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**SUMMARY REPORT FOR UGLCC INTERLABORATORY
STUDIES ON THE ANALYSIS OF ORGANOCHLORINES
IN WATER AND STANDARD SOLUTIONS**

by

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and the Data Quality Management Work
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MANAGEMENT PERSPECTIVE

The Upper Great Lakes Connecting Channels (UGLCC) have been designated as "Areas of Concern" by the International Joint Commission. A Canada-U.S. binational study (UGLCCS) involving the identification and assessment of the environmental impacts of toxic substances in those areas was initiated in late 1985. In order to assist contributing analytical laboratories, to generate reliable and accurate data during the study, a Data Quality Management Work Group was formed and 13 interlaboratory performance evaluation studies were initiated.

Final reports for the 13 interlaboratory studies have been completed. This report presents a summary of interlaboratory studies QM-1 and QM-8 on the analysis of organochlorines in water and standard solutions contained in ampules. The information contained in this report will assist project leaders, managers and users of UGLCC data in evaluating the performance of participating laboratories.

Dr. J. Lawrence
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PERSPECTIVE DE GESTION

Les chenaux reliant les Grands Lacs d'amont ont été classés parmi les "zones suscitant des préoccupations" par la Commission mixte internationale. À la fin de 1985, le Canada et les États-Unis ont amorcé une étude conjointe visant à identifier et à évaluer les effets des substances toxiques sur l'environnement dans ces zones. On a créé un groupe de travail sur la gestion de la qualité des données et on a commencé treize évaluations du rendement interlaboratoire afin d'aider les laboratoires analytiques touchés à fournir des renseignements précis et fiables au cours de l'étude.

Les rapports finals des treize études interlaboratoires sont terminés. Le présent rapport résume les études interlaboratoires QM-1 et QM-8 portant sur l'analyse des composés organochlorés dans l'eau et dans des solutions étalons conservées dans des ampoules. Les données de ce rapport aideront les chefs de projet, les gestionnaires et les utilisateurs des données relatives aux chenaux reliant les Grands Lacs d'amont à évaluer le rendement des laboratoires touchés.

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ABSTRACT

In the early planning stages of the Upper Great Lakes Connecting Channels (UGLCC) Study, it was recognized that quality assurance/quality control (QA/QC) aspects would be crucial to the overall usefulness of the study results. In order to address this matter, a Data Quality Management Work Group was established and thirteen interlaboratory performance evaluation (PE) studies for inorganic and organic parameters were designed and conducted during the duration of the UGLCC study (1985 - 1987).

Final reports for the 13 interlaboratory studies have been completed. Results from interlaboratory PE studies nos. QM-1 and QM-8 on the analysis of organochlorines in water and standard solutions contained in ampules are now integrated into this report. Other reports will respectively deal with each class of parameters. The information contained in this report will assist project leaders, managers and users of UGLCCS data in evaluating the performance of participating laboratories.

RÉSUMÉ

Dès les premières étapes de la planification de la Upper Great Lakes Connection Channels (UGLCC) Study (étude sur les chenaux reliant les Grands Lacs d'amont), on a reconnu que le contrôle et l'assurance de la qualité seraient cruciales à l'utilité générale des résultats de l'étude. Par conséquent, on a créé un groupe de travail sur la gestion de la qualité des données et on a planifié et réalisé, parallèlement à la UGLCC Study, treize évaluations du rendement interlaboratoire en ce qui a trait aux paramètres inorganiques et organiques (1985-1987).

Les rapports finals des treize études interlaboratoires sont terminés. Les résultats des études de rendement interlaboratoire QM-1 et QM-8 visant l'analyse des composés organochlorés dans l'eau et dans des solutions étalons conservés dans des ampoules ont été intégrés à ce rapport. Chaque catégorie de paramètres fera également l'objet d'un rapport distinct. Les renseignements fournis dans ce document aideront les chefs de projet, les gestionnaires et les utilisateurs des données sur la UGLCC Study à évaluer le rendement des laboratoires touchés.

1.0 INTRODUCTION

The Upper Great Lakes Connecting Channels Study (UGLCCS) was established to identify and deal with environmental problems associated with the St. Mary's, St. Clair and Detroit Rivers and Lake St. Clair. This three-year binational study was started in late 1985 and involved Canadian and U.S. environmental and resource agencies.

In the early planning stages of the study, it was recognized that quality assurance/quality control (QA/QC) aspects would be crucial to the overall usefulness of the study results. In order to address this matter, a Data Quality Management Work Group (see Appendix I-A) was established and thirteen interlaboratory performance evaluation studies were conducted.

Thirteen individual final reports on the interlaboratory studies have been completed, as listed in Appendix I-B. This report is a summary of the interlaboratory studies (nos. QM-1 and QM-8) for organochlorines in water and standard solutions contained in ampules. The data accuracy and precision for individual laboratories are discussed as well as data addressing between-laboratory comparability drawn from various studies.

2.0 STUDY DESIGN

At the outset, the Data Quality Management Work Group considered that control of standardss and the calibration process (1) were the two most serious sources of variation in results between different laboratories. Therefore, a series of check standards covering all of the UGLCCS parameters for which check standards were available was distributedd to laboratories participating in the study.

Table 2.1 provides a listing of the samples distributed for these interlaboratory studies and the constituents to be analyzed covering 36 inorganic and 50 organic parameters. The

participants in these studies included different governmental and private laboratories in both Canada and the U.S., and are enumerated in Table 2.2. The schedule of the QC studies are listed in Table 2.3.

Each study consisted of between four and eight samples which contained either standard solutions in ampules, surrogate spikes for waters, or a limited number of natural reference materials. Test compounds were of fixed concentration for each sample, but levels were made to vary between studies and samples by as much as two orders of magnitude. Most samples were sent out with blind duplicates, so that reproducibility could be assessed. All samples were well-characterized and their stability was verified in advance. Sample stability was also assessed by re-using samples in various studies. This approach has been successfully employed in IJC and LRTAP interlaboratory studies (2,3).

These studies were designed and conducted under the direction of the QA Team of the Research and Applications Branch at the National Water Research Institute in Burlington.

3.0 DATA EVALUATION

In the past, a technique known as Youden ranking (4) was employed to determine bias in a laboratory's results. However, because of the small number of laboratories which provided data, this technique could not be used. As an alternative, each laboratory's result for a particular parameter and a given sample was treated as a 'recovery' and the design value for that parameter and sample was taken as the true value. Percent recoveries for each sample and parameter combination were then calculated and compared to value ranges in the table listed below.

<u>Average or Individual % Recovery</u>	<u>Individual Result Designation (Flag)</u>	<u>Multiple Result Designation (Bias)</u>
≥ 150	Very high (VH)	Very High (VH)
149 - 125	High (H)	High (H)
124 - 76	Satisfactory (S)	Satisfactory (S)
75 - 51	Low (L)	Low (L)
≤ 50	Very low (VL)	Very Low (VL)

In addition to the flagging of individual sample results, bias was also evaluated as an average for all results in a study with the same parameter (i.e. regardless of sample concentration or matrix). The same designation scheme was used as with individual test results (see above).

Appendix II contains a summary of each laboratory's appraisal for flags and bias in various studies.

In these laboratory comparison studies, medians rather than means were preferred for evaluating accuracy of interlaboratory results where there were relatively few data and the means were strongly influenced by outliers. For evaluating precision of interlaboratory results, means and standard deviations were calculated with outliers removed by using Grubb's test (3). The standard deviation (σ) and relative standard deviation (RSD) were calculated as follows:

$$\sigma = \sqrt{(x_i - \bar{x})^2 / n - 1} \quad \text{and} \quad \text{RSD, \%} = \sigma / \bar{x} \times 100$$

where x_i = individual result, \bar{x} = mean,
and n = number of individual results

4.0 RESULTS AND DISCUSSION

4.1 Interlaboratory Comparability

Two studies contained samples which were used for

organochlorines (OC) analysis: QM-1 (January 24, 1986) and QM-8 (March 27, 1986). The participants in these studies are listed in Table 4.1.1. Standard solutions contained in ampules were used as OC samples in both study QM-1 and study QM-8; additional spiked water samples were used only in study QM-8.

Both studies also included sample duplicates which were used to assess reproducibility within the same laboratory. Appendix III provides a summary of within-lab precision for the analysis of organochlorines in various studies.

For tracibility of interlaboratory studies, several samples were used in both QM-1 and QM-8. Samples 105/108 in QM-1 and samples 801/802 in QM-8 were one group of identical samples which contained a mixture of 7 OC parameters. Samples 106/107 in QM-1 and samples 803/804 in QM-8 were another group of identical samples which contained a mixture of 5 OC parameters. Summaries of the design values and interlaboratory medians for these two groups are given in Tables 4.1.2a and 4.1.2b. Figures 4.1.1a and 4.1.1b show percent recoveries of interlaboratory medians for OC parameters in these two groups of identical samples. As can be seen from the above figures, the agreement of interlaboratory medians for these identical samples was excellent and the percent recoveries of interlaboratory medians were within $\pm 25\%$ of the design values for all OC parameters except for p,p'-DDD (sample 108 in QM-1).

Range and average values of interlaboratory medians of all samples for all OC parameters in various studies are summarized in Table 4.1.3. Figure 4.1.2 presents condensed results of average recoveries of interlaboratory medians for all samples in various studies. As can be seen from this figure, the interlaboratory results were comparable and satisfactory for all OC parameters in ampules in both QM-1 and QM-8 studies. Furthermore, as compared with the design values, interlaboratory results in QM-8 were more accurate than those in QM-1 for most OC parameters. It suggests that overall performance of participating

laboratories has been improved.

The average recoveries of OCs in spiked water samples (QM-8) were less accurate than those for samples in ampule (QM-1 and QM-8). However, the interlaboratory results for all OCs with the exception of hexachlorobenzene (HCB) in QM-8 were still within $\pm 25\%$ of the design values.

Data on the precision of interlaboratory results for OCs in various studies are summarized in Table 4.1.4. Figure 4.1.3 shows graphically average RSDs for all OC parameters in various studies. Average RSDs for most OCs from samples in ampules were $\leq 25\%$ except HCB in QM-1 and QM-8 and p,p'-DDD in QM-8 were more than $\pm 25\%$. The precision of interlaboratory results for spiked water samples in QM-8 was worse than samples in ampules. Nine out of 12 OCs in spiked waters were with average RSDs more than $\pm 25\%$ and only three parameters (dieldrin, α -chlordane and γ -chlordane) were with average RSDs less than $\pm 25\%$. The larger variations observed with the interlaboratory results obtained with spiked water samples were as expected considering the additional preparation steps these samples require for extraction, concentration and cleanup.

