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MANAGEMENT PERSPECTIVE

Hexachlorobutadiene (HCBD), octachlorostyrene (OCS), hexachlorobenzene (HCB) and other chlorobenzenes (CBs) were found to be present in the St. Clair River Delta during the Upper Great Lakes Connecting Channels Study (UGLCCS). The follow-up study for the clean up of contaminated sediments from areas of concern was conducted under the auspices of Great Lakes Action Plan (GLAP).

The successful implementation of the GLAP is dependent on the availability of reliable scientific data. To assist project managers and regulating bodies in ensuring the validity of analytical data, a series of interlaboratory studies for the analysis of selected chlorinated hydrocarbons, namely, HCBD, OCS, HCB and other CBs in sediments was designed and conducted. The present study (G-2) will help to establish the degree of comparability of interlaboratory results among participating laboratories.

SOMMAIRE À L'INTENTION DE LA DIRECTION

On a constaté la présence d'hexachlorobutadiène (HCBD), d'octachlorostyrène (OCS), d'hexachlorobenzène (HCB) et d'autres chlorobenzènes (CB) dans le delta de la rivière Saint-Clair au cours de l'Upper Great Lakes Connecting Channels Study (UGLCCS). L'étude de suivi pour la dépollution des sédiments contaminés provenant des secteurs préoccupants a été effectuée sous les auspices du Plan d'action des Grands Lacs (PAGL).

Le succès de la mise en oeuvre du PAGL dépend de la disponibilité de données scientifiques fiables. Afin d'aider les gestionnaires et les organisations de réglementation à assurer la validité des données analytiques, une série d'études interlaboratoires pour l'analyse d'hydrocarbures chlorés sélectionnés, soit le HCBD, l'OCS, le HCB et d'autres CB dans les sédiments a été conçue et réalisée. La présente étude (G-2) aidera à établir un certain degré de comparabilité entre les résultats interlaboratoires des laboratoires participants.

ABSTRACT

As part of the quality assurance/quality control (QA/QC) program for sediments under the auspices of the Great Lakes Action Plan (GLAP), an interlaboratory study (G-2) for the analysis of selected chlorinated hydrocarbons in sediments was designed and conducted. Twenty-three laboratories were sent five test samples including one standard solution and four naturally contaminated sediments. Each laboratory was requested to analyze HCBD, OCS, HCB and other CBs in all test samples. Fourteen out of twenty-three laboratories submitted results.

The interlaboratory results for chlorinated hydrocarbons in standard solution were satisfactory since the medians for all parameters were within ± 10% of their design values. The sediment results were, however, less satisfactory with four out of twelve parameters (namely, 1,3-DCB, 1,3,5-TCB, 1,2,3,4-TeCB and HCBD) having deviations exceeding ± 25% of their design values.

For overall laboratory performance, eleven out of fourteen laboratories submitted satisfactory results for standard solution while only two laboratories provided satisfactory results for sediment samples.

RÉSUMÉ

Dans le cadre du programme d'assurance de la qualité et de contrôle de la qualité (AQ/QC) pour les sédiments sous les auspices du Plan d'action des Grands Lacs (PAGL), une étude interlaboratoire (G-2) pour l'analyse d'hydrocarbures chlorés sélectionnés présents dans les sédiments a été conçue et réalisée. Vingt-trois laboratoires ont reçu cinq échantillons d'essai, y compris une solution étalon et quatre sédiments contaminés naturellement. On a demandé à chaque laboratoire d'analyser le HCBD, l'OCS, le HCB et d'autres CB dans tous les échantillons à l'essai. Quatorze des 23 laboratoires ont présenté des résultats.

Les résultats interlaboratoires pour les hydrocarbures chlorés dans la solution étalon étaient satisfaisants, étant donné que les médianes de tous les paramètres étaient comprises entre ±10 % des valeurs nominales. Toutefois, les résultats obtenus avec les sédiments étaient moins satisfaisants : 4 des 12 paramètres (soit le 1,3-DCB, le 1,3,5-TCB, le 1,2,3,4-TeCB et le HCBD) présentaient des écarts dépassant ±25 % des valeurs nominales.

Les résultats d'ensemble du rendement des laboratoires sont les suivants : 11 laboratoires sur 14 ont présenté des résultats satisfaisants pour la solution étalon, alors que seulement deux laboratoires ont fourni des résultats satisfaisants pour les échantillons de sédiments.

1. INTRODUCTION

Hexachlorobutadiene (HCBD), octachlorostyrene (OCS), hexachlorobenzene (HCB) and other chlorobenzenes (CBs) were found to be present in the St. Clair River Delta during the Upper Great Lakes Connecting Channels Study (UGLCCS) (1). The follow-up study (2) for the clean up of contaminated sediments from areas of concern was conducted under the auspices of Great Lakes Action Plan (GLAP).

To assist project managers and regulating bodies in ensuring the validity of analytical data, a QA/QC (quality assurance/quality control) program for sediments was initiated in September, 1990 upon the request from Environmental Protection - Ontario Region as part of Great Lakes Action Plan. The objectives of this program were (1) to prepare reference standards and sediment reference materials for HCBD, OCS, HCB as well as any other significant sediment-associated contaminants for the support of monitoring in the St. Clair River Delta; (2) to design and conduct interlaboratory studies specific to HCBD, OCS, HCB and other CBs for the evaluation of contract laboratories.

As part of this QA/QC program for sediments, a series of interlaboratory comparison studies, on a continual basis would be designed and conducted by the Environmental Standards and Statistics Poject of the Aquatic Ecosystem Protection Branch (formerly the Quality Assurance Project of the Research and Applications Branch) at the National Water Research Institute. The goal of these studies is to assist analytical laboratories to generate accurate data. The present comparison study, G-2, was distributed on August 21, 1991. It involved the analysis of selected chlorinated hydrocarbons, namely, HCBD, OCS, HCB and other CBs (such as 1,4-DCB, 1,3-DCB, 1,2-DCB, 1,3,5TCB, 1,2,4-TCB, 1,2,3-TCB, 1,2,4,5-TeCB, 1,2,3,4-TeCB and PeCB) in standard solution and naturally contaminated sediment samples. The original deadline for reporting results was October 4, 1991. However, most laboratories were late in reporting, so the study was closed October 31, 1991. A preliminary data summary with a brief overview was prepared and distributed to those participants that had submitted their results. The summary allows participants to compare their results with those of their peers and also with the design values. Thus corrective action can be taken if necessary in a timely manner. This final report provides more information on the data evaluation and laboratory performance of participants.

