,41,42, 46,47,48,50	1,15,19,35, 41,42,47,48,50	15	15,41	12,15,41	1,12,15,19,35,41 ,42,48	1,41,42
MICROBIOLOGY	1,9,10,42	1,9,10,42	9,10	9,10		1,9,10,16,42	1,42
BULK PROPERTIES (grain size, susp. solids, etc.)	1,35	1,35				1,35	1

NON-VARIABLE SPECIFIC	20,21,22,23, 25,26,30,32	20,21,22,23,25 ,26,30,32,36	14	25,26,31,32	7,24,32	7,13,20,21,22,23 ,24,31,32	32
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TABLE D. TOPIC: DATA MANAGEMENT

Summary of references containing information relevant to DATA MANAGEMENT.

SUBCATEGORY:	
DATA RECORDING, SCREENING, VALIDATION AND VERIFICATION	1,2,5,8,13,14,15,16,17,18,19,20,21,22,23,24,25,26,28,29,32,35,37 ,39,40,41,42,44,46,47,48,50
DATA INTERPRETATION	8,13,14,15,16,18,19,20,21,22,23,24,25,26,28,29,32,35,37,40,41,46 ,47,48,50
DATA PRESENTATION, REPORTING, CUSTODY	1,12,13,15,16,18,19,20,21,22,23,24,25,26,28,32,35,37,39,40,41,4 2,44,46,48,49,50
MANAGEMENT OF DATA BASES	13,32,37,39,40,44
AUDITS	13,37,40
ACTION PLAN TO RESOLVE PROBLEMS	37,40

APPENDIX E

Glossary of Terms

NOTE: Number in brackets is Reference Number.

a + b - (#1) notation for acid and alkali solutions. In additive volumes (A+B), the first number, a, refers to the volume of a concentrated reagent; the second number, b, refers to the volume of distilled water required for dilution.

Accuracy - (#1) the closeness of a measured or computed value to its true value.

Accuracy - (#11) this denotes the nearness that an analytical result approaches the accepted or "true" value and is normally expressed in terms of error.

Accuracy - (#31) agreement between an experimentally determined value and an accepted reference or "true" value. It includes systematic error (bias) and random error.

Accuracy - (#17) refers to the agreement between the measured value and the accepted or "true" value. It is expressed as the difference between these two values.

Acute - (#20) means within a short period in relation to the life span of the organism, usually ≤ 4 days for fish. An acute toxic effect would be induced and observable within the short period.

Aliquot - (#1) a divisor that divides a sample into a number of equal parts, leaving no remainder; a sample resulting from such a divisor.

Ambient - (#1) surrounding, encircling.

Analyte - (#1) the specific component measured in a chemical analysis.

APHA - (#1) American Public Health Association.

Apparent Particle Size Distribution - (#1) distribution comprised of both the inorganic and organic particles in a sample (i.e., organic material is not oxidized).

Archive - (#1) a repository of evidence or information.

Asymptote - (#1) a line considered a limit to a curve in the sense that the perpendicular distance from a moving point on the curve to the line approaches zero as the point moves an infinite distance from the origin.

Auto-injection - (#1) an automated introduction of a sample into an instrument for analysis. Usually used for extracts analyzed by gas chromatography.

Background Correction Factor - (#1) a number that adjusts the analyte signal for interfering matrix effects in flame and graphite furnace AA analysis (usually done automatically by the instrument itself through the use of continuous deuterium lamp).

Bacteriostasis - (#1) the arrestment or inhibition of bacterial growth and reproduction.

Batch - (#1) usually refers to the number of samples that can be prepared or analyzed at one time. A typical batch size is 20 for extraction or organic compounds.

Benthic - (#1) that portion of the marine environment inhabited by organisms that live permanently in or on the bottom.

Between-laboratory precision - (#13) this refers to the variability between results obtained on the same material in different laboratories. The "Between-laboratory" variability is sometimes called "reproducibility".

Bias - (#11) the degree of difference of the average measured value from the assumed or accepted true value. It may also be referred to as systematic error.

Bias - (#13) a system displacement of all the observations on a sample from the true or accepted value; or a systematic and constant *error* in test results.

Bias - (#31) a systematic error which is the difference between a population mean of measurements or test results and an accepted reference value.