4.2 Comparison of Laboratory Performance in Various Studies

The key step in evaluating laboratory data was the selection of criterion. The criterion used for this report was based on the average of % bias and % flags within a study. This approach was similar to that used by LOTAP QA program for the evaluation of laboratories involved in the analyses of major ions, nutrients and physical parameters in surface waters (2). This criterion provided a simple way to compare laboratory performance in these OC interlaboratory studies as shown below:

Average of Percent Bias
and Percent Flags

Comment

≤ 25%	Satisfactory (A)
26 - 50%	Moderate (B)
≥ 51%	Poor (C)

An analysis of the data obtained in various studies for OCs has been carried out on the basis of the criterion given above and the results are summarized in Table 4.2.1. As shown in Table 4.2.1, few laboratories, such as U001, U014 and U072, have consistently produced satisfactory results for OC analyses of both samples in ampules and spiked water samples. In addition, these laboratories analyzed all the samples provided and most parameters requested. Some other participating laboratories (U005, U009, U091 and U092) also produced satisfactory results but only participated only in either study QM-1 or study QM-8. Only one laboratory (U063) produced inconsistent and rather poor results for OC analyses in both studies.

For the evaluation of the relative performance of participating laboratories, the results of each study were summarized in Tables 4.2.2a and 4.2.2b, respectively, to account for the anticipated less satisfactory performance with spiked water samples as compared with those samples in ampules and the fact that some laboratories submitted only the results for samples in ampules. These tables provide useful information to project leaders, managers and users of data on the comparability of participating laboratories.

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TABLE 2.1

QC Study Parameters for UGLCC
Interlaboratory Performance Evaluation Studies

Study	Test Samples	Parameters	Substrate
QM-1	4 Ampules	Aroclors	Std. Solutions
	4 Ampules	Chlorinated Insecticides	Std. Solutions
	4 Ampules	Chlorinated Hydrocarbon	Std. Solutions
QM-2	4 Ampules	16 PAHs	Std. Solutions
QM-3	5 Sediments	10 Metals	Sediment CRM or RM
QM-4	4 Waters	23 Major Ions & Nutrients	Water CRM
QM-5	4 Waters	7 Metals	Water CRM
QM-6	4 Sediments	Chlorinated Hydrocarbons	Sediment CRMN or RM
	2 Ampules	Chlorinated Hydrocarbons	Std. Solutions
QM-7	2 Ampules	Aroclors	Std. Solutions
	2 Ampules	Chlorinated Hydrocarbons	Std. Solutions
	4 Ampules	Aroclor & Chlorinated Hydrocarbons	Spiking Solutions & Natural Water
QM-8	4 Ampules	Chlorinated Insecticides	Std. Solutions
	4 Ampules	Chlorinated Insecticides	Spiking Solutions & Natural Water
QM-9	4 Waters	Mercury	Water CRM
QM-10	2 Ampules	16 PAH	Std. Solutions
	4 Ampules	15 PAHs	Spiking Solutions & Natural Waters
QM-11	4 Waters	Cyanide	Water CRM
QM-12	4 Waters	Total Phenol	Water CRM
QM-13	2 Ampules	5 Chlorophenols	Std. Solutions
	2 Oils		Fish Oils
	2 Tissues		Fish Tissues

TABLE 2.2
Participants in the UGLCCS Performance Evaluation Studies

U.S. Laboratories

- The Bionetics Corporation, (U.S. Environmental Protection Agency - Great Lakes National Program Office), Chicago, Illinois, USA.**
- Clarkson University, (U.S. Environmental Protection Agency - Large Lakes Research Station, Gross Ile, Michigan), Potsdam, New York, USA.**
- Detroit Water and Sewerage Department - Analytical Laboratory, Detroit Michigan, USA.**
- Great Lakes Environmental Research Laboratory - National Oceanic and Atmospheric Administration, Ann Arbor, Michigan, USA.**
- Michigan Department of Public Health - Centre for Environmental Health Science - Epidemiological Studies Laboratory, Lansing, Michigan, USA.**
- Michigan Department of Natural Resources, Lansing, Michigan, USA.**
- Raytheon Service Corporation (U.S. Environmental Protection Agency - Large Lakes Research Station), Grosse Ile, Michigan, USA.**
- University of Michigan - Great Lakes Research Division, (U.S. Environmental Protection Agency - Great Lakes National Program Office and Great Lakes Environmental Research Laboratory - National Oceanic and Atmospheric Administration) Ann Arbor, Michigan, USA.**
- U.S. Army Corps of Engineers - Environmental Analysis Branch, Detroit, Michigan, USA.**
- U.S. Geological Survey - National Water Quality Laboratory, Arvada, Colorado, USA.**

Canadian Laboratories

- Barringer Magenta Limited, Rexdale, Ontario, Canada.**
- Beak Analytical Services, Mississauga, Ontario, Canada.**
- Mann Testing Laboratories, Mississauga, Ontario, Canada**
- National Water Research Institute, Environmental Contaminants Division - Inorganics Section, Burlington, Ontario, Canada.**
- National Water Research Institute, Environmental Contaminants Division - Organics-Pathways Section, Burlington, Ontario, Canada.**
- National Water Research Institute - Environmental Contaminants Division - Organics-Properties Section, Burlington, Ontario, Canada.**
- Ontario Ministry of Environment, London, Ontario, Canada.**
- Ontario Ministry of Environment - Inorganic Trace Contaminants Waters Unit, Rexdale, Ontario, Canada.**
- Ontario Ministry of Environment - Trace Organics Section - Drinking Water, Rexdale, Ontario, Canada.**
- Ontario Ministry of Environment - Trace Organics Section - Sediment and Biota, Rexdale, Ontario, Canada.**
- Ontario Ministry of Environment - Trace Organics Section - Wastewater, Rexdale, Ontario, Canada.**
- Ontario Ministry of Environment - Water Quality Section, Rexdale, Ontario, Canada.**
- Ontario Ministry of Environment - Thunder Bay, Ontario, Canada.**
- Wastewater Technology Centre, (Conservation and Protection, Toronto), Burlington, Ontario, Canada.**
- National Water Quality Laboratory, Burlington, Ontario, Canada.**
- Zenon Environmental Inc., Burlington, Ontario, Canada.**

TABLE 2.3
Interlaboratory Performance Evaluation or QC Studies

UGLCCS QC Study Schedules

Study No.	No. of Questionnaires	No. of Participants	Sent Out Date		Reporting Deadline	No. of Labs Reporting
			Questionnaires	Samples		
QM-1	45	16	Dec. 17/85	Jan. 24/86	Mar 20/86 Closed July 4/86	9
QM-2	45	16	Dec. 17/85	Jan. 24/86	Mar 20/86 Closed July 4/86	7
QM-3	45	15	Dec. 17/85	Jan. 24/86	Mar 20/86 Closed July 4/86	10
QM-4	50	13	Jan. 31/86	Feb. 28/86	Apr. 30/86 Closed Aug. 8/86	10
QM-5	50	14	Jan. 31/86	Feb. 28/86	Apr. 30/86 Closed Aug. 8/86	11
QM-6	50	12	Jan. 31/86	Feb. 28/86	Apr. 30/86 Closed Aug. 8/86	7
QM-7	55	16	Feb. 28/86	Mar. 27/86	May 15/86 Closed Sept 30/86	12
QM-8	55	14	Feb. 28/86	Mar. 27/86	May 15/86 Closed Sept 30/86	10
QM-9	55	12	Feb. 28/86	Mar. 27/86	May 27/86 Closed Sept 30/86	11
QM-10	59	14	Apr. 2/86	May 1/86	May 30/86 Closed Oct. 10/86	9
QM-11	59	10	Apr. 2/86	May 1/86	May 30/86 Closed Oct. 10/86	7
QM-12	59	10	Apr. 2/86	May 1/86	May 30/86 Closed Oct. 10/86	7
QM-13	55	6	May 9/86	Jun. 24/86	Aug. 1/86 Closed Oct. 17/86	2

TABLE 4.1.1

Participants in OCs Interlaboratory Performance Evaluation Studies

Laboratory Code	Study Number	
	QM-1	QM-8
U001	X	X
U005	X	-
U009	X	-
U013	-	X
U014	X	X
U063	X	X
U072	X	X
U075	X	-
U077	-	X
U079	X	-
U086	X	X
U091	-	X
U092	-	X
U093	-	X

Note x: participated
 -: did not participate

TABLE 4.1.2a

Interlaboratory Medians for OCs with Identical Samples
in Various Studies

Parameter No	Parameter	Design Value	QM-1		QM-8	
			105	108	801	802
————— pg/μL —————						
1	HCB	51.8	39.5 (76.3)	40.0 (77.2)	41.9 (80.9)	45.1 (87.1)
2	α-BHC	26.2	23.6 (90.1)	22.1 (84.4)	23.9 (91.2)	23.4 (89.3)
3	γ-BHC	24.9	24.3 (97.6)	21.4 (85.9)	22.7 (91.2)	22.5 (90.4)
4	Mirex	54.3	49.3 (90.8)	48.0 (88.4)	47.0 (86.6)	48.0 (88.4)
5	P,P'-DDE	111.4	98.0 (88.0)	94.5 (84.8)	98.6 (88.5)	98.8 (88.7)
6	P,P'-DDD	50.4	43.1 (85.5)	36.2 (71.8)	43.0 (85.3)	44.0 (87.3)
7	P,P'-DDT	50.9	45.8 (90.0)	44.0 (86.4)	41.6 (81.7)	41.5 (81.5)
8	Heptachlor epoxide					
9	Dieldrin					
10	α-chlordane					
11	γ-chlordane					
12	Oxychlordane					

Note: The numbers in parentheses are the percent recoveries of design values.

TABLE 4.1.2b

Interlaboratory Medians for OCs with Identical Sample
in Various Studies

Parameter No.	Parameter	Design Value	QM-1		QM-8	
			106	107	803	804
pg/ μ L						
1	HCB					
2	α -BHC					
3	γ -BHC					
4	Mirex					
5	P,P'-DDE					
6	P,P'-DDD					
7	P,P'-DDT					
8	Heptachlor epoxide	39.5	41.1 (104)	38.5 (97.5)	38.4 (97.2)	39.3 (99.5)
9	Dieldrin	43.0	41.9 (97.4)	39.0 (90.7)	42.0 (97.7)	41.0 (95.3)
10	α -chlordane	52.6	53.6 (102)	55.0 (105)	52.0 (98.9)	52.0 (98.9)
11	γ -chlordane	48.9	47.4 (96.9)	49.0 (100)	45.5 (93.0)	47.5 (97.1)
12	Oxychlordane	24.5	27.0 (110)	25.6 (104)	23.0 (93.9)	23.9 (97.6)

Note: The numbers in parentheses are the percent recoveries of design values.