2. STUDY DESIGN

The interlaboratory study (G-2) for the analysis of HCBD, OCS, HCB and other CBs in standard solution and sediments was initiated in June, 1991. About 70 governmental, industrial and private laboratories were invited to participate. From the returned questionnaires, twenty-three laboratories

expressed interest to participate in this study. By the time the study was closed, fourteen out of twenty-three participants had submitted results. The list of participants is given in Table 1.

The study consists of five test samples for the analysis of selected chlorinated hydrocarbons as mentioned earlier. Description of samples is given in Table 2. Sample #1 in sealed glass ampule was a mixture of standard solution of HCBD, OCS, HCB and other nine CBs in iso-octane. This standard solution was used to evaluate the performance of in-house calibration standards and instrumentation of participants. Samples #2 to 5 were freeze-dried naturally contaminated sediment samples for the evaluation of accuracy and precision of analytical procedures used by participants. To assess reproducibility within the same laboratory, two pairs of blind duplicates were included in the four sediment samples as shown in Table 2.

3. RESULTS AND DISCUSSION

3.1 Analytical Methodology

The participants were instructed to analyze the test samples using their in-house analytical methodology and standards. However, a known standard solution of OCS (100.0 µg/mL) was also provided to each laboratory for the preparation of OCS calibration standards.

In general, a wide variety of analytical methods, sample extractions and cleanup procedures were used by participants. Of the methods used for the extraction of HCBD, OCS, HCB and other CBs from sediments, which included soxhlet, sonicator, shaker and steam distillation methods, the soxhlet and shaking methods were most commonly used. The solvent system included mixtures of acetone and hexane, acetone and dichloromethane, dichloromethane alone, petroleum ether or benzene. Solvent was evaporated by using rotovap, Kuderna-Danish evaporator, or nitrogen evaporation with a water bath. Cleanup of sediment extracts was achieved by adsorption chromatography using silica gel, florisil or silica gel SPE cartridge. Mercury and activated copper were also used to remove sulphur interferences. All participants used either single or dual capillary columns for the separation of the HCBD, OCS, HCB and other CBs. Electron capture detection for sample analysis was used by most participants and mass spectrometric detection were used by two participants. Two participants (G028 and G040) did not provide any information on analytical procedures. Analytical methodology used by participants is summarized in Table 3.

3.2 Data Evaluation

The data submitted by all participants for OCS, HCBD, HCB and other CBs in standard solution and sediments are summarized in Appendix I. Interlaboratory means and standard deviations of these samples were calculated after outliers (marked with a *) were removed by using Grubbs' test (3). To determine accuracy of interlaboratory results, median values were used to compare with the design values. The desin values and interlaboratory medians for OCS, HCBD, HCB and other CBs in standard solution and sediments are summarized in Tables 4-1 and 4-2, respectively.

For the interlaboratory studies of the QA/QC program for GLAP, values determined for test samples in an interlaboratory study, were considered to be satisfactory if they fell within a window of ± 25% of the design value. These criteria of ± 25% are somewhat arbitrary but have been used in other QA/QC programs (2,3). For standard solutions without matrix effect and at the higher concentration levels, these criteria could be a little generous whereas at sub ppb levels and in the presence of a large amount of co-extractive (sediments), these criteria are quite demanding. For the present study, these criteria are used for the evaluation of interlaboratory results for the parameters analyzed in standard solution and sediments.

Comparison of the interlaboratory medians with design values for standard solution (Table 4-1) showed that agreement for all twelve parameters was excellent with the deviations within ± 10% of the design values. Interlaboratory results for the sediment samples showed that wide deviations existed while the magnitude of the deviations varied for the different sediment samples and for the different parameters and in most cases were greater than those for the standard solution. This was to be expected because analysis of sediment samples involved more tedious sample preparation steps such as extraction, concentration and cleanup. As shown in Table 4-2, interlaboratory medians of eight out of twelve parameters studied for all four sediment samples were satisfactory with the deviations within ± 25% of the design values. The other four parameters, namely, 1,3-DCB, 1,3,5-TCB, 1,2,3,4-TeCB and HCBD, were less satisfactory with the deviations exceeding ± 25% for some sediment samples. The range and average values of percent recoveries of interlaboratory medians for the parameters studied in standard solution and sediments are summarized in Table 5.

Interlaboratory precision for the twelve selected chlorinated hydrocarbons, expressed as the relative standard deviation (RSD) is given in Table 6. As can be seen from the table, the interlaboratory precision for standard solution was better than those of the sediment samples. Results of standard solution indicate that five out of twelve parameters outside the ± 25% range. While results for all twelve parameters in sediments have RSD outside the range of ± 25%.

3.3 Comparison of Laboratory Performance

For detailed evaluation of each laboratory, submitted results were calculated for the percent recoveries for each parameter based on the design values. When the design values were not available for the parameters in a particular sediment, the interlaboratory medians were used for the calculation. These results are summarized in Appendix II. As described previously, the ± 25% of the design value was set as the satisfactory range. Outside the satisfactory range, the results were flagged very high (VH), high (H), low (L) or very low (VL) accordingly as shown below:

% Recovery	Flag
≥ 150%	Very High (VH)
149% - 125%	High (H)
124% - 76%	Satisfactory (S)
75% - 51%	Low (L)
≤ 50%	Very Low (VL)

The results for each laboratory's appraisal for flags is given in appendix III. Summaries of flags in standard solution and sediments for the study G-2, obtained from the Tables in Appendix III, are given in Tables 7-1 and 7-2, respectively. In the calculation of the number of results flagged in Tables 7-1 and 7-2, a very high or very low flag was counted as on flag while a high or low flag was counted as half a flag. Results of "not detected" (ND) were not used for calculation of flags if the detection limits were higher than the design values. When the detection limits were lower than 50% of their design values, the ND results were flagged as very low.