Bioaccumulation - (#1) the accumulation of chemical substances in the tissues of organisms.

Biomass - (#1) the weight of living material in all or part of an organism, population, or community. Commonly expressed as weight per unit area, a biomass density.

Blanc-corrected - (#1) the concentration of an analyte adjusted for the concentration of that analyte in the blank.

Blank - (#17) a sample of distilled water.

Blank - (#62) matrices that have negligible or unmeasurable amounts of the substance of interest.

Blind replicates - (#13) analysis conducted on specified control samples where the expected values are unknown to the analyst.

Bow wake - (#1) the pressure wave that forms below a solid object as it is lowered through the water column.

Bridle - (#1) the line that links each otter board with the hydrowire.

Calibration - (#1) the systematic standardization of the graduations of the quantitative measuring instrument.

Calibration - (#13) comparison of a measurement standard or instrument with another standard or instrument in order to report or eliminate by adjustment, any variation (deviation) in the accuracy of the item being compared.

Calibration - (#31) calibration is the process for determining the correctness of the assigned values of the physical standards of the scales of the measuring instruments. The term standardization is used more frequently to describe the determination of the response function of analytical instruments.

Carryover - (#1) contamination arising from previous analysis or extraction of a standard or highly contaminated sample.

Chain-of-custody - (#1) the procedures and forms used to trace and record environmental samples through all stages of collection, shipping, analysis, and final disposition.

Chelation - (#1) the addition of organic complexing agents, such as EDTA (ethylenediaminetetraacetic acid) that preferentially bind with metals, thereby reducing the exposure and possible toxicity to organisms (e.g., bacteria).

Chief scientist - (#1) the person in charge of the sampling team on a research vessel.

Chronic - (#20) means occurring during a relatively long period of exposure, usually a significant portion of the life span of the organism such as 10% or more.

Chronic toxicity - (#20) implies long-term effects that are related to changes in such things as: metabolism, growth, reproduction, or ability to survive.

Chronic value - (#20) is the geometric mean of the NOEC and LOEC in tests which have a chronic exposure. See also *TEC* as a recommended term.

Clean up - (#1) the removal of co-extracted compounds that may cause interference from a sample extract.

Cod end - (#1) the mesh bag at the back of an otter trawl in which the catch is collected. It is often of smaller mesh size than the remainder of the net.

Coefficient of variation - (#1) the standard deviation expressed as a percentage of the mean.

Coefficient of variation - (#11) the standard deviation of a set of data expressed as a percentage of the mean value.

Co-extractive - (#1) materials other than analytes of interest that are extracted along with the analytes. These can be sources of interference.

Compliance - (#20) means in accordance with governmental permitting or regulatory requirements.

Composite sample - (#1) a sample composed of two or more grab samples or increments.

Composite sample - (#17) a sample obtained by mixing several discrete samples, or representative portions thereof, into one bottle (see flow proportional and sequential composite-samples).

Confidence limit (interval) - (#13) that range of values, calculated from an estimate of the mean and the standard deviation, which is expected to include the population mean with a stated level of confidence. Confidence limits in the same context may also be calculated for standard deviations, lines, slopes and points.

Contamination - (#17) a foreign or unwanted material which renders a sample unfit for meaningful analyses.

Contingency plans - (#1) procedures to be followed when those that were planned originally cannot be carried out.

Control - (#20) is a treatment in an investigation or study that duplicates all the conditions and factors that might affect the results of the investigation, except the specific condition that is being studied. In an aquatic toxicity test, the control must duplicate all the conditions of the exposure treatment(s), but must contain no test material. The control is used to determine the absence of measurable toxicity due to basic test conditions (e.g., quality of the dilution water, health or handling of test organisms).

Control/dilution water - (#20) means the water used for diluting the test material, or for the control test, or both.

Copenhagen seawater - (#1) seawater of known chlorinity, an international standard for salinity determinations.

Corrective action - (#1) measures taken to remove, adjust, remedy, or counteract a malfunction or error so that a standard or required condition is met.

Cross-contamination - (#1) contamination of a sample or sample extract from exposure to another sample or sample extract, usually of higher concentration.

Data quality objectives - (#13) those desired outcomes in which the collected data are accompanied with the best achievable and optimum data quality parameters such as precision, accuracy, data completeness and confidence limit values that can be extracted from the monitoring system.