TABLE 4.1.3

Range and Average Values of Percent Recoveries for OCs in Various Studies

Parameter No.	Parameter	QM-1 (ampules)		QM-8 (ampules)		QM-8 (waters)	
		Range	Average	Range	Average	Range	Average
1	HCB	76.3-77.2	76.8(2)	80.9-87.1	84.0(2)	60.6-77.2	69.8(4)
2	α-BHC	84.4-90.1	87.3(2)	89.3-91.2	90.3(2)	58.6-104	85.8(4)
3	γ-BHC	85.9-97.6	91.8(2)	90.4-91.2	90.8(2)	78.3-88.4	84.7(4)
4	Mirex	88.4-90.8	89.6(2)	86.6-88.4	87.5(2)	88.2-98.5	93.8(4)
5	p,p'-DDE	84.8-88.0	86.4(2)	88.5-88.7	88.6(2)	93.5-114	104(4)
6	p,p'-DDD	71.8-85.5	78.7(2)	85.3-87.3	86.3(2)	87.3-107	95.9(4)
7	p,p'-DDT	86.4-90.0	88.2(2)	81.5-81.7	81.6(2)	74.8-96.6	83.4(4)
8	Heptachlor epoxide	97.5-104	101(2)	97.2-99.5	98.4(2)	93.2-117	105(4)
9	Dieldrin	90.7-97.4	94.1(2)	95.3-97.7	96.5(2)	83.2-96.3	91.7(4)
10	α-chlordane	102-105	104(2)	98.9-98.9	98.9(2)	87.6-99.0	93.3(4)
11	γ-chlordane	96.9-100	98.5(2)	93.0-97.1	95.1(2)	86.1-91.0	88.9(4)
12	Oxychlordane	104-110	107(2)	93.9-97.6	95.8(2)	77.7-88.6	84.9(4)

Note: The numbers in parentheses are the number of samples.

TABLE 4.1.4

Precision of Interlaboratory Results for OCs in Various Studies
(Percent RSD)

Parameter No.	Parameter	QM-1 (ampules)		QM-8 (ampules)		QM-8 (waters)	
		Range	Average	Range	Average	Range	Average
1	HCB	21.8-32.5	27.2(2)	35.6-36.4	36.0(2)	26.1-49.6	41.0(4)
2	α -BHC	9.4-16.7	13.1(2)	15.2-15.3	15.3(2)	14.8-48.2	37.0(4)
3	γ -BHC	11.1-15.0	13.2(2)	16.2-19.7	18.0(2)	23.0-44.5	27.7(4)
4	Mirex	13.3-14.8	14.1(2)	6.0-7.0	6.5(2)	17.3-42.2	29.0(4)
5	p,p'-DDE	5.3-8.0	6.7(2)	9.1-10.9	10.0(2)	13.1-38.6	26.1(4)
6	p,p'-DDD	33.6-33.9	33.8(2)	16.4-18.9	17.7(2)	6.9-53.5	28.0(4)
7	p,p'-DDT	14.1-15.1	14.6(2)	10.8-11.1	11.0(2)	28.3-41.0	34.4(4)
8	Heptachlor epoxide	18.4-31.8	25.1(2)	26.0-26.2	26.1(2)	28.9-38.4	34.0(4)
9	Dieldrin	8.6-11.4	10.0(2)	10.4-12.7	11.6(2)	11.9-26.2	20.2(4)
10	α -chlordane	6.7-8.2	7.5(2)	8.5-10.5	9.5(2)	10.9-32.8	21.7(4)
11	γ -chlordane	13.4-17.5	15.5(2)	8.5-9.2	8.9(2)	8.9-28.6	18.1(4)
12	Oxychlordane	19.2-21.3	20.3(2)	14.9-17.5	16.2(2)	12.5-67.0	36.2(4)

Note: The numbers in parentheses are the number of samples.

TABLE 4.2.1

Comparison of Laboratory Performance for OCs in Various Studies

Lab. No.	Study No.	Matrix	Bias			Flags			Average of % Biased and % Flagged	Comment
			No. of Parameters Analyzed	No. of* Parameters Biased	% of Parameters Biased	No. of Results Reported	No. of [†] Results Flagged	% of Results Flagged		
U001	QM-1	Ampules	11	0.0	0.0	22	1.0	4.5	2.3	A
	QM-8	Ampules	11	0.0	0.0	22	1.0	4.5	2.3	A
	QM-8	Waters	11	0.5	4.5	44	3.5	8.0	6.3	A
U005	QM-1	Ampules	11	1.5	13.6	22	3.5	15.9	14.8	A
U009	QM-1	Ampules	12	1.5	12.5	24	3.5	14.6	13.6	A
U013	QM-8	Ampules	11	0.5	4.5	22	1.5	6.8	5.7	A
	QM-8	Waters	9	5.5	61.1	18	8.5	47.2	54.2	C
U014	QM-1	Ampules	10	1.5	15.0	20	3.0	15.0	15.0	A
	QM-8	Ampules	10	2.0	20.0	20	4.0	20.0	20.0	A
	QM-8	Waters	10	1.5	15.0	40	5.0	12.5	13.8	A
U063	QM-1	Ampules	12	5.0	41.7	24	8.0	33.3	37.5	B
	QM-8	Ampules	12	12.0	100	24	24.0	100	100	C
	QM-8	Waters	12	11.0	91.6	48	43.0	89.6	90.6	C
U072	QM-1	Ampules	12	0.0	0.0	24	0.0	0.0	0.0	A
	QM-8	Ampules	12	0.0	0.0	24	0.0	0.0	0.0	A
	QM-8	Waters	12	1.0	8.3	48	5.5	11.5	9.9	A

**LAB-SPECIFIC APPRAISAL FOR FLAG STATEMENTS
(OCs)**

Lab Code: U001

Parameter	QM-1 (ampules)	QM-8 (ampules)	QM-8 (waters)
HCB	-	1 L	-
Alpha-BHC	-	-	-
Gamma-BHC	-	-	-
Mirex	1 L	-	-
p,p'-DDE	-	-	-
p,p'-DDD	1 L	1 L	3 L
p,p'-DDT	-	-	2 L
Heptachlor epoxide	-	-	1 H
Dieldrin	-	-	1 L
Alpha-Chlordane	-	-	-
Gamma-Chlordane	-	-	-
Oxychlordane	NA	NA	NA

II-B: OCS

(FLAGS)

**LAB-SPECIFIC APPRAISAL FOR BIAS STATEMENTS
(OCs)**

Lab Code: U093

Parameter	QM-1 (ampules)		QM-8 (ampules)		QM-8 (waters)	
	Avg. Rec.	Bias	Avg. Rec.	Bias	Avg. Rec.	Bias
	(%)		(%)		(%)	
HCB			52.1	L	44.8	VL
Alpha-BHC			85.9	S	81.2	S
Gamma-BHC			92.4	S	119	S
Mirex			88.4	S	150	VH
p,p'-DDE			83.5	S	153	VH
p,p'-DDD			74.4	L	132	H
p,p'-DDT			71.7	L	108	S
Heptachlor epoxide			86.1	S	109	S
Dieldrin			82.6	S	115	S
Alpha-Chlordane			92.3	S	133	H
Gamma-Chlordane			86.9	S	122	S
Oxychlordane			77.6	S	128	H

**LAB-SPECIFIC APPRAISAL FOR BIAS STATEMENTS
(OCs)**

Lab Code: U092

Parameter	QM-1 (ampules)		QM-8 (ampules)		QM-8 (waters)	
	Avg. Rec.	Bias	Avg. Rec.	Bias	Avg. Rec.	Bias
	(%)		(%)		(%)	
HCB			46.3	VL	56.2	L
Alpha-BHC			84.0	S	88.4	S
Gamma-BHC			88.4	S	93.6	S
Mirex			83.8	S	91.0	S
p,p'-DDE			91.6	S	103	S
p,p'-DDD			84.3	S	95.9	S
p,p'-DDT			71.7	L	53.4	L
Heptachlor epoxide			89.9	S	72.0	L
Dieldrin			83.7	S	83.3	S
Alpha-Chlordane			94.2	S	91.0	S
Gamma-Chlordane			91.0	S	89.4	S
Oxychlordane			77.6	S	74.3	L

**LAB-SPECIFIC APPRAISAL FOR BIAS STATEMENTS
(OCs)**

Lab Code: U091

Parameter	QM-1 (ampules)		QM-8 (ampules)		QM-8 (waters)	
	Avg. Rec.	Bias	Avg. Rec.	Bias	Avg. Rec.	Bias
	(%)		(%)		(%)	
HCB			21.2	VL	NA	-
Alpha-BHC			91.6	S	NA	-
Gamma-BHC			88.4	S	NA	-
Mirex			86.0	S	NA	-
p,p'-DDE			88.0	S	NA	-
p,p'-DDD			91.3	S	NA	-
p,p'-DDT			88.4	S	NA	-
Heptachlor epoxide			108	S	NA	-
Dieldrin			97.7	S	NA	-
Alpha-Chlordane			104	S	NA	-
Gamma-Chlordane			99.1	S	NA	-
Oxychlordane			96.0	S	NA	-

**LAB-SPECIFIC APPRAISAL FOR BIAS STATEMENTS
(OCs)**

Lab Code: U086

Parameter	QM-1 (ampules)		QM-8 (ampules)		QM-8 (waters)	
	Avg. Rec.	Bias	Avg. Rec.	Bias	Avg. Rec.	Bias
	(%)		(%)		(%)	
HCB	57.0	L	71.5	L	77.6	S
Alpha-BHC	68.7	L	76.3	S	39.2	VL
Gamma-BHC	76.3	S	94.2	S	46.7	VL
Mirex	65.4	L	78.3	S	74.7	L
p,p'-DDE	76.3	S	85.5	S	108	S
p,p'-DDD	34.7	VL	85.3	S	87.3	S
p,p'-DDT	78.6	S	88.4	S	65.1	L
Heptachlor epoxide	NA	-	NA	-	NA	-
Dieldrin	NA	-	NA	-	NA	-
Alpha-Chlordane	NA	-	NA	-	NA	-
Gamma-Chlordane	84.9	S	97.1	S	86.5	S
Oxychlordane	NA	-	NA	-	NA	-