To compare the overall laboratory performance in this study, the key step was the selection of an acceptance criterion as performance index. The criterion used for this report was the %flags within a study and this criterion was designated as the performance index. This criterion was used in the UGLCCS (Upper Great Lakes connecting Channel Study) and CEPA (Canadian Environmental Protection Act) QA programs for comparison of the relative laboratory performance for organic parameters (4,5). It provides a simple way to evaluate laboratory performance as shown below:

Performance Index	Comment
≤ 25%	Satisfactory
26% - 50%	Moderate
≥ 51%	Poor

Results of performance index for each individual laboratory in this study are also given in Tables 7-1 and 7-2 for standard solution and sediments, respectively. For the standard solution, eleven out of fourteen participating laboratories had satisfactory performance and only one laboratory had poor performance (Table 7-1). For the sediment samples, in contrast, only two out of fourteen participating laboratories demontrated satisfactory performance and five laboratories were rated poor performance (Table 7-2). As expected, the laboratory performance of the sediment samples which involved more tedious sample preparation steps was less satisfactory than for the standard solution. It is recommended that available sediment reference materials such as EC-2 and EC-3 be used in in-house and interlaboratory quality control studies to improve data quality on a long term basis.

ACKNOWLEDGEMENT

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Table 1. List of the participating laboratories.

Federal Government:

1. Environment Canada
   Lake Research Branch
   National Water Research Institute
   Burlington, Ontario

Provincial Governmnets:

2. Environment Quebec
   Ste-Foy, Quebec

3. Environment Quebec
   Laval, quebec

4. Alberta Agriculture
   Food Laboratory Services Branch
   Edmonton, Alberta

5. Environment Ontario
   Rexdale, Ontario

Private Laboratories:

6. Enviroclean
   London, Ontario

7. Walker Laboratories
   Thorold, Ontario

8. Research & Productivity Council
   Fredericton, N.B.

9. Zenon Environmental Laboratories
   Burlington, Ontario

10. Zenon Environmental Laboratories
    Burnaby, B.C.

11. Axys Analytical Services Ltd.
    Sidney, B.C.

12. ASL Analytical Services Laboratories Ltd.
    Vancouver, B.C.

13. Barringer Laboratories Ltd.
    Mississauga, Ontario

14. Gore & Storrie Ltd.
    Toronto, Ontario

Table 2. Samples distributed in study G-2.

Sample No.	Description
1	Mixed standard solution, CH-3S
2	Freeze-dried sediment RM, EC-7
3	Freeze-dried sediment CRM,EC-2
4	Same as sample #2
5	Same as sample #3

Table 3. Analytical methodology used by participating Laboratories.

Lab	Extraction Method	Solvent System	Cleanup	Evaporation Technique	Detection	
					Separation	Measurement
G006	Shaker	1:1 acetone/hexane	1% deactivated florisil column	Kuderna-Danish Apparatus; N_2 Evaporation	Dual capillary columns, DB-5 and DB-17, 30 m x 0.25 mm i.d. x 0.25μm film, each	GC/ECD
G009	Soxhlet	Dichloromethane	Activated florisil column	Nitrogen evaporation	Dual capillary columns 25 m HP17 and 25 m Ultra-2	GC/ECD
G016A	Shaking	10:3 hexane/acetone	Florisil column; activated copper	Nitrogen evaporation	DB-5, 30 m x 0.25 mm x 0.25 μm phase thickness	GC/ECD
G017	Mixing	1:1 hexane/acetone	Florisil column	Rotary evaporation	Dual columns, DB-1 and DB-1701, 30 m x 0.25 mm i.d. x 0.25 μm film thickness, each	GC/ECD
G020	Soxhlet	Methylene chloride			DB-5, 30 m x 0.25 mm i.d.	GC/MSD (SIM mode)
G023	Shaking	Petroleum ether	5% deactivated florisil	Rotary evaporation	DB-5, 30 m x 0.325 mm i.d. x 1 μm coating	GC/ECD
G025	Sonicator	Benzene	No		DB-5, 30 m x 0.53 mm i.d. x 1.5 μm film thickness	GC/ECD

Table 3. Analytical methodology used by participating laboratories (continued).

Lab	Extraction Method	Solvent System	Cleanup	Evaporation Technique	Detection	
					Separation	Measurement
G029	Soxhlet	Methylene chloride	3% silica gel/ sodium sulphate		Dual DB-1701	GC/ECD
G030		2:1 methylene chloride/methanol	Florisil column		DB-5 capillary column	GC/ECD
G034	Steam distillation		Activated copper turnings	Nitrogen evaporation		GC/MS and GC/ECD
G035	Soxhlet	1:1 hexane/dichloromethane	Silica gel SPE cartridge	Nitrogen evaporation	DB-5 and DB-608; 30 m x 0.32 mm i.d., each	GC/ECD
G041	Soxhlet	Dichloromethane	Silica gel and mercury	Rotary evaporator	HP-1 and Rtx-1701	GC/ECD

Table 4-1. **Design values and interlaboratory medians for OCS, HCBD, HCB and other chlorobenzenes in standard solution (all values are in ng/mL).**

Parameter	Sample #1	
	Design value	Interlab. Median
1,4-DCB	180	161.9 (90.0)
1,3-DCB	150	136.8 (91.2)
1,2-DCB	120	128.2 (106.8)
1,3,5-TCB	40	41.5 (103.8)
1,2,4-TCB	80	86.4 (109.0)
1,2,3-TCB	40	44.0 (110.0)
1,2,4,5-TeCB	20	20.7 (103.5)
1,2,3,4-TeCB	20	20.5 (102.5)
PeCB	20	19.0 (95.0)
HCB	20	19.4 (97.0)
HCBD	20	20.0 (100.0)
OCS	20	18.6 (93.0)

Note: The numbers in parentheses are the deviations froom the design values, expressed as "percent recovery".

Table 4-2. Design values and interlaboratory medians for OCS,HCBD, HCB and other chlorobenzenes in sediments (all values are in ng/g).