Degrees of freedom - (#13) the number of elements or variables in a data set that can vary *freely* or independently is called the "Degree of Freedom". Mathematically, if there are n

elements in the data set and $n-k$ elements can vary independently (where k estimates have been made), then the number of degrees of freedom is given by $n-k$.

Demersal - (#1) living on or near the bottom of the sea.

Depth-integrated sample - (#17) a sample which represents the water-suspended sediment mixture throughout the water column so that the contribution to the sample from each point is proportional to the stream velocity at that point.

Desiccation - (#1) the thorough drying of a sample by removal of moisture.

Design value - (#13) the value (quantity) of a water quality variable that has been obtained by careful and accurate analysis and re-analysis by the initiating laboratory in the interlaboratory QA process.

Detection limit - (#1) the smallest concentration of some component of interest that can be measured by a single measurement with a stated level of confidence.

Detection limit - (#11) the smallest concentration or amount of a substance which can be reported as present with a specified degree of certainty by a definite, complete analytical procedure.

Detection limit - (#17) the smallest concentration of a substance which can be reported as present with a specified degree of precision and accuracy by a specific analytical method.

Deterioration - (#17) a decline in the quality of a sample over a period of time due to improper preservation techniques.

Digestion - (#1) in preparing samples for analysis of metals, an acidic solution added to break organometallic bonds, freeing the metals for analysis by atomic absorption or atomic emission spectrophotometry.

Dilution water - (#20) is the water used to dilute a test material in order to prepare different concentrations for the various toxicity test treatments.

Dissolved oxygen (DO) - (#17) is the amount of oxygen dissolved in a given volume of water.

Distillation - (#1) the vaporization of a liquid mixture with subsequent collection of components by differential cooling to condensation.

Duplicate analysis - (#1) a second analysis made on the same (or identical) sample of material to assist in the evaluation of measurement variance.

Duplicate samples - (#17) obtained by dividing one sample into two or more identical sub-

samples.

Effluent - (#1) something that flows out, for example, the liquid material discharged by sewage treatment plants.

Effluent - (#20) is any liquid waste (e.g., industrial, municipal) discharged to the aquatic environment.

Elutriate - (#20) is an aqueous solution obtained after adding water to a solid material (e.g., sediment, tailings, drilling mud, dredge spoil), shaking the mixture, then centrifuging or filtering it or decanting the supernatant.

Electrolyte - (#1) a substance that dissociates into ions in solution or when fused, thereby becoming electrically conducting.

Emulsion - (#1) a suspension of small globules of one liquid in a second liquid with which the first will not mix.

Endpoint - (#20) means the variable (i.e., time, reaction of the organisms, etc.) that indicate the termination of a test, and also means the measurement(s) or value(s) derived, that characterize the results of the test (NOEC, IC₅₀, etc.).

Epibenthic - (#1) residing primarily on the sediment surface.

Equilibrium - (#1) the state of a reaction in which its forward and reverse reactions occur at equal rates so that the concentration of the reactants does not change with time.

Extraction - (#1) a method of separation in which a solid or solution is contacted with a liquid solvent to transfer one or more component(s) into the solvent.

False positive - (#1) a positive measurement of an analyte not attributable to the sample.

Field blank - (#1) an empty container or uncontaminated representative matrix carried through the field routine in the same manner as a sample.

Filter blank - (#1) an unused filter extracted and analyzed in the same manner as filters used to collect samples. The filter should be prepared in the same manner as sample filters.

Fixation - (#1) the process of putting something into a stable or unalterable form.

Flow proportional composite sampling - (#17) is obtained by (1) continuous pumping at a rate proportional to the flow; (2) mixing equal volumes of water collected at time intervals which are inversely proportional to the volume of flow; (3) mixing volumes of water proportional to the flow collected during or at regular time intervals. This sample will indicate a "flow" average water quality condition over the period of time of compositing.

Flow through - (#20) describes tests in which solutions in test vessels are renewed

continuously by the constant inflow of a fresh solution, or by a frequent intermittent inflow.

Footrope - (#1) the line that forms the front edge of the bottom of an otter trawl. Weight is often added to it to keep it on the bottom when being towed.