**LAB-SPECIFIC APPRAISAL FOR BIAS STATEMENTS
(OCs)**

Lab Code: U079

Parameter	QM-1 (ampules)		QM-8 (ampules)		QM-8 (waters)	
	Avg. Rec.	Bias	Avg. Rec.	Bias	Avg. Rec.	Bias
	(%)		(%)		(%)	
HCB	97.4	S				
Alpha-BHC	NA	-				
Gamma-BHC	105	S				
Mirex	NA	-				
p,p'-DDE	94.3	S				
p,p'-DDD	NA	-				
p,p'-DDT	80.0	S				
Heptachlor epoxide	NA	-				
Dieldrin	NA	-				
Alpha-Chlordane	NA	-				
Gamma-Chlordane	NA	-				
Oxychlordane	NA	-				

**LAB-SPECIFIC APPRAISAL FOR BIAS STATEMENTS
(OCs)**

Lab Code: U077

Parameter	QM-1 (ampules)		QM-8 (ampules)		QM-8 (waters)	
	Avg. Rec.	Bias	Avg. Rec.	Bias	Avg. Rec.	Bias
	(%)		(%)		(%)	
HCB			92.7	S	82.9	S
Alpha-BHC			122	S	109	S
Gamma-BHC			80.3	S	75.3	L
Mirex			81.0	S	68.7	L
p,p'-DDE			84.4	S	71.5	L
p,p'-DDD			85.3	S	78.2	S
p,p'-DDT			79.6	S	83.3	S
Heptachlor epoxide			88.6	S	59.0	L
Dieldrin			77.9	S	68.2	L
Alpha-Chlordane			98.9	S	76.9	S
Gamma-Chlordane			93.1	S	73.2	L
Oxychlordane			93.9	S	73.0	L

**LAB-SPECIFIC APPRAISAL FOR BIAS STATEMENTS
(OCs)**

Lab Code: U075

Parameter	QM-1 (ampules)		QM-8 (ampules)		QM-8 (waters)	
	Avg. Rec. (%)	Bias	Avg. Rec. (%)	Bias	Avg. Rec. (%)	Bias
HCB	69.5	L				
Alpha-BHC	NA	-				
Gamma-BHC	NA	-				
Mirex	NA	-				
p,p'-DDE	NA	-				
p,p'-DDD	NA	-				
p,p'-DDT	NA	-				
Heptachlor epoxide	NA	-				
Dieldrin	NA	-				
Alpha-Chlordane	NA	-				
Gamma-Chlordane	NA	-				
Oxychlordane	NA	-				

**LAB-SPECIFIC APPRAISAL FOR BIAS STATEMENTS
(OCs)**

Lab Code: U072

Parameter	QM-1 (ampules)		QM-8 (ampules)		QM-8 (waters)	
	Avg. Rec.	Bias	Avg. Rec.	Bias	Avg. Rec.	Bias
	(%)		(%)		(%)	
HCB	82.3	S	85.8	S	68.6	L
Alpha-BHC	87.5	S	90.3	S	92.9	S
Gamma-BHC	89.2	S	89.0	S	84.4	S
Mirex	91.5	S	91.6	S	95.7	S
p,p'-DDE	90.7	S	88.9	S	123	S
p,p'-DDD	87.1	S	91.6	S	97.7	S
p,p'-DDT	87.9	S	86.6	S	130	H
Heptachlor epoxide	101	S	98.4	S	78.0	S
Dieldrin	99.9	S	93.1	S	91.6	S
Alpha-Chlordane	101	S	97.6	S	95.0	S
Gamma-Chlordane	102	S	98.2	S	94.1	S
Oxychlordane	102	S	97.0	S	89.2	S

**LAB-SPECIFIC APPRAISAL FOR BIAS STATEMENTS
(OCs)**

Lab Code: U063

Parameter	QM-1 (ampules)		QM-8 (ampules)		QM-8 (waters)	
	Avg. Rec.	Bias	Avg. Rec.	Bias	Avg. Rec.	Bias
	(%)		(%)		(%)	
HCB	102	S	554	VH	61.8	L
Alpha-BHC	276	VH	512	VH	209	VH
Gamma-BHC	104	S	480	VH	220	VH
Mirex	250	VH	322	VH	243	VH
p,p'-DDE	80.6	S	260	VH	240	VH
p,p'-DDD	81.1	S	386	VH	237	VH
p,p'-DDT	81.1	S	297	VH	142	H
Heptachlor epoxide	393	VH	380	VH	180	VH
Dieldrin	1117	VH	316	VH	195	VH
Alpha-Chlordane	205	VH	397	VH	265	VH
Gamma-Chlordane	114	S	396	VH	263	VH
Oxychlordane	113	S	254	VH	255	VH

**LAB-SPECIFIC APPRAISAL FOR BIAS STATEMENTS
(OCs)**

Lab Code: U014

Parameter	QM-1 (ampules)		QM-8 (ampules)		QM-8 (waters)	
	Avg. Rec.	Bias	Avg. Rec.	Bias	Avg. Rec.	Bias
	(%)		(%)		(%)	
HCB	96.5	S	92.7	S	69.2	L
Alpha-BHC	NA	-	NRA	-	NRA	-
Gamma-BHC	100	S	139	H	89.2	S
Mirex	138	H	93.0	S	97.6	S
p,p'-DDE	91.2	S	111	S	101	S
p,p'-DDD	108	S	124	S	109	S
p,p'-DDT	102	S	74.7	L	72.2	L
Heptachlor epoxide	157	VH	173	VH	140	H
Dieldrin	100	S	96.5	S	106	S
Alpha-Chlordane	105	S	111	S	87.8	S
Gamma-Chlordane	106	S	114	S	87.1	S
Oxychlordan	NA	-	NRA	-	NRA	-

**LAB-SPECIFIC APPRAISAL FOR BIAS STATEMENTS
(OCs)**

Lab Code: U013

Parameter	QM-1 (ampules)		QM-8 (ampules)		QM-8 (waters)	
	Avg. Rec. (%)	Bias	Avg. Rec. (%)	Bias	Avg. Rec. (%)	Bias
HCB			90.0	S	36.3	VL
Alpha-BHC			103	S	49.6	VL
Gamma-BHC			104	S	66.3	L
Mirex			NA	-	NA	-
p,p'-DDE			91.1	S	64.8	L
p,p'-DDD			77.4	S	71.5	L
p,p'-DDT			67.8	L	72.9	L
Heptachlor epoxide			96.2	S	NA	-
Dieldrin			110	S	NA	-
Alpha-Chlordane			79.8	S	66.5	L
Gamma-Chlordane			88.0	S	71.8	L
Oxychlordane			118	S	69.4	L

**LAB-SPECIFIC APPRAISAL FOR BIAS STATEMENTS
(OCs)**

Lab Code: U009

Parameter	QM-1 (ampules)		QM-8 (ampules)		QM-8 (waters)	
	Avg. Rec.	Bias	Avg. Rec.	Bias	Avg. Rec.	Bias
	(%)		(%)		(%)	
HCB	71.6	L				
Alpha-BHC	91.6	S				
Gamma-BHC	98.0	S				
Mirex	95.8	S				
p,p'-DDE	81.1	S				
p,p'-DDD	100	S				
p,p'-DDT	101	S				
Heptachlor epoxide	64.1	L				
Dieldrin	90.9	S				
Alpha-Chlordane	105	S				
Gamma-Chlordane	98.5	S				
Oxychlordane	147	H				

**LAB-SPECIFIC APPRAISAL FOR BIAS STATEMENTS
(OCs)**

Lab Code: U005

Parameter	QM-1 (ampules)		QM-8 (ampules)		QM-8 (waters)	
	Avg. Rec. (%)	Bias	Avg. Rec. (%)	Bias	Avg. Rec. (%)	Bias
HCB	49.3	VL				
Alpha-BHC	NRA	-				
Gamma-BHC	82.3	S				
Mirex	88.4	S				
p,p'-DDE	83.1	S				
p,p'-DDD	53.6	L				
p,p'-DDT	80.6	S				
Heptachlor epoxide	84.8	S				
Dieldrin	76.8	S				
Alpha-Chlordane	102	S				
Gamma-Chlordane	78.8	S				
Oxychlordane	96.0	S				

**LAB-SPECIFIC APPRAISAL FOR BIAS STATEMENTS
(OCs)**

Lab Code: U001

Parameter	QM-1 (ampules)		QM-8 (ampules)		QM-8 (waters)	
	Avg. Rec.	Bias	Avg. Rec.	Bias	Avg. Rec.	Bias
	(%)		(%)		(%)	
HCB	76.8	S	82.6	S	82.1	S
Alpha-BHC	91.3	S	87.4	S	93.1	S
Gamma-BHC	90.0	S	90.8	S	88.3	S
Mirex	77.7	S	85.3	S	86.8	S
p,p'-DDE	85.6	S	95.3	S	94.1	S
p,p'-DDD	76.0	S	75.9	S	72.5	L
p,p'-DDT	89.1	S	82.1	S	75.5	S
Heptachlor epoxide	106	S	120	S	120	S
Dieldrin	92.3	S	102	S	90.6	S
Alpha-Chlordane	87.7	S	99.8	S	93.2	S
Gamma-Chlordane	77.3	S	88.4	S	86.5	S
Oxychlordane	NA	-	NA	-	NA	-

II-A: OCs

(BIAS)