Parameter	Samples # 2 & 4			Samples # 3 & 5		
	Design value	Interlab. medians		Design value	Interlab medians	
1,4-DCB	NA	21.5	20.9	59	56.8 (96.3)	66.7 (113.1)
1,3-DCB	NA	4.1	5.5	78	53.5 (68.6)	48.5 (62.2)
1,2-DCB	NA	7.0	12.7	10	11.0 (110.0)	10.0 (100.0)
1,3,5-TCB	16.5	12.7 (77.0)	11.6 (70.3)	34.3	28.5 (83.1)	25.0 (72.9)
1,2,4-TCB	5.4	6.0 (111.1)	4.8 (88.9)	80.7	61.1 (75.7)	64.7 (80.2)
1,2,3-TCB	NA	4.0	NC	5	5.7 (114.0)	5.7 (114.0)
1,2,4,5-TeCB	20.0	17.4 (87.0)	16.7 (83.5)	84.0	82.4 (98.1)	75.1 (89.4)
1,2,3,4-TeCB	0.9	1.6 (177.8)	1.5 (166.7)	36.5	32.0 (87.7)	32.1 (87.9)
PeCB	8.5	10.0 (117.6)	8.9 (104.7)	48.6	47.6 (97.9)	49.5 (101.9)
HCB	59.7	55.6 (93.1)	52.8 (88.4)	201	183.5 (91.3)	173.0 (86.1)
HCBD	10.5	7.4 (70.5)	6.9 (65.7)	21.3	15.0 (70.4)	17.0 (79.8)
OCS	18.8	16.0 (85.1)	16.4 (87.2)	33	26.6 (80.6)	28.0 (84.8)

Note: The numbers in parentheses are the deviations from the design values, expressed as "percent recovery".

Table 5. **Range and average values of percent recvoveries of interlaboratory medians for OCS, HCBD, HCB and other chlorobenzenes in standard solution and sediments.**

Parameter	Standard Solution		Sediments	
	Range	Average	Range	Average
1,4-DCB	-	89.9 (1)	96.3 - 113.1	104.7 (2)
1,3-DCB	-	91.2 (1)	62.2 - 68.6	65.4 (2)
1,2-DCB	-	106.8 (1)	100.0 -110.0	105.0 (2)
1,3,5-TCB	-	103.8 (1)	70.3 - 83.1	75.8 (4)
1,2,4-TCB	-	108.0 (1)	75.7 - 111.1	89.0 (4)
1,2,3-TCB	-	110.0 (1)	114.0 -114.0	114.0 (2)
1,2,4,5-TeCB	-	103.5 (1)	83.5 - 98.1	89.5 (4)
1,2,3,4-TeCB	-	102.5 (1)	87.7 - 177.8	130.0 (4)
PeCB	-	95.0 (1)	97.9 - 117.6	105.5 (4)
HCB	-	97.0 (1)	86.1 - 93.1	89.7 (4)
HCBD	-	100.0 (1)	65.7 - 79.8	71.6 (4)
OCS	-	93.0 (1)	80.6 - 87.2	84.4 (4)

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

Table 6. **Range and average values of RSD* of interlaboratory results for OCS, HCBD, HCB and other chlorobenzenes in standard solution and sediments.**

Parameter	Standard Solution		Sediments	
	Range	Average	Range	Average
1,4-DCB	-	36.1 (1)	35.2 - 56.4	43.0 (4)
1,3-DCB	-	26.2 (1)	32.7 - 82.1	56.4 (4)
1,2-DCB	-	23.2 (1)	36.1 - 108.7	61.0 (4)
1,3,5-TCB	-	19.5 (1)	21.2 - 35.4	26.6 (4)
1,2,4-TCB	-	18.3 (1)	22.9 - 42.3	35.8 (4)
1,2,3-TCB	-	14.1 (1)	25.6 - 92.7	48.5 (3)
1,2,4,5-TeCB	-	38.0 (1)	50.7 - 60.3	54.9 (4)
1,2,3,4-TeCB	-	20.3 (1)	30.7 - 85.2	53.0 (4)
PeCB	-	18.7 (1)	36.5 - 49.5	42.3 (4)
HCB	-	19.9 (1)	40.5 - 46.2	42.5 (4)
HCBD	-	31.6 (1)	43.6 - 47.6	46.2 (4)
OCS	-	25.5 (1)	46.8 - 55.7	52.6 (4)

Note: The numbers in parentheses are the numbers of samples.
* RSD (relative standard deviation) is expressed as the percent of standard deviation over mean.

Table 7-1. Performance of individual laboratory for standard solution in study G-2.

Lab Code	Flags			Comment
	No. of results reported	No. of results flagged	% flags (Performance Index)	
G006	8	2.0	25.0	Satisfactory
G009	12	3.0	25.0	Satisfactory
G016A	10	1.0	10.0	Satisfactory
G017	9	0.0	0.0	Satisfactory
G020	10	1.0	10.0	Satisfactory
G023	4	2.0	25.0	Satisfactory
G025	12	1.0	8.3	Satisfactory
G028	9	0.5	5.6	Satisfactory
G029	12	8.5	70.8	Poor
G030	2	1.0	50.0	Moderate
G034	12	5.5	45.8	Moderate
G035	10	2.0	20.0	Satisfactory
G040	10	0.0	0.0	Satisfactory
G041	12	1.5	12.5	Satisfactory

Note: VH or VL flag was counted as on flag, while H or L flag was counted as half of a flag.

Table 7-2. Performance of individual laboratory for sediments in study G-2.

Lab Code	Flags			Comment
	No. of results reported	No. of results flagged	% flags (Performance Index)	
G006	28	11.0	39.3	Moderate
G009	47	17.5	37.2	Moderate
G016A	24	15.0	62.5	Poor
G017	33	9.5	28.8	Moderate
G020	40	16.5	41.3	Moderate
G023	16	11.0	68.8	Poor
G025	39	12.0	30.8	Moderate
G028	31	24.5	79.0	Poor
G029	47	35.5	75.5	Poor
G030	8	8.0	100.0	Poor
G034	47	11.5	24.5	Satisfactory
G035	38	10.5	27.6	Moderate
G040	35	7.5	21.4	Satisfactory
G041	40	15.5	38.8	Moderate

Note: * VH or VL flag was counted as on flag, while H or L flag was counted as half of a flag.