Formalin - (#1) a trademark for a 37 percent by weight aqueous solution of formaldehyde with some methanol.

Formazin - (#1) a polymer used as a reference standard suspension for turbidity measurements.

Grab sample - (#1) (a) see increment, or (b) a sample of bottom sediment collected by a grab sampler.

Gravimetric - (#1) of or pertaining to measurement by weight.

Headrope - (#1) the line that forms the front edge of the top of an otter trawl. Floats are attached to it to hold the net open when being towed.

Headspace - (#1) the airspace between a collected sample and the container lid.

Heavy metals - (#17) metallic elements with specific gravities greater than 5, such as cadmium, copper, lead and zinc.

Hydrowire - (#1) the cable used to deploy equipment over the side of a vessel. It usually is attached to a winch at one end and to the piece of equipment at the other end.

Hygroscopic - (#1) readily absorbing moisture, as from the atmosphere.

ICp - (#20) is the inhibiting concentration for a (specified) percentage effect. It represents a point estimate of the concentration of test material that causes a designated percentage impairment in a quantitative biological function such as growth of fish. For example, an IC25 could be the concentration estimated to cause a 25% reduction in growth of larval fish, relative to the control. This term should be used for any toxicological test which measures a change in rate, such as reproduction, growth, or respiration. (The term EC₅₀ or median effective concentration is limited to quantal measurements, i.e., number of individuals which show a particular effect.)

Increment - (#1) an individual portion of material collected by a single operation of a sampling device, from parts of a lot separated in time or space. Increments may be either tested individually or combined (composited) and tested as a unit.

In situ - (#1) in something's original place.

In situ measurements - (#17) measurements made directly in the water body.

Interelement correction factor - (#1) a number that adjusts the analyte signal for the interfering effects of other elements present in a sample undergoing ICP analysis (usually done automatically by the instrument itself).

Interference - (#1) a substance present in the sample that impedes the accurate measurement of an analyte of interest.

Interference check sample - (#1) a solution contaminating both interfering and analyte elements of known concentration that can be used to verify background and interelement correction factors in ICP analysis.

Interlaboratory - between laboratory, e.g., referring to the procedure of comparing results obtained from the same material in different laboratories, or determining between-laboratory precision.

Intralaboratory - pertaining to within laboratory activities.

In vivo - (#1) within the living organism.

Isobath - (#1) a contour of constant depth.

LC₅₀ - (#20) is the median lethal concentration, i.e., the concentration of material in water that is estimated to be lethal to 50% of the test organisms. The LC₅₀ and its 95% confidence limits are usually derived by statistical analysis of mortalities in several test concentrations, after a fixed period of exposure. The duration of exposure must be specified (e.g., 7-d LC₅₀).

Leachate - (#20) is water or wastewater that has percolated through a column of soil or solid waste within the environment.

Lethal - (#20) means causing death by direct action. Death of fish is defined as the cessation of all visible signs of movement or other activity.

Limit of Detection (LOD) - (#31) the LOD is the lowest concentration level that can be detected to be statistically different from a blank.

Limit of Quantitation (LOQ) - (#31) the LOQ is the level above which quantitative results may be obtained with a specified degree of confidence.

LOEC - (#20) is the lowest-observed-effect concentration. This is the lowest concentration of a test material to which organisms are exposed, that causes adverse effects on the organism, effect which are detected by the observer and are statistically significant. For example, the LOEC might be the lowest concentration at which growth of fish differed significantly from that in the control. LOEC is generally reserved for sublethal effects but can also be used for mortality, which might sometimes be the most sensitive effect observed.

LT₅₀ - (#20) is the time (period of exposure) estimated to cause 50% mortality in a group of fish held in a particular test solution. The value is estimated graphically since there is no standard mathematical or computer technique in common use.

LRTAP - (#13) this designation stands for Long Range Transport of Airborne Pollutants and is associated with the program that analyzes unpreserved "soft waters" for up to 23 constituents (major ions, nutrients and physical parameters).

LRTAPP - (#13) a similar program to LRTAP but relates to the studies involving plant materials for nutrients and metals. These studies are provided through the Great Lakes Forestry Centre which is located at Sault Sainte Marie, Ontario, Canada.