APPENDIX II

**Lab-Specific Appraisal for
Bias and Flag Statements**

APPENDIX I-B

UGLCCS - FINAL REPORTS

<u>QM-#</u>	<u>TITLE OF FINAL REPORT</u>	<u>AUTHORS</u>
1	PCBs, OCs and CHs in Ampules	W. Horn, R. Szawiola and H.B. Lee and the QMWG
2	PAHs in Ampules	W. Horn, R. Szawiola and H.B. Lee and the QMWG
3	Trace Metals In Sediments	W. Horn, R. Szawiola and H.B. Lee and the QMWG
4	Major Ions In Surface Water	W.A. Horn, R. Szawiola and D. Takeuchi and the QMWG
4	Revised: Major Ions In Surface Water	W.A. Horn, R. Szawiola, D. Takeuchi and P.D. Leishman and the QMWG
5	Trace Metals In Surface Waters	W.A. Horn, D. Takeuchi and R. Szawiola and the QMWG
6	Chlorinated Hydrocarbons In Sediments And Ampules	H.B. Lee, D. Takeuchi and E. Kokotich and the QMWG
7	Chlorinated Hydrocarbons And PCBs In Ampules And Water	R. Szawiola, W. Horn and H.B. Lee and the QMWG
8	Organochlorines In Ampules And Water	R. Szawiola, W. Horn, P. Leishman and H.B. Lee and the QMWG
9	Total Mercury In Surface Water	R. Szawiola, W. Horn and D. Takeuchi and the QMWG
10	PAHs in Ampules and Water	W.C. Li, H.B. Lee and W.A. Horn and the QMWG
11	Total Cyanide In Water	W.C. Li, H.B. Lee and E. Kokotich and the QMWG
12	Total Phenol In Water	W.C. Li, H.B. Lee and E. Kokotich and the QMWG
13	Chlorophenols In Ampules, Fish Oils and Tissues	W.C. Li, R. Szawiola and H.B. Lee and the QMWG

APPENDIX I-A

DATA QUALITY MANAGEMENT WORK GROUP

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Fig. 4.1.3 Avg. RSD (%) for OCs
(Various Studies)

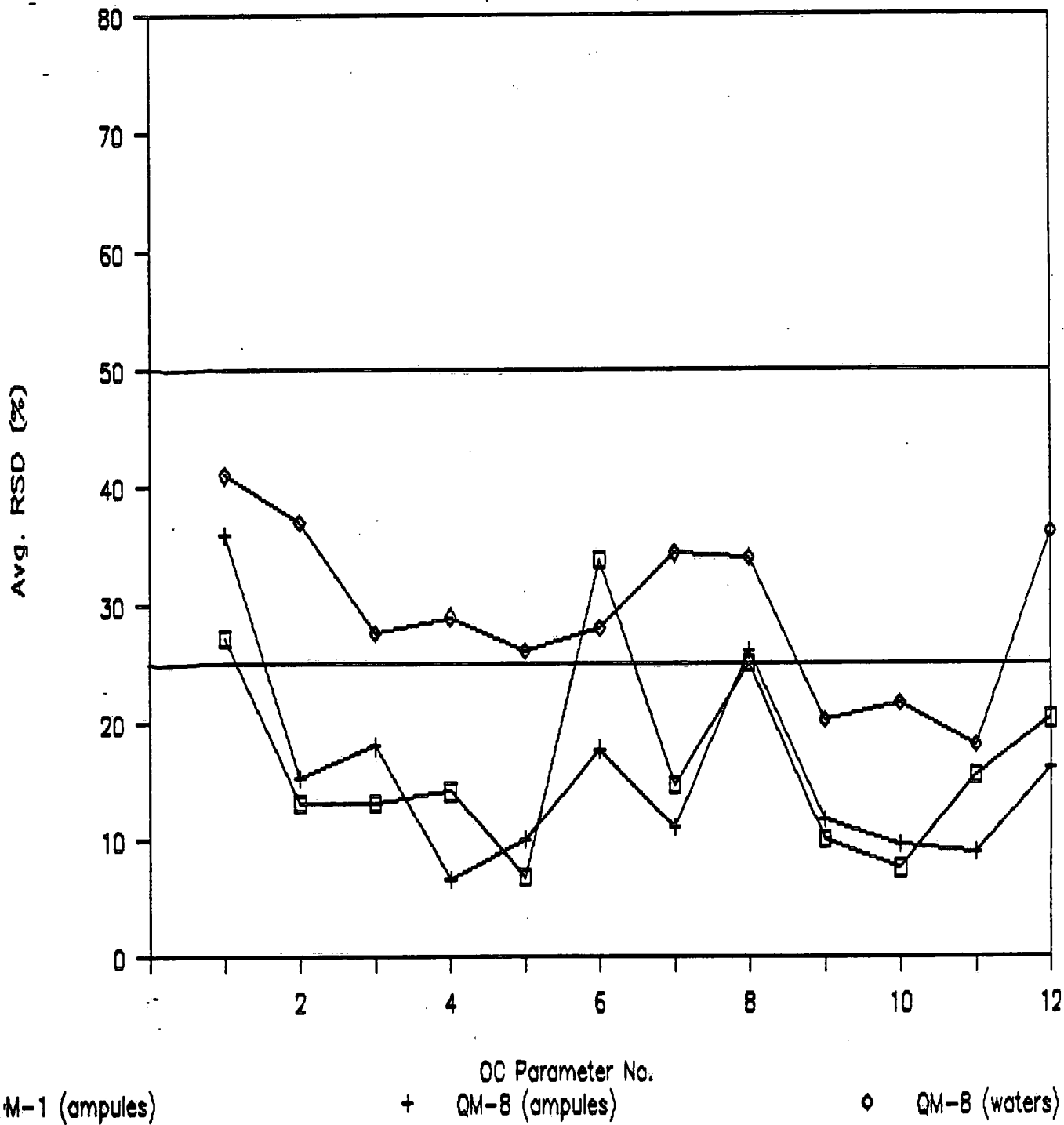


Fig. 4.1.2 Avg. Recovery (%) for OCs
(Various Studies)

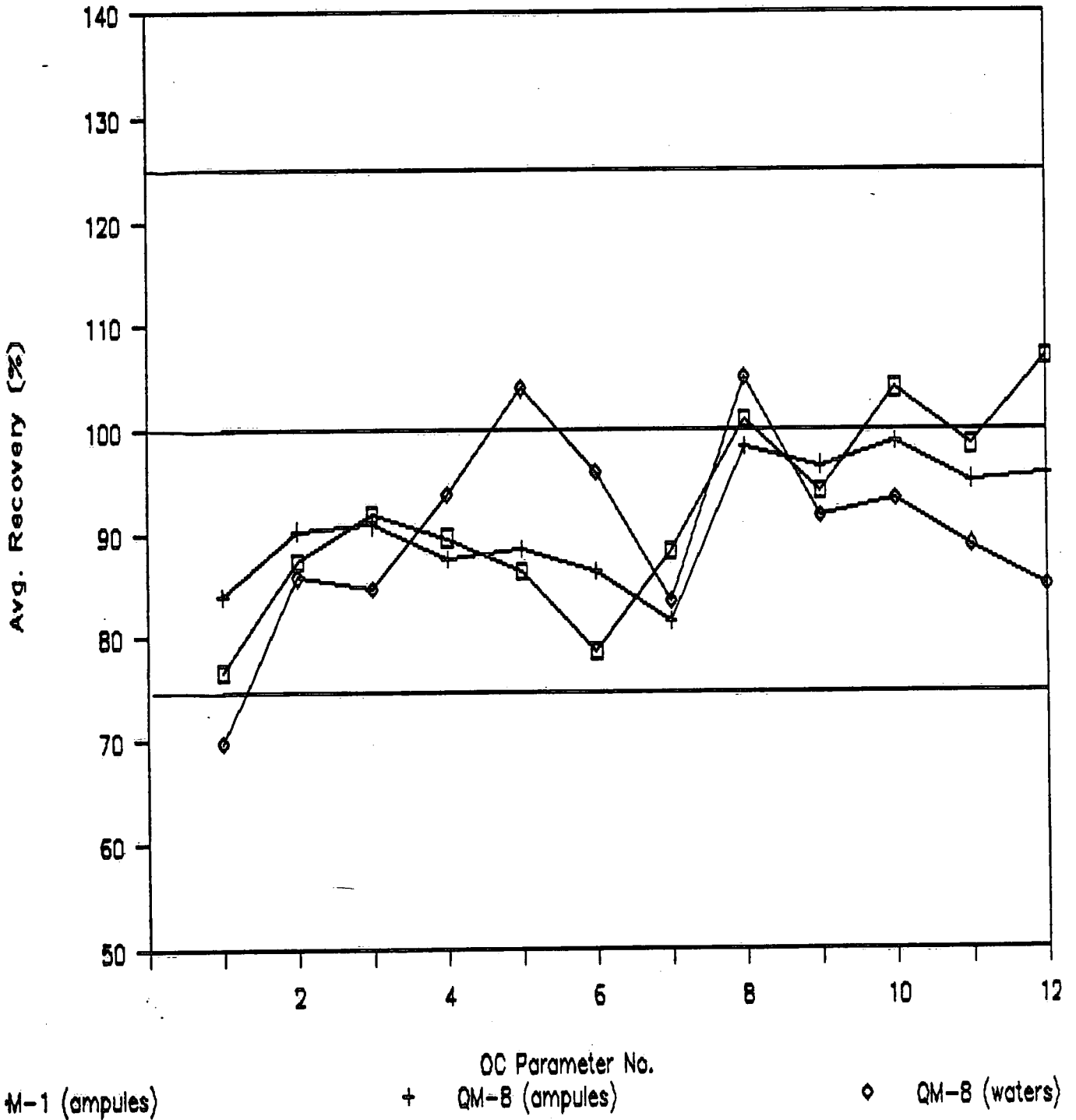


Fig. 4.1.1b Percent Recovery for OCs
(Identical samples)