APPENDIX I

DATA SUMMARY

Table I-1. Results for OCS, HCBD, HCB and other chlorobenzenes in standard solution (Sample #1).

Lab No.	1,4-DCB	1,3-DCB	1,2-DCB	1,3,5-TCB	1,2,4-TCB	1,2,3-TCB	1,2,4,5-TeCB	1,2,3,4-TeCB	PeCB	HCB	HCBD	OCS
	(ng/mL)											
G006	NA	NA	NA	NA	27*	47	22	25	23	25	22	23
G009	158.7	94.4	134.0	40.0	81.0	37.0	20.3	30.2	16.1	17.0	69.7*	13.1
G016A	130	160	120	NA	100	44	19	NA	17	20	20	19
G017	NA	NA	NA	42.9	84.0	43.1	16.6	18.8	19.0	19.4	18.6	21.6
G020	180	140	160	40	100	40	20	20	18	20	<4000	NA
G023	NA	NA	NA	NA	NA	NA	NA	NA	1.2 *	13.9	10.5	20.8
G025	185	140	140	52	95	48	21	25	22	20	20	18
G028	NA	NA	NA	39	70	44	17	20	20	14	20	16
G029	77.5	77.0	77.0	56.9	59.5	164*	36.8	28.8	27.6	39.8*	5.08	28.9
G030	NA	NA	NA	NA	NA	NA	NA	NA	NA	13.2	NA	13.3
G034	76.2	105.9	86.9	29.7	60.4	26.9	15.1	15.0	14.3	13.8	12.5	13.0
G035	165	185	158	NA	101	43.6	33.4	20.5	16.1	19.3	20.0	NA
G040	NA	136.8	128.2	NA	95.04	44.54	22.73	20.20	19.04	21.6	22.03	18.27
G041	235	115	110	47.3	86.4	46.3	44.3	22.1	20.3	21.0	20.4	23.4
Mean	150.9	128.2	123.8	43.5	84.8	42.2	24.0	22.3	19.4	18.3	17.4	19.0
S.D.	54.44	33.59	28.77	8.47	15.51	5.95	9.13	4.51	3.62	3.65	5.50	4.84
Median	161.9	136.8	128.2	41.5	86.4	44.0	20.7	20.5	19.0	19.4	20.0	18.6
Design	180	150	120	40	80	40	20	20	20	20	20	20

Table I-2. Results for 1,4-dichlorobenzene in sediments.

Lab No.	Sample #2	Sample #3	Sample #4	Sample #5	D.L. for sediments
	(ng/g)				
G006	NA	NA	NA	NA	-
G009	13.9	69.4	10.7	65.4	0.7
G016A	<100	<100	<100	<100	100
G017	NA	NA	NA	NA	-
G020	42	40	27	99	-
G023	NA	NA	NA	NA	-
G025	<10	<10	<10	<10	10
G028	NA	NA	NA	NA	-
G029	21.5	47.8	25.3	47	6.0
G030	NA	NA	NA	NA	-
G034	<2.0	28.1	<2.0	27.6	2.0
G035	<10.0	65.8	<10.0	68.0	10.0
G040	NA	NA	NA	NA	-
G041	<15.0	78.2	16.5	99.3	15.0
Mean	25.8	54.9	19.9	67.7	-
S.D.	14.54	19.30	7.65	28.36	-
Median	21.5	56.8	20.9	66.7	-
Design	NA	59	NA	59	-

Table I-3. Results for 1,3-dichlorobenzene in sediments.

Lab No.	Sample #2	Sample #3	Sample #4	Sample #5	D.L. for sediments
	(ng/g)				
G006	NA	NA	NA	NA	-
G009	2.3	35.2	1.9	33.9	0.7
G016A	<100	<100	<100	<100	100
G017	NA	NA	NA	NA	-
G020	4	76	<4	58	-
G023	NA	NA	NA	NA	-
G025	<10	<10	<10	<10	10
G028	NA	NA	NA	NA	-
G029	9.7	58.7	12.7	47.9	6.0
G030	NA	NA	NA	NA	-
G034	4.1	53.5	5.5	49.1	2.0
G035	28.8*	112	27.6*	115*	10.0
G040	5.239	16.85	-	11.66	-
G041	<10.0	38.3	<10.0	49.1	10.0
Mean	5.1	55.8	6.7	41.6	-
S.D.	2.79	31.17	5.50	16.59	-
Median	4.1	53.5	5.5	48.5	-
Design	NA	78	NA	78	-

Table I-4. Results for 1,2-dichlorobenzene in sediments.

Lab No.	Sample #2	Sample #3	Sample #4	Sample #5	D.L. for sediments
	(ng/g)				
G006	NA	NA	NA	NA	-
G009	8.3	12.1	13.9	10.3	0.7
G016A	<100	<100	<100	<100	100
G017	NA	NA	NA	NA	-
G020	7	9	<4	10	-
G023	NA	NA	NA	NA	-
G025	<10	11	<10	<10	10
G028	NA	NA	NA	NA	-
G029	9.7	58.7	12.7	47.9*	6.0
G030	NA	NA	NA	NA	-
G034	2.9	4.5	3.4	5.5	2.0
G035	<10.0	13.8	<10.0	14.3	10.0
G040	4.817	10.29	-	7.064	-
G041	ND	ND	ND	ND	10.0
Mean	6.5	17.1	10.0	9.4	-
S.D.	2.72	18.59	5.75	3.39	-
Median	7.0	11.0	12.7	10.0	-
Design	NA	10	NA	10	-

Table I-5. Results for 1,3,5-trichlorobenzene in sediments.