Macroinvertebrate - (#1) an invertebrate retained by a sieve having a mesh size of 1 mm.

Matrix spike compound - (#1) a known amount of an analyte added to a sample, usually prior to extraction or digestion.

Mean error - (#11) the difference between the average value of a series of test results and the true value.

Method blank - (#1) the contamination by the analyte from all sources external to the sample. The blank value is determined by proceeding through all phases of extraction and analysis with no addition of sample.

Minimum significant difference (MSD) - (#20) means the difference between groups (in this test with fathead minnows, the difference in average weights or average mortality) that would have to exist before it could be concluded that there was a significant difference between the groups. MSD is provided by Dunnett's multiple-range test, a standard statistical procedure.

Monitoring - (#20) is the routine (e.g., daily, weekly, monthly, quarterly) checking of quality, or collection and reporting of information. In the context of this report, it means either the periodic (routine) checking and measurement of certain biological or water-quality variables, or the collection and testing of samples of effluent, elutriate, leachate, or receiving water for toxicity.

NBS - (#1) National Bureau of Standards.

NOEC - (#20) is the no-observed-effect concentration. This is the highest concentration of a test material to which organisms are exposed, that does not cause any observed and statistically significant adverse effects on the organism. For example, the NOEC might be the highest test concentration at which an observed variable such as growth did not differ significantly from growth in the control. NOEC customarily refers to sublethal effects, and to the most sensitive effect unless otherwise specified.

Noise - (#11) an extraneous electronic signal which affects base-line stability.

Offshore - (#1) in this document, refers to all aspects of the receiving environment for effluents (i.e., water, sediment, and organism).

Otter board - (#1) a flat board that is attached to each side of the front end of an otter trawl. Its planing action when being towed holds the mouth of the net open.

Oxidation - (#1) an increase in positive valence or a decrease in negative valence by the loss of electrons.

Penetration depth - (#1) the maximum depth below the sediment surface that a grab sampler achieved during a single cast.

Performance sample - (#1) a sample or solution with known concentrations of analytes of interest, submitted to a laboratory for the purpose of evaluating the performance of that laboratory.

Phi value - (#1) a measure of particle size commonly used by geologists. A phi value is equal to the negative logarithm (base 2) of the diameter of a particle expressed in millimetres.

Point waste source - (#17) any discernible, confined and discrete conveyance such as any pipe, ditch, channel, tunnel or conduit from which pollutants are discharged.

Population - (#1) a general term denoting any finite or infinite collection of individual things, objects, or events; in the broadest concept, an aggregate determined by some property that distinguishes things that do and do not belong.

PPWB - (#13) this designation refers to the Prairie Provinces Water Board. The PPWB QA program involves laboratories in Alberta, Saskatchewan and Manitoba. The program runs concurrently with the Federal-Provincial QA program (now Inter Regional QA program) and is similar in design.

Precision - (#1) the degree of mutual agreement characteristic of independent measurements as the result of repeated application of the process under specified conditions.

Precision - (#11) this denotes the agreement between the numerical values of two or more measurements that have been made under the same conditions. The term is used to describe the reproducibility of the measurement or method.

Precision - (#17) denotes the agreement between the numerical values of two or more measurements on the same homogeneous sample made under the same conditions. The term is used to describe the reproducibility of the measurement or method. It can be expressed by the standard deviation.

Precision - (#31) agreement between individual measurements or test results. Statistically the concept is referred to as dispersion or imprecision.

Preservation - (#1) maintenance in an unaltered form.

Preservation - (#17) a substance added to the sample in order to maintain given component(s) in a particular state, e.g., dissolved metals in solution.

Preventive maintenance - (#1) procedures conducted routinely to ensure that equipment continues to operate properly.

Primary standard - (#1) a substance or artifact, the value of which can be accepted (within specific limits) without question when used to establish the value of the same or related property or another material.

Priority pollutant - (#1) those toxic pollutants defined by the U.S. EPA in 1976 that are the primary subject of regulation of the Clean Water Act. A list of these substances can be found in the Code of Federal Regulations Vol. 40, Section 401.15.

Procedure - (#31) written directions necessary to use a method.

Procedures - (#13) systematic instructions for using a method of measurement or a method of sampling, or the steps or operations associated with such.