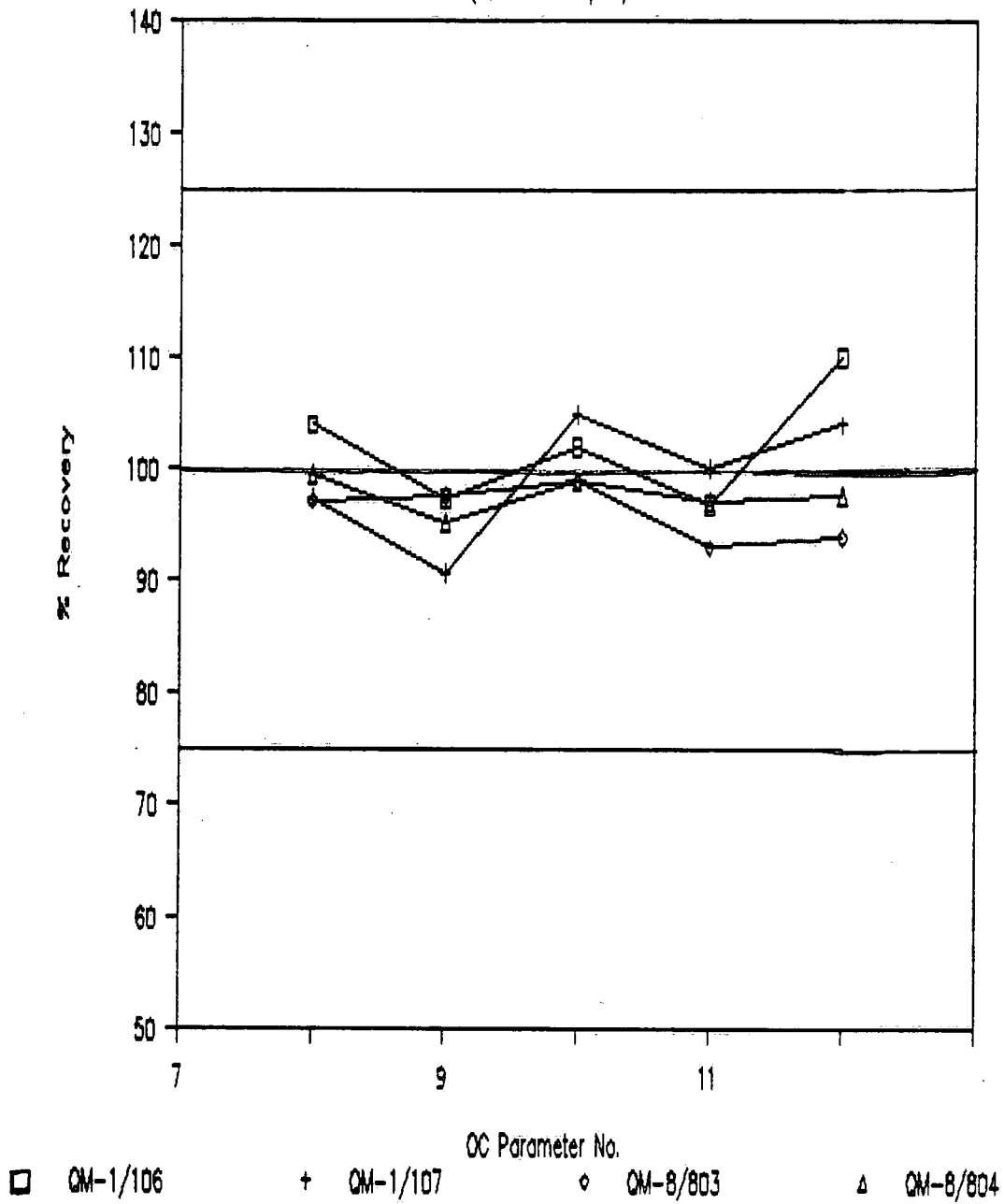
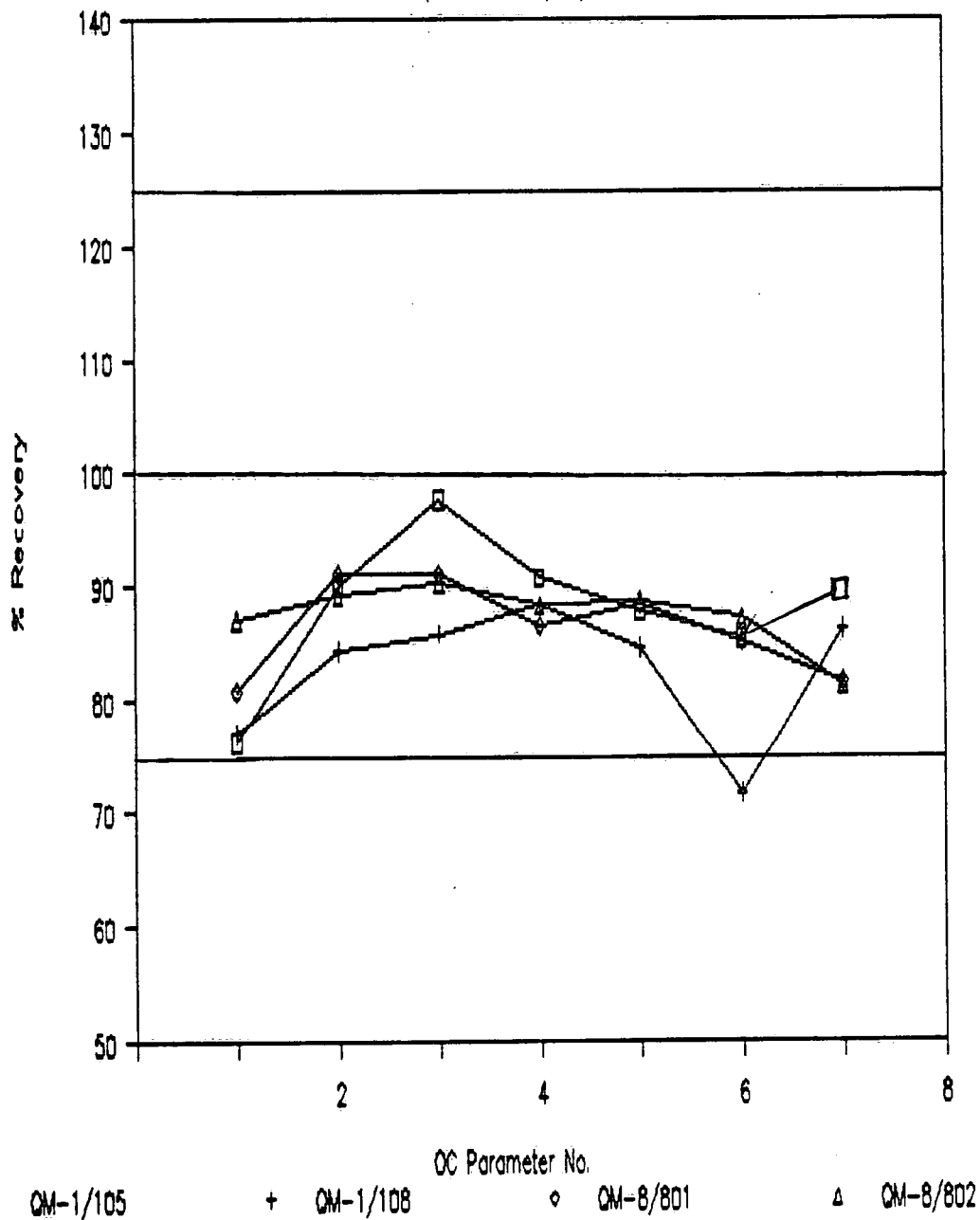


Fig. 4.1.1a Percent Recovery for OCs
(Identical Samples)



NOTE FOR FIGURES

OC Parameter No. : 1: HCB; 2: α -BHC; 3: γ -BHC; 4: Mirex;
5: p,p'-DDE; 6: p,p'-DDD; 7: p,p'-DDT;
8: Heptachlor epoxide; 9: Dieldrin;
10: α -chlordane; 11: γ -chlordane and
12: Oxychlordane.

TABLE 4.2.2b

Summary of Relative Performance of Laboratories
for OCs in Waters

Lab Code	Average of % biased and % flagged (%)	Number of Studies	Comment
U001	6.3	1	A
U072	9.9	1	A
U014	13.8	1	A
U092	17.8	1	A
U077	26.6	1	B
U086	35.2	1	B
U093	36.0	1	B
U013	54.2	1	C
U063	90.6	1	C

TABLE 4.2.2a

Summary of Relative Performance of Laboratories
for OCs in Ampules

Lab Code	Average* Performance (%)	Number of Studies	Comment
U072	0.0	2	A
U079**	0.0	1	A
U077	1.1	1	A
U001	2.3	2	A
U013	5.7	1	A
U091	8.3	1	A
U092	12.5	1	A
U093	12.5	1	A
U009	13.6	1	A
U005	14.8	1	A
U014	20.0	2	A
U086	20.4	2	A
U075**	37.5	1	B
U063	68.8	2	C

Note: * Average Performance (%) is mean value for the average of % biased and % flagged obtained from QM-1 and QM-8.

** Less than 4 parameters were analyzed.

TABLE 4.2.1 (continued)

Lab. No.	Study No.	Matrix	Bias			Flags			Average of % Biased and % Flagged	Comment
			No. of Parameters Analyzed	No. of Parameters Biased	% of Parameters Biased	No. of Results Reported	No. of Results Flagged	% of Results Flagged		
U075	QM-1	Ampules	1	0.5	50.0	2	0.5	25.0	37.5	B
U077	QM-8	Ampules	12	0.0	0.0	24	0.5	2.1	1.1	A
	QM-8	Waters	12	3.5	29.2	48	11.5	24.0	26.6	B
U079	QM-1	Ampules	4	0.0	0.0	8	0.0	0.0	0.0	A
U086	QM-1	Ampules	8	2.5	31.3	16	6.0	37.5	34.4	B
	QM-8	Ampules	8	0.5	6.3	16	1.0	6.3	6.3	A
	QM-8	Waters	8	3.0	37.5	32	10.5	32.8	35.2	B
U091	QM-8	Ampules	12	1.0	8.3	24	2.0	8.3	8.3	A
	QM-8	Waters		NA			NA			
U092	QM-8	Ampules	12	1.5	12.5	24	3.0	12.5	12.5	A
	QM-8	Waters	12	2.0	16.7	48	9.0	18.8	17.8	A
U093	QM-8	Ampules	12	1.5	12.5	24	3.0	12.5	12.5	A
	QM-8	Waters	12	4.5	37.5	48	16.5	34.4	36.0	B

Note: * L or H of a bias was counted as half of a bias
+ L or H of a flag was counted as half of a flag

LAB-SPECIFIC APPRAISAL FOR FLAG STATEMENTS
(OCs)

Lab Code: U005

Parameter	QM-1 (ampules)	QM-8 (ampules)	QM-8 (waters)
HCB	2 VL		
Alpha-BHC	NRA		
Gamma-BHC	-		
Mirex	-		
p,p'-DDE	-		
p,p'-DDD	2 L		
p,p'-DDT	-		
Heptachlor epoxide	-		
Dieldrin	1 L		
Alpha-Chlordane	-		
Gamma-Chlordane	-		
Oxychlordane	-		

LAB-SPECIFIC APPRAISAL FOR FLAG STATEMENTS
(OCs)

Lab Code: U009

Parameter	QM-1 (ampules)	QM-8 (ampules)	QM-8 (waters)
HCB	2 L		
Alpha-BHC	-		
Gamma-BHC	-		
Mirex	-		
p,p'-DDE	-		
p,p'-DDD	-		
p,p'-DDT	-		
Heptachlor epoxide	2 L		
Dieldrin	-		
Alpha-Chlordane	-		
Gamma-Chlordane	-		
Oxychlordane	1VH;1H		