Lab No.	Sample #2	Sample #3	Sample #4	Sample #5	D.L. for sediments
	(ng/g)				
G006	NA	NA	NA	NA	-
G009	12.0	28.5	11.3	24.3	0.1
G016A	NA	NA	NA	NA	-
G017	10.7	30.0	11.6	28.8	1.6
G020	20	37	13	45	-
G023	NA	NA	NA	NA	-
G025	15	26	15	25	5
G028	8.3	27	10	24	2.0
G029	22.9	59.0*	23.4*	60.7*	3.0
G030	NA	NA	NA	NA	-
G034	13.3	32.8	14.6	30.3	1.0
G035	NA	NA	NA	NA	-
G040	NA	NA	NA	NA	-
G041	10.8	17.7	7.0	24.5	0.80
Mean	14.1	28.4	11.8	28.8	-
S.D.	4.99	6.03	2.77	7.53	-
Median	12.7	28.5	11.6	25.0	-
Design	16.5	34.3	16.5	34.3	-

Table I-6. Results for 1,2,4-trichlorobenzene in sediments.

Lab No.	Sample #2	Sample #3	Sample #4	Sample #5	D.L. for sediments
	(ng/g)				
G006	4	16	4	19	3
G009	4.8	61.0	4.6	54.1	0.1
G016A	12	34	11*	37	10
G017	4.0	61.1	4.7	64.4	1.6
G020	9	89	4	95	-
G023	NA	NA	NA	NA	-
G025	5.3	69	5.7	66	5
G028	<2.0	20	3.0	31	2.0
G029	<2.0	66.9	<2.0	65.0	2.0
G030	NA	NA	NA	NA	-
G034	4.7	79.2	5.8	79.5	1.0
G035	6.69	94.0	5.91	94.2	5.0
G040	8.915	57.90	6.733	62.99	-
G041	6.6	54.2	4.8	69.1	0.80
Mean	6.6	58.5	4.9	61.4	-
S.D.	2.63	24.72	1.12	23.37	-
Median	6.0	61.1	4.8	64.7	-
Design	5.4	80.7	5.4	80.7	-

Table I-7. Results for 1,2,3-trichlorobenzene in sediments.

Lab No.	Sample #2	Sample #3	Sample #4	Sample #5	D.L. for sediments
	(ng/g)				
G006	ND	3	ND	4	3
G009	0.5	5.2	0.4	4.0	0.1
G016A	<10	<10	<10	<10	10
G017	<DL	5.5	<DL	5.4	2.4
G020	4	8	<4	9	-
G023	NA	NA	NA	NA	-
G025	<5	6.0	<5	6.0	5
G028	<2.0	<2.0	<2.0	<2.0	2.0
G029	101*	202*	99.1*	209*	3.0
G030	NA	NA	NA	NA	-
G034	<1.0	5.9	<1.0	5.7	1.0
G035	<5.0	5.66	<5.0	5.78	5.0
G040	8.638	6.633	-	6.088	-
G041	<0.60	4.0	<0.60	5.4	0.60
Mean	4.4	5.5	NC	5.7	-
S.D.	4.08	1.44	NC	1.46	-
Median	4.0	5.7	NC	5.7	-
Design	NA	5	NA	5	-

Table I-8. **Results for 1,2,4,5-tetrachlorobenzene in sediments.**

Lab No.	Sample #2	Sample #3	Sample #4	Sample #5	D.L. for sediments
	(ng/g)				
G006	10	24	10	20	2
G009	15.5	69.6	14.6	61.1	0.05
G016A	10	34	12	40	10
G017	9.6	59.2	9.8	57.9	0.8
G020	22	126	19	130	-
G023	NA	NA	NA	NA	-
G025	18	84	17	79	5
G028	4.4	40	6.0	33	1.0
G029	34.6	152	32.7	155	2.5
G030	NA	NA	NA	NA	-
G034	16.8	80.9	20.2	71.2	0.5
G035	31.3	145	28.5	142	5.0
G040	18.88	83.99	16.42	89.55	-
G041	44.6	138	35.7	166	1.0
Mean	19.6	86.4	18.5	87.1	-
S.D.	11.82	44.54	9.38	49.72	-
Median	17.4	82.4	16.7	75.1	-
Design	20.0	84.0	20.0	84.0	-

Table I-9. Results for 1,2,3,4-tetrachlorobenzene in sediments.

Lab No.	Sample #2	Sample #3	Sample #4	Sample #5	D.L. for sediments
	(ng/g)				
G006	ND	22	ND	26	2
G009	0.7	45.5	0.7	37.2	0.05
G016A	NA	NA	NA	NA	-
G017	2.1	29.3	<DL	29.4	0.8
G020	<4	44	<4	46	-
G023	NA	NA	NA	NA	-
G025	<5	32	<5	30	5
G028	<1.0	20	<1.0	14	1.0
G029	3.4	53.0	4.7	56.6	3.0
G030	NA	NA	NA	NA	-
G034	0.9	39.5	1.2	33.3	0.5
G035	<5.0	43.6	<5.0	43.6	5.0
G040	-	27.86	-	31.70	-
G041	1.6	27.6	1.8	32.1	0.30
Mean	1.7	34.9	2.1	34.5	-
S.D.	1.08	10.72	1.79	11.25	-
Median	1.6	32.0	1.5	32.1	-
Design	0.9	36.5	0.9	36.5	-

Table I-10. Results for pentachlorobenzene in sediments.

Lab No.	Sample #2	Sample #3	Sample #4	Sample #5	D.L. for sediments
	(ng/g)				
G006	8	40	8	38	3
G009	7.2	38.4	6.6	34.3	0.01
G016A	7	26	8	26	1
G017	<DL	49.5	8.1	49.5	1.6
G020	12	70	12	68	-
G023	1.2	8.2	1.1	3.5	0.2
G025	19	46	11	58	1
G028	3.6	30	5.2	32	1.0
G029	14.9	63.1	17.9	65.4	0.1
G030	NA	NA	NA	NA	-
G034	9.9	53.4	9.6	55.6	0.2
G035	10.7	49.2	9.69	47.5	2.0
G040	10.01	50.28	9.992	53.62	-
G041	11.2	47.6	8.9	50.2	0.30
Mean	9.6	44.0	8.9	44.7	-
S.D.	4.75	16.05	3.87	17.72	-
Median	10.0	47.6	8.9	49.5	-
Design	8.5	48.6	8.5	48.6	-

Table I-11. Results for hexachlorobenzene in sediments.