Protocol - #31 a set of definitive directions that must be followed, without exception, if the analytical results are to be accepted for a given purpose.

Purge - (#1) the removal of volatile organic compounds from the sample matrix for analysis.

Quality - (#1) an estimation of acceptability or suitability for a given purpose of an object, item, tangible, or intangible thing.

Quality assessment - (#1) the overall system of activities whose purpose is to provide assurance that the quality control activities are being done effectively. It involves a continuing evaluation of performance of the production system and the quality of the products produced.

Quality assessment - (#13) the overall system of activities whose purpose is to provide assurance that the quality control activities are being carried out effectively. It involves a continuing evaluation of performance of the data producing systems and the quality of the data produced.

Quality assessment - (#31) the mechanism to verify that a system is operating within acceptable limits.

Quality assurance - (#1) a system of activities to provide to the producer or user of a product or a service the assurance that it meets defined standards of quality.

Quality assurance - (#1) a system of activities to provide to the producer or user of a product or a service the assurance that it meets defined standards of quality.

Quality assurance - (#13) relates to a system of activities whose purpose is to provide to the producer or user of a product (e.g., data) or a service, the assurance that the product (service) meets defined standards of quality. It consists of two separate but related activities, quality control and quality assessment. The quality assurance process includes documentation of procedures, identification of critical points within the data collection activities which require monitoring by quality control procedures, the level of quality achieved, problems encountered, and corrective actions undertaken.

Quality control - (#1) the overall system of activities whose purpose is to control the quality of a product or service so that it meets the needs of users. The aim is to provide equality that is satisfactory, adequate, dependable, and economic.

Quality control - (#13) the overall system of activities whose purpose is to control the quality of a product (e.g., data) or service so that it meets the needs of users. The aim is to provide quality that is satisfactory, adequate, dependable, and economic.

Quality control - (#31) the mechanism established to control errors in a measurement.

Quantification - (#1) the determination or expression of the number or amount of something.

Random error - (#13) errors due to chance or uncontrollable situations are called random or indeterminate errors. Examples of such errors are variation in reagent addition, instrument response, and inadvertent contamination of sample or sampleware. Fortunately, indeterminate variations conform to the laws of chance; therefore, statistical measures of precision can be used to quantify them.

Range - (#11) the difference between the lowest and highest values in a set of data.

Range - (#17) the difference between the lowest and highest values in a set of data.

Reagent - (#1) a solvent or other chemical used during sample preparation or analysis.

Recover (percent) - (#11) a measure of the ratio, expressed as a percentage, of the amount of the determinant found to the true amount known to be present in the sample. This gives an indication of the presence or absence of interfering substances in a sample.

Recovery - (#1) the amount of an analyte detected relative to the amount added (e.g., spike) or known to be present (e.g., standard reference material). Usually expressed as a percentage.

Receiving water - (#20) is surface water (e.g., in a stream, river, or lake) that has received a discharge waste, or else is about to receive such a waste (e.g., it is just upstream from the discharge point). Further descriptive information must be provided to indicate which meaning is intended.

Reduction - (#1) a decrease in positive valence by the loss of electrons or an increase in negative valence by the gain of electrons.

Reference area - (#1) a station or group of stations with which potentially impacted stations are compared to determine the degree of impact. Ideally, the reference area represents unaltered background conditions.

Reference collection - (#1) a group of preserved organisms of known and verified taxonomic identity that is used as the standard for comparison for future taxonomic identifications.

Reference toxicant - (#20) is a standard chemical used to measure the sensitivity of the test fish in order to establish confidence in the toxicity data obtained for a test material. In most instances, a toxicity test with a reference toxicant is performed to assess the sensitivity of the organisms at the time the test material is evaluated, and the precision of results obtained by the laboratory for that chemical.

Relative error - (#11) the mean error expressed as a percentage of the true value.

Relative percent difference - (#1) difference of two measurements x_1 and x_2 , divided by the mean of the measurements, multiplied by 100.

Relaxation - (#1) reduction of muscular or nervous tension.

Replicate - (#1) a counterpart of another, usually referring to an analytical sample or a measurement. It is the general case for which duplicate is the special case consisting of two samples or measurements.