**LAB-SPECIFIC APPRAISAL FOR FLAG STATEMENTS
(OCs)**

Lab Code: U013

Parameter	QM-1 (ampules)	QM-8 (ampules)	QM-8 (waters)
HCB		-	1 L;1 VL
Alpha-BHC		-	1 L;1 VL
Gamma-BHC		-	1 L
Mirex		NA	NA
p,p'-DDE		-	2 L
p,p'-DDD		1 L	1 L
p,p'-DDT		2 L	2 L
Heptachlor epoxide		-	NA
Dieldrin		-	NA
Alpha-Chlordane		-	2 L
Gamma-Chlordane		-	1 L
Oxychlordane		-	2 L

**LAB-SPECIFIC APPRAISAL FOR FLAG STATEMENTS
(OCs)**

Lab Code: U014

Parameter	QM-1 (ampules)	QM-8 (ampules)	QM-8 (waters)
HCB	-	-	3 L
Alpha-BHC	NA	NRA	NRA
Gamma-BHC	-	2 H	-
Mirex	2 H	-	-
p,p'-DDE	-	-	-
p,p'-DDD	-	1 H	-
p,p'-DDT	-	1 L	3 L
Heptachlor epoxide	2 VH	2 VH	4 H
Dieldrin	-	-	-
Alpha-Chlordane	-	-	-
Gamma-Chlordane	-	-	-
Oxychlordane	NA	NRA	NRA

**LAB-SPECIFIC APPRAISAL FOR FLAG STATEMENTS
(OCs)**

Lab Code: U063

Parameter	QM-1 (ampules)	QM-8 (ampules)	QM-8 (waters)
HCB	1 VH;1 L	2 VH	1 H;2 VL
Alpha-BHC	1 VH	2 VH	2 VH;1 VL
Gamma-BHC	-	2 VH	3 VH;1 VL
Mirex	1 VH	2 VH	4 VH
p,p'-DDE	1 L	2 VH	4 VH
p,p'-DDD	1 L	2 VH	4 VH
p,p'-DDT	1 L	2 VH	2 VH;1H
Heptachlor epoxide	1 VH	2 VH	3 VH
Dieldrin	1 VH	2 VH	3 VH;1 VL
Alpha-Chlordane	1 VH	2 VH	4 VH
Gamma-Chlordane	-	2 VH	4 VH
Oxychlordane	-	2 VH	4 VH

LAB-SPECIFIC APPRAISAL FOR FLAG STATEMENTS
(OCs)

Lab Code: U072

Parameter	QM-1 (ampules)	QM-8 (ampules)	QM-8 (waters)
HCB	-	-	1 L;1 VL
Alpha-BHC	-	-	1 L
Gamma-BHC	-	-	-
Mirex	-	-	-
p,p'-DDE	-	-	1 VH;1 H
p,p'-DDD	-	-	-
p,p'-DDT	-	-	1 VH;1 H
Heptachlor epoxide	-	-	1 L
Dieldrin	-	-	-
Alpha-Chlordane	-	-	-
Gamma-Chlordane	-	-	-
Oxychlordane	-	-	-

LAB-SPECIFIC APPRAISAL FOR FLAG STATEMENTS
(OCs)

Lab Code: U075

Parameter	QM-1 (ampules)	QM-8 (ampules)	QM-8 (waters)
HCB	1 L		
Alpha-BHC	NA		
Gamma-BHC	NA		
Mirex	NA		
p,p'-DDE	NA		
p,p'-DDD	NA		
p,p'-DDT	NA		
Heptachlor epoxide	NA		
Dieldrin	NA		
Alpha-Chlordane	NA		
Gamma-Chlordane	NA		
Oxychlordane	NA		

**LAB-SPECIFIC APPRAISAL FOR FLAG STATEMENTS
(OCs)**

Lab Code: U077

Parameter	QM-1 (ampules)	QM-8 (ampules)	QM-8 (waters)
HCB	-	-	-
Alpha-BHC	-	-	1 H;1 L
Gamma-BHC	-	-	1 L
Mirex	-	-	3 L
p,p'-DDE	-	-	2 L
p,p'-DDD	-	-	1 L
p,p'-DDT	-	1 L	1 L
Heptachlor epoxide	-	-	3 L;1 VL
Dieldrin	-	-	3 L
Alpha-Chlordane	-	-	1 L
Gamma-Chlordane	-	-	2 L
Oxychlordane	-	-	2 L

LAB-SPECIFIC APPRAISAL FOR FLAG STATEMENTS
(OCs)

Lab Code: U079

Parameter	QM-1 (ampules)	QM-8 (ampules)	QM-8 (waters)
HCB	-		
Alpha-BHC	NA		
Gamma-BHC	-		
Mirex	NA		
p,p'-DDE	-		
p,p'-DDD	NA		
p,p'-DDT	-		
Heptachlor epoxide	NA		
Dieldrin	NA		
Alpha-Chlordane	NA		
Gamma-Chlordane	NA		
Oxychlordane	NA		

LAB-SPECIFIC APPRAISAL FOR FLAG STATEMENTS
(OCs)

Lab Code: U086

Parameter	QM-1 (ampules)	QM-8 (ampules)	QM-8 (waters)
HCB	2 L	2 L	1 L
Alpha-BHC	2 L	-	1 L; 2 VL
Gamma-BHC	-	-	2 L; 2 VL
Mirex	2 L	-	3 L
p,p'-DDE	1 L	-	1 H
p,p'-DDD	2 VL	-	1 L
p,p'-DDT	1 L	-	2 L; 1 VL
Heptachlor epoxide	NA	NA	NA
Dieldrin	NA	NA	NA
Alpha-Chlordane	NA	NA	NA
Gamma-Chlordane	-	-	-
Oxychlordane	NA	NA	NA

**LAB-SPECIFIC APPRAISAL FOR FLAG STATEMENTS
(OCs)**

Lab Code: U091

Parameter	QM-1 (ampules)	QM-8 (ampules)	QM-8 (waters)
HCB		2 VL	NA
Alpha-BHC		-	NA
Gamma-BHC		-	NA
Mirex		-	NA
p,p'-DDE		-	NA
p,p'-DDD		-	NA
p,p'-DDT		-	NA
Heptachlor epoxide		-	NA
Dieldrin		-	NA
Alpha-Chlordane		-	NA
Gamma-Chlordane		-	NA
Oxychlordane		-	NA

**LAB-SPECIFIC APPRAISAL FOR FLAG STATEMENTS
(OCs)**

Lab Code: U092

Parameter	QM-1 (ampules)	QM-8 (ampules)	QM-8 (waters)
HCB		2 VL	3 L;1 VL
Alpha-BHC		-	1 L
Gamma-BHC		-	1 L
Mirex		-	-
p,p'-DDE		-	-
p,p'-DDD		-	-
p,p'-DDT		2 L	3 L;1 VL
Heptachlor epoxide		-	3 L
Dieldrin		-	-
Alpha-Chlordane		-	-
Gamma-Chlordane		-	-
Oxychlordane		-	3 L

**LAB-SPECIFIC APPRAISAL FOR FLAG STATEMENTS
(OCs)**

Lab Code: U093

Parameter	QM-1 (ampules)	QM-8 (ampules)	QM-8 (waters)
HCB		2 L	1 L; 3 VL
Alpha-BHC		-	1 VL
Gamma-BHC		-	1 VH; 1 L
Mirex		-	2 VH
p,p'-DDE		-	2 VH; 2 H
p,p'-DDD		2 L	1 VH
p,p'-DDT		2 L	1 H
Heptachlor epoxide		-	-
Dieldrin		-	1 H
Alpha-Chlordane		-	1 VH; 1 H
Gamma-Chlordane		-	2 H
Oxychlordane		-	1 VH

APPENDIX III

Within-lab Precision

Within-lab Precision for OCs
(Avg. RSD)

Lab Code: U001

Parameter	QM-1 (Ampules)	QM-8 (Ampules)	QM-8 (Waters)
	----- § -----		
HCB	0.8 (1)	12.5 (1)	1.0 (2)
Alpha-BHC	10.6 (1)	1.8 (1)	8.5 (2)
Gamma-BHC	10.8 (1)	1.9 (1)	8.2 (2)
Mirex	3.6 (1)	10.7 (1)	3.4 (2)
p,p'-DDE	4.6 (1)	10.0 (1)	4.0 (2)
p,p'-DDD	7.8 (1)	20.8 (1)	13.1 (2)
p,p'-DDT	4.2 (1)	8.8 (1)	12.5 (2)
Heptachlor epoxide	0.9 (1)	2.9 (1)	6.4 (2)
Dieldrin	4.3 (1)	2.9 (1)	13.8 (2)
Alpha-Chlordane	0.2 (1)	1.8 (1)	7.0 (2)
Gamma-Chlordane	1.8 (1)	2.6 (1)	8.4 (2)
Oxychlordane	NA	NA	NA

Note: The numbers in parentheses are the number of duplicate pairs.

Within-lab Precision for OCs
(Avg. RSD)

Lab Code: U005

Parameter	QM-1 (Ampules)	QM-8 (Ampules)	QM-8 (Waters)
	----- % -----		
HCB	2.6 (1)		
Alpha-BHC	NRA		
Gamma-BHC	3.4 (1)		
Mirex	0.0 (1)		
p,p'-DDE	2.3 (1)		
p,p'-DDD	0.0 (1)		
p,p'-DDT	0.0 (1)		
Heptachlor epoxide	2.1 (1)		
Dieldrin	4.3 (1)		
Alpha-Chlordane	4.2 (1)		
Gamma-Chlordane	1.9 (1)		
Oxychlordane	3.0 (1)		

Note: The numbers in parentheses are the number of duplicate pairs.

Within-lab Precision for OCs
(Avg. RSD)

Lab Code: U009

Parameter	QM-1 (Ampules)	QM-8 (Ampules)	QM-8 (Waters)
	----- % -----		
HCB	5.7 (1)		
Alpha-BHC	2.4 (1)		
Gamma-BHC	0.0 (1)		
Mirex	0.0 (1)		
p,p'-DDE	0.7 (1)		
p,p'-DDD	1.3 (1)		
p,p'-DDT	1.4 (1)		
Heptachlor epoxide	2.8 (1)		
Dieldrin	1.1 (1)		
Alpha-Chlordane	2.0 (1)		
Gamma-Chlordane	2.2 (1)		
Oxychlordane	2.9 (1)		

Note: The numbers in parentheses are the number of duplicate pairs.