Lab No.	Sample #2	Sample #3	Sample #4	Sample #5	D.L. for sediments
	(ng/g)				
G006	42	170	42	170	1
G009	43.5	139.7	41.5	122.6	0.01
G016A	45	94	47	112	1
G017	<DL	215	36.1	211	0.8
G020	104	387	102	362	-
G023	19.9	273	36.9	197	1.0
G025	63	169	57	155	1
G028	15	72	25	70	1.0
G029	721*	698*	93.0	811*	0.1
G030	350*	1750*	510*	1660*	1
G034	57.0	216.4	62.1	157.4	0.2
G035	55.6	186	52.8	176	1.0
G040	65.15	198.2	78.27	211.9	-
G041	69.0	181	59.2	182	0.20
Mean	52.7	191.8	56.4	177.2	-
S.D.	24.37	81.83	22.82	71.72	-
Median	55.6	183.5	52.8	173.0	-
Design	59.7	201	59.7	201	-

Table I-12. Results for hexachlorobutadiene in sediments.

Lab No.	Sample #2	Sample #3	Sample #4	Sample #5	D.L. for sediments
	(ng/g)				
G006	7	15	7	18	1
G009	4.4	9.8	3.4	10.8	0.05
G016A	7	9	7	9	1
G017	7.8	17.1	9.1	19.5	0.8
G020	<200	<1100	<200	<2200	-
G023	ND	ND	3.9	8.4	1.0
G025	7.4	15	6.7	16	1
G028	2.8	9.0	3.3	6.0	1.0
G029	0.2	1.4	0.6	1.5	0.1
G030	NA	NA	NA	NA	-
G034	10.9	19.6	11.4	21.7	0.2
G035	9.77	20.7	8.85	19.0	1.0
G040	10.24	20.17	7.599	17.94	1.0
G041	9.0	13.1	6.6	19.6	0.30
Mean	7.0	13.6	6.3	14.0	-
S.D.	3.30	5.93	3.00	6.52	-
Median	7.4	15.0	6.9	17.0	-
Design	10.5	21.3	10.5	21.3	-

Table I-13. Results for octachlorostyrene in sediments.

Lab No.	Sample #2	Sample #3	Sample #4	Sample #5	D.L. for sediments
	(ng/g)				
G006	16	25	15	28	1
G009	10.1	18.3	9.0	15.2	0.01
G016A	13	18	14	19	2
G017	18.1	17.6	18.4	17.9	0.8
G020	22	26	20	32	-
G023	16.0	50.0	17.8	26.8	1.0
G025	18	52	12	52	1
G028	5.1	21	8.4	20	1.0
G029	47.7	83.2	40.7	79.8	0.1
G030	95*	250*	131*	260*	-
G034	16.3	47.5	17.2	50.3	0.2
G035	14.6	26.6	14.0	24.8	1.0
G040	15.89	32.08	18.79	33.02	-
G041	18.8	41.4	16.4	49.4	0.80
Mean	17.8	35.3	17.1	34.5	-
S.D.	9.91	19.06	8.00	18.56	-
Median	16.0	26.6	16.4	28.0	-
Design	18.8	33	18.8	33	-

APPENDIX II

PERCENT RECOVERY OF OCS, HCBD, HCB AND OTHER CBs IN STANDARD SOLUTION AND SEDIMENTS

TABLE II - 1

% Recovery calculated from the design values and the medians

Lab No. G006

Parameter	% Recovery from Design Value					% Recvoery from Interlb. Median				
	Sample #1	Sample #2	Sample #3	Sample #4	Sample #5	Sample #1	Sample #2	Sample #3	Sample #4	Sample #5
1,4-DCB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-DCB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-DCB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-TCB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-TCB	33.8	74.1	19.8	74.1	23.5	31.3	67.2	26.2	84.2	29.4
1,2,3-TCB	117.5	ND	60.0	ND	80.0	106.8	ND	53.0	ND	70.2
1,2,4,5-TeCB	110.0	50.0	28.6	50.0	23.8	106.5	57.5	29.1	59.8	26.6
1,2,3,4-TeCB	125.0	ND	60.3	ND	71.2	122.0	ND	68.8	ND	81.2
PeCB	115.0	94.1	82.3	94.1	78.2	120.9	80.4	84.0	89.9	76.8
HCB	125.0	70.4	84.6	70.4	84.6	128.9	75.5	92.6	79.6	98.3
HCBD	110.0	66.7	70.4	66.7	84.5	110.0	94.6	100.0	102.9	106.1
OCS	115.0	85.1	75.8	79.8	84.9	123.4	100.0	94.0	91.5	100.0

TABLE II - 2

% Recovery calculated from the design values and the medians

Lab No. G009

Parameter	% Recovery from Design Value					% Recvoery from Interlb. Median				
	Sample #1	Sample #2	Sample #3	Sample #4	Sample #5	Sample #1	Sample #2	Sample #3	Sample #4	Sample #5
1,4-DCB	88.2	64.7	117.6	51.2	110.9	98.1	64.7	122.2	51.2	98.1
1,3-DCB	62.9	56.1	45.1	34.6	43.5	69.0	56.1	65.8	34.6	69.9
1,2-DCB	111.7	118.6	121.0	109.5	103.0	104.5	118.6	110.0	109.5	103.0
1,3,5-TCB	100.0	72.7	83.1	68.5	70.9	96.5	94.9	100.0	97.4	97.2
1,2,4-TCB	101.3	88.9	75.6	85.2	67.0	93.8	80.7	99.9	96.8	83.6
1,2,3-TCB	92.5	12.5	104.0	NC	80.0	84.1	12.5	91.9	NC	70.2
1,2,4,5-TeCB	101.5	77.5	82.9	73.0	72.7	98.3	89.1	84.4	87.4	81.4
1,2,3,4-TeCB	151.0	77.8	124.7	77.9	101.9	147.3	43.8	142.2	46.7	115.9
PeCB	80.5	84.7	79.0	77.7	70.6	84.7	72.3	80.7	74.2	69.3
HCB	85.0	72.9	69.5	69.5	61.0	87.6	78.2	76.1	78.6	70.9
HCBD	348.5	41.9	46.0	32.4	50.7	348.5	59.5	65.3	49.6	63.6
OCS	65.5	53.7	55.5	47.8	46.1	70.3	63.1	68.8	54.9	54.3