Replicate sample (spatial) - (#17) two or more samples taken simultaneously in a given cross-section of the water body under study. They are used for measuring the cross-sectional variations in the water quality parameters.

Replicate sample (temporal) - (#17) two or more samples taken at the same place sequentially at specified intervals over a specific period of time. They are used to determine the uncertainty in various water quality parameters due to temporal variations.

Representative sample - (#17) a sample of a universe or population whose composition is expected to exhibit their average properties.

Reproducibility - (#1) the ability to produce the same results for a measurement. Often measured by calculation of relative percent difference or coefficient of variation.

Resection - (#1) the surgical removal of part of an organ or structure.

Sample - (#1) a portion of a population or lot. It may consist of an individual or groups of individuals. It may refer to objects, materials, or to measurements, conceivable as part of a larger group that could have been considered.

Sample integrity - (#1) the unaltered composition of a sample.

Sample matrix - (#1) the material in which the analytes of interest are found (e.g., water, sediment, tissue).

Sample tracking - (#1) monitoring the course of samples through all phases of laboratory analysis.

Scope - (#1) the length of hydrowire used when towing an otter trawl.

Secondary standard - (#1) a standard whose value is based upon comparison with some primary standard.

Seed - (#1) a population of microbiological organisms added to a sample for BOD analysis because the sample does not contain a microbial population sufficient for the needs of the analysis.

Sensitivity - (#1) capability of methodology or instrumentation to discriminate between samples having differing concentrations of an analyte.

Sensitivity - (#13) the ability of an analytical method to detect small quantities of the measured component (it has no numerical value). Alternatively, sensitivity can be regarded as the change in measured value resulting from a concentration change of one unit.

Sensitivity - (#31) the ratio of change in the instrument response to the change in analyte concentration.

Sequential composite sample - (#17) a sample obtained either by continuous, constant pumping of water or by mixing equal volumes of water collected at regular time intervals. This sample will indicate an average water quality condition over the period of time of compositing.

Significant figure - (#1) a figure(s) that remains to a number or decimal after the ciphers to the right or left are cancelled.

Sort - (#1) to separate benthic organisms from the inorganic and plant material that are collected in sieved grab samples.

Spike - (#1) the addition of a known amount of an analyte or internal standard to a sample.

Split - (#1) a replicate portion or sub-sample of a total sample obtained in such a manner that it is not believed to differ significantly from other portions of the same sample.

Split sample - (#17) a single sample separated into two or more parts such that each part is representative of the original sample.

Standard - (#1) a substance or material, the properties of which are believed to be known with sufficient accuracy to permit its use to evaluate the same property of another. In chemical measurements, it often describes a solution of substance, commonly prepared by the analyst, to establish a calibration curve or the analytical response function of an instrument.

Standard deviation - (#11) a measure of the dispersion or spread of data points around the mean value of the data set obtained by repetitive testing of a homogeneous sample under specified conditions.

Standard deviation - (#17) a measure of the dispersion or spread of data points around the mean value of the data set obtained by repetitive testing of a homogeneous sample under specified conditions.

Standardization - (#13) the process whereby the value of a potential standard is fixed by measurement with respect to a standard of known value.

Standard reference material - (#1) a material or substance one or more properties of which are sufficiently well established to be used for the assessment of a method or the calibration of an apparatus.

Sterilization - (#1) removal of all bacteria and other microorganisms from an object.

Subsample - (#1) a portion taken from a sample. A laboratory sample may be a subsample of a field sample. Similarly, a test portion may be a subsample of a laboratory sample.

Surrogate spike compound - (#1) a known amount of a compound, with characteristics similar to that of an analyte, added to a sample prior to extraction. This compound can be used to estimate recovery of analytes of interest. Also called "recovery internal standard".

Systematic error - (#13) a systematic error is one which contributes a constant error or bias to results. Such an error is often called determinate or assignable.

Tare - (#1) the weight of a container or wrapper that is deducted from the gross weight to obtain net weight.

Taxon - (#1) a group of organisms constituting one of the categories or formal units in taxonomic classification, such as phylum, class, order, family, genus, or species.

Taxonomy - (#1) the theory, principles, and process of classifying organisms in established categories.

TEC - (#20) is the threshold-effect concentration. It is calculated as the geometric mean of NOEC and LOEC. *Chronic value* or *subchronic value* are alternative terms that might be appropriate depending on the duration of exposure in the test.