Within-lab Precision for OCs
(Avg. RSD)

Lab Code: U013

Parameter	QM-1 (Ampules)	QM-8 (Ampules)	QM-8 (Waters)
	----- % -----		
HCB		1.4 (1)	114 (1)
Alpha-BHC		0.0 (1)	65.3 (1)
Gamma-BHC		5.5 (1)	30.0 (1)
Mirex		NA	NA
p,p'-DDE		11.7 (1)	7.7 (1)
p,p'-DDD		3.6 (1)	15.7 (1)
p,p'-DDT		6.2 (1)	3.8 (1)
Heptachlor epoxide		0.0 (1)	NA
Dieldrin		3.2 (1)	NA
Alpha-Chlordane		6.8 (1)	4.1 (1)
Gamma-Chlordane		3.3 (1)	28.3 (1)
Oxychlordane		4.8 (1)	8.4 (1)

Note: The numbers in parentheses are the number of duplicate pairs.

Within-lab Precision for OCs
(Avg. RSD)

Lab Code: U014

Parameter	QM-1 (Ampules)	QM-8 (Ampules)	QM-8 (Waters)
	----- % -----		
HCB	0.0 (1)	3.0 (1)	3.5 (2)
Alpha-BHC	NA	NA	NA
Gamma-BHC	0.0 (1)	6.1 (1)	8.4 (2)
Mirex	0.0 (1)	1.4 (1)	3.2 (2)
p,p'-DDE	2.1 (1)	0.6 (1)	2.4 (2)
p,p'-DDD	1.3 (1)	1.1 (1)	1.7 (2)
p,p'-DDT	0.0 (1)	7.5 (1)	6.3 (2)
Heptachlor epoxide	4.5 (1)	2.0 (1)	7.9 (2)
Dieldrin	0.0 (1)	1.8 (1)	13.7 (2)
Alpha-Chlordane	0.0 (1)	1.3 (1)	1.2 (2)
Gamma-Chlordane	0.0 (1)	1.8 (1)	5.1 (2)
Oxychlordane	NA	NA	NA

Note: The numbers in parentheses are the number of duplicate pairs.

Within-lab Precision for OCs
(Avg. RSD)

Lab Code: U063

Parameter	QM-1 (Ampules)	QM-8 (Ampules)	QM-8 (Waters)
	----- % -----		
HCB	41.5 (1)	3.1 (1)	49.7 (2)
Alpha-BHC	98.9 (1)	31.8 (1)	78.3 (2)
Gamma-BHC	26.1 (1)	0.6 (1)	64.9 (2)
Mirex	98.8 (1)	5.9 (1)	7.1 (2)
p,p'-DDE	12.4 (1)	3.3 (1)	6.7 (2)
p,p'-DDD	17.1 (1)	4.0 (1)	13.7 (2)
p,p'-DDT	36.5 (1)	3.8 (1)	22.4 (2)
Heptachlor epoxide	107 (1)	0.9 (1)	41.3 (2)
Dieldrin	130 (1)	0.0 (1)	76.9 (2)
Alpha-Chlordane	63.4 (1)	0.0 (1)	20.0 (2)
Gamma-Chlordane	123 (1)	0.4 (1)	18.0 (2)
Oxychlordane	5.0 (1)	2.2 (1)	31.3 (2)

Note: The numbers in parentheses are the number of duplicate pairs.

Within-lab Precision for OCs
(Avg. RSD)

Lab Code: U072

Parameter	QM-1 (Ampules)	QM-8 (Ampules)	QM-8 (Waters)
	----- % -----		
HCB	5.1 (1)	1.2 (1)	13.3 (2)
Alpha-BHC	4.9 (1)	1.4 (1)	15.5 (2)
Gamma-BHC	3.9 (1)	0.3 (1)	4.4 (2)
Mirex	1.0 (1)	0.1 (1)	6.0 (2)
p,p'-DDE	0.1 (1)	0.7 (1)	14.0 (2)
p,p'-DDD	2.6 (1)	3.8 (1)	5.7 (2)
p,p'-DDT	0.5 (1)	0.7 (1)	6.2 (2)
Heptachlor epoxide	17.8 (1)	1.6 (1)	5.4 (2)
Dieldrin	0.1 (1)	3.3 (1)	5.0 (2)
Alpha-Chlordane	0.7 (1)	2.4 (1)	6.0 (2)
Gamma-Chlordane	0.7 (1)	2.6 (1)	7.5 (2)
Oxychlordane	2.1 (1)	0.9 (1)	4.7 (2)

Note: The numbers in parentheses are the number of duplicate pairs.

Within-lab Precision for OCs
(Avg. RSD)

Lab Code: U075

Parameter	QM-1 (Ampules)	QM-8 (Ampules)	QM-8 (Waters)
	----- % -----		
HCB	31.4	(1)	
Alpha-BHC			
Gamma-BHC			
Mirex			
p,p'-DDE			
p,p'-DDD			
p,p'-DDT			
Heptachlor epoxide			
Dieldrin			
Alpha-Chlordane			
Gamma-Chlordane			
Oxychlordane			

Note: The numbers in parentheses are the number of duplicate pairs.

Within-lab Precision for OCs
(Avg. RSD)

Lab Code: U077

Parameter	QM-1 (Ampules)	QM-8 (Ampules)	QM-8 (Waters)
	----- % -----		
HCB		0.0 (1)	0.0 (2)
Alpha-BHC		0.0 (1)	17.4 (2)
Gamma-BHC		0.0 (1)	8.1 (2)
Mirex		0.0 (1)	10.6 (2)
p,p'-DDE		0.0 (1)	17.2 (2)
p,p'-DDD		0.0 (1)	11.4 (2)
p,p'-DDT		12.2 (1)	20.6 (2)
Heptachlor epoxide		0.0 (1)	9.5 (2)
Dieldrin		2.2 (1)	12.6 (2)
Alpha-Chlordane		0.0 (1)	10.8 (2)
Gamma-Chlordane		1.6 (1)	10.7 (2)
Oxychlordane		0.0 (1)	9.4 (2)

Note: The numbers in parentheses are the number of duplicate pairs.

Within-lab Precision for OCs
(Avg. RSD)

Lab Code: U079

Parameter	QM-1 (Ampules)	QM-8 (Ampules)	QM-8 (Waters)
	----- % -----		
HCB	8.2 (1)		
Alpha-BHC	NA		
Gamma-BHC	0.7 (1)		
Mirex	NA		
p,p'-DDE	0.0 (1)		
p,p'-DDD	NA		
p,p'-DDT	7.8 (1)		
Heptachlor epoxide	NA		
Dieldrin	NA		
Alpha-Chlordane	NA		
Gamma-Chlordane	NA		
Oxychlordane	NA		

Note: The numbers in parentheses are the number of duplicate pairs.

Within-lab Precision for OCs
(Avg. RSD)

Lab Code: U086

Parameter	QM-1 (Ampules)	QM-8 (Ampules)	QM-8 (Waters)
	----- % -----		
HCB	7.0 (1)	3.9 (1)	4.3 (2)
Alpha-BHC	7.9 (1)	0.0 (1)	109 (2)
Gamma-BHC	0.0 (1)	8.7 (1)	49.6 (2)
Mirex	2.0 (1)	5.0 (1)	7.0 (2)
p,p'-DDE	16.6 (1)	4.1 (1)	19.9 (2)
p,p'-DDD	12.1 (1)	3.3 (1)	10.9 (2)
p,p'-DDT	14.1 (1)	6.2 (1)	43.6 (2)
Heptachlor epoxide	NA	NA	NA
Dieldrin	NA	NA	NA
Alpha-Chlordane	NA	NA	NA
Gamma-Chlordane	1.8 (1)	4.3 (1)	7.5 (2)
Oxychlordane	NA	NA	NA

Note: The numbers in parentheses are the number of duplicate pairs.

Within-lab Precision for OCs
(Avg. RSD)

Lab Code: U091

Parameter	QM-1 (Ampules)	QM-8 (Ampules)	QM-8 (Waters)
	----- % -----		
HCB		0.0 (1)	NA
Alpha-BHC		0.0 (1)	NA
Gamma-BHC		0.0 (1)	NA
Mirex		0.0 (1)	NA
p,p'-DDE		0.0 (1)	NA
p,p'-DDD		0.0 (1)	NA
p,p'-DDT		0.0 (1)	NA
Heptachlor epoxide		1.9 (1)	NA
Dieldrin		0.0 (1)	NA
Alpha-Chlordane		1.3 (1)	NA
Gamma-Chlordane		1.3 (1)	NA
Oxychlordane		3.0 (1)	NA

Note: The numbers in parentheses are the number of duplicate pairs.

Within-lab Precision for OCs
(Avg. RSD)

Lab Code: U092

Parameter	QM-1 (Ampules)	QM-8 (Ampules)	QM-8 (Waters)
	----- % -----		
HCB		0.0 (1)	6.8 (2)
Alpha-BHC		0.0 (1)	22.2 (2)
Gamma-BHC		0.0 (1)	14.0 (2)
Mirex		1.6 (1)	5.9 (2)
p,p'-DDE		0.0 (1)	7.5 (2)
p,p'-DDD		1.7 (1)	11.3 (2)
p,p'-DDT		2.0 (1)	8.5 (2)
Heptachlor epoxide		2.0 (1)	4.8 (2)
Dieldrin		0.0 (1)	2.8 (2)
Alpha-Chlordane		1.4 (1)	6.5 (2)
Gamma-Chlordane		1.5 (1)	5.1 (2)
Oxychlordane		0.0 (1)	5.2 (2)

Note: The numbers in parentheses are the number of duplicate pairs.

Within-lab Precision for OCs
(Avg. RSD)

Lab Code: U093

Parameter	QM-1 (Ampules)	QM-8 (Ampules)	QM-8 (Waters)
	----- % -----		
HCB		0.0 (1)	8.1 (2)
Alpha-BHC		3.1 (1)	33.5 (2)
Gamma-BHC		0.0 (1)	30.1 (2)
Mirex		0.0 (1)	10.9 (2)
p,p'-DDE		1.6 (1)	9.0 (2)
p,p'-DDD		1.9 (1)	23.4 (2)
p,p'-DDT		2.0 (1)	32.8 (2)
Heptachlor epoxide		0.0 (1)	4.7 (2)
Dieldrin		1.9 (1)	8.5 (2)
Alpha-Chlordane		1.4 (1)	12.9 (2)
Gamma-Chlordane		1.6 (1)	7.0 (2)
Oxychlordane		0.0 (1)	20.2 (2)

Note: The numbers in parentheses are the number of duplicate pairs.