TFE - (#1) a plastic tetrafluoroethylene polymer composed of very long chains of CF_2 units. Commonly known by the trade name Teflon.

Titration - (#1) the process or method of determining the concentration of a substance in solution by adding to it a standard reagent of known concentration in carefully measured amounts until a reaction of definite and known proportion is completed, as shown by a colour change or by electrical measurement, and then calculating the unknown concentration.

Trace - (#1) very small quantity of analyte in the sample.

True particle size distribution - (#1) distribution comprised only of inorganic particles after organic material is oxidized completely.

Volatile organic compounds - (#1) organic compounds with high vapour pressures. In this document it refers to the 29 U.S. EPA priority pollutants considered as volatiles (e.g., benzene).

Water quality criteria - (#17) scientific information, e.g., concentration-effect data, used to recommend water quality objectives.

Water quality objective - (#17) a concentration or a narrative statement describing the water body, which, when met, will protect the uses of the water.

Water quality standard - (#17) the concentration of a constituent or a narrative statement describing the water body established under statutory authority, e.g., legally enforceable.

Water quality variables - (#13) "Water Quality Variables" are those specific entities or substances which are found and tested in water from various sources (rivers, lakes, streams, ponds, etc.). The substances or entities may be chemical, physical or biological.

Winnow - (#1) to separate different constituents of a substance by means of a current of air or water.

Within laboratory precision - (#13) this refers to the variability between replicate results obtained on the same material within a single laboratory. The "Within Laboratory Variability" is sometimes referred to as "repeatability".

ZID - (#1) zone of initial dilution for an effluent discharged into the environment.

APPENDIX F

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Provost, L.P. and R.S. Elder. 1985. Choosing cost-effective QA/QC programs for chemical analysis. U.S. Environmental Protection Agency, Environmental Monitoring Series. EPA/600/4-85-056.

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Contact: Richard Scroggins

Environment Canada's Laboratory Methods Manual, Volume 1 - Inorganic/non metals; Volume 2 - Metals; Volume 3 - Organics.

Expected date of completion: ?

Contact: Hag Agemian (Burlington) 1-416-336-4679

Genest-Conway, Beverly. 1987. Guidelines for a Quality Assurance/Quality Control Program for the NWT Water Quality Monitoring Activities of Indian and Northern Affairs Canada.

SOURCE:

STATUS: Document not retrieved - ordered by SA.

Guidelines for wastewater characterization in the Fraser River Basin. - deals with effluent only.

Contact: Lisa Walls (604) 666-3487

APPENDIX G

DATABASE LITERATURE SEARCH

The following CDROM databases were searched at the listed locations:

<u>CDROM Database (Version)</u>	<u>Location</u>	<u>Description</u>
AQUAREF References, (Dec '92)	IOS (Institute of Ocean Sciences, DFO) exclusively.	Also called Canadian Water Resources contains >82,000 citations, Canadian coverage
ASFA - Aquatic Sciences and Fisheries Abstracts	IOS	Published by United Nations Food and Agriculture Organization (FAO). Contains >363,000 citations - worldwide coverage.
WAVES (Dec '92)	IOS	Catalogues of Fisheries & Oceans Libraries Canada. Contains >80,000 citations. Also indexes publications from scientific organizations in UK, Australia (CSIRO), Denmark (ICES), North Atlantic (NAFO) and US (WHOI - Woods Hole).
NTIS - U.S. National Technical Information Service	Royal Roads	Published by NTIS, contains >1.5 million citations, primary focus is U.S. Govern. agencies' reports.

The following search DESCRIPTORS or Key Words were used on each database search:

QUALITY ASSURANCE
 QA/QC
 QUALITY CONTROL
 FIELD SAMPLING
 DESIGN
 MANUAL
 EPS
 EPA
 QUALITY ASSESSMENT
 ENVIRONMENTAL
 WATER SAMPLING

Combinations of the above DESCRIPTORS were often used to limit the resulting number of kits. For example, a search of the ASFA database for Quality Control alone yielded 2,492 hits. When combined with Quality Assurance, this search yielded 92 hits. The titles of these were then scanned and the abstracts read if the title indicated relevant material in the article.