TABLE II - 3

% Recovery calculated from the design values and the medians

Lab No. G016A

Parameter	% Recovery from Design Value					% Recvoery from Interlb. Median				
	Sample #1	Sample #2	Sample #3	Sample #4	Sample #5	Sample #1	Sample #2	Sample #3	Sample #4	Sample #5
1,4-DCB	72.2	ND	ND	ND	ND	80.3	ND	ND	ND	ND
1,3-DCB	106.7	ND	ND	ND	ND	117.0	ND	ND	ND	ND
1,2-DCB	100.0	ND	ND	ND	ND	93.6	ND	ND	ND	ND
1,3,5-TCB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-TCB	125.0	222.2	42.1	203.7	45.8	115.7	201.7	55.7	231.6	57.2
1,2,3-TCB	110.0	ND	ND	ND	ND	100.0	ND	ND	ND	ND
1,2,4,5-TeCB	95.0	50.0	40.5	60.0	47.6	92.0	57.5	41.2	71.8	53.3
1,2,3,4-TeCB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PeCB	85.0	82.4	53.5	94.1	53.5	89.4	70.3	54.6	98.9	53.5
HCB	100.0	75.4	46.8	78.7	55.7	103.1	80.9	51.2	89.0	64.7
HCBD	100.0	66.7	42.3	66.7	42.3	100.0	94.6	60.0	102.2	53.0
OCS	95.0	69.2	54.6	74.5	57.6	101.9	81.3	67.7	85.4	67.9

TABLE II - 4

% Recovery calculated from the design values and the medians

Lab No. G017

Parameter	% Recovery from Design Value					% Recvoery from Interlb. Median				
	Sample #1	Sample #2	Sample #3	Sample #4	Sample #5	Sample #1	Sample #2	Sample #3	Sample #4	Sample #5
1,4-DCB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-DCB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-DCB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-TCB	107.3	64.9	87.5	70.3	84.0	103.4	84.6	105.3	100.0	115.2
1,2,4-TCB	105.0	74.1	75.7	87.0	79.8	97.2	67.2	100.1	99.0	99.6
1,2,3-TCB	107.8	ND	110.0	NC	108.0	98.0	ND	97.2	NC	94.7
1,2,4,5-TeCB	83.0	48.0	70.5	49.0	68.9	80.4	55.2	71.8	58.7	77.1
1,2,3,4-TeCB	94.0	233.3	80.3	ND	80.6	91.7	131.3	91.6	ND	91.6
PeCB	95.0	<18.8	101.9	95.3	101.9	99.9	<16.0	104.0	91.0	100.0
HCB	97.0	<1.3	107.0	60.5	105.0	100.0	<1.3	117.2	68.4	122.0
HCBD	93.0	74.3	80.3	96.7	91.6	93.0	105.4	114.0	132.9	114.9
OCS	108.0	96.3	53.3	97.9	54.2	115.9	113.1	66.2	112.2	63.9

TABLE II - 5

% Recovery calculated from the design values and the medians

Lab No. G020

Parameter	% Recovery from Design Value					% Recvoery from Interlb. Median				
	Sample #1	Sample #2	Sample #3	Sample #4	Sample #5	Sample #1	Sample #2	Sample #3	Sample #4	Sample #5
1,4-DCB	100.0	195.4	67.8	129.2	167.8	111.2	195.4	70.4	129.2	148.4
1,3-DCB	93.3	97.6	97.4	ND	74.4	102.3	97.6	142.1	ND	119.6
1,2-DCB	133.3	100.0	90.0	<31.5	100.0	124.8	100.0	81.8	<31.5	100.0
1,3,5-TCB	100.0	121.2	107.9	78.8	131.2	96.5	158.1	129.8	112.1	180.0
1,2,4-TCB	125.0	166.7	110.3	74.1	117.7	115.7	151.3	145.8	84.2	146.8
1,2,3-TCB	100.0	100.0	160.0	NC	180.0	90.9	100.0	141.3	NC	157.9
1,2,4,5-TeCB	100.0	110.0	150.0	95.0	155.0	96.9	126.4	152.8	113.7	173.1
1,2,3,4-TeCB	100.0	ND	120.6	ND	126.0	97.6	ND	137.5	ND	143.3
PeCB	90.0	141.2	144.0	141.2	139.9	94.6	120.5	147.1	134.8	137.4
HCB	100.0	174.2	192.5	170.9	180.1	103.1	187.1	210.9	193.2	209.3
HCBD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
OCS	NA	117.0	78.8	106.4	97.0	NA	137.5	97.7	122.0	114.3

TABLE II - 6

% Recovery calculated from the design values and the medians

Lab No. G023

Parameter	% Recovery from Design Value					% Recvoery from Interlb. Median				
	Sample #1	Sample #2	Sample #3	Sample #4	Sample #5	Sample #1	Sample #2	Sample #3	Sample #4	Sample #5
1,4-DCB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-DCB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-DCB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-TCB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-TCB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-TCB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-TeCB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4-TeCB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PeCB	6.0	14.1	16.9	12.9	7.2	6.3	12.1	17.2	12.4	7.1
HCB	69.5	33.3	135.8	61.8	98.0	71.7	35.8	148.8	69.9	113.9
HCBD	52.5	<9.5	<4.7	37.1	39.4	52.5	<13.5	<6.7	56.9	49.5
OCS	104.0	85.1	151.5	94.7	81.2	111.6	100.0	188.0	108.5	95.7

TABLE II - 7

% Recovery calculated from the design values and the medians

Lab No. G025

Parameter	% Recovery from Design Value					% Recvoery from Interlb. Median				
	Sample #1	Sample #2	Sample #3	Sample #4	Sample #5	Sample #1	Sample #2	Sample #3	Sample #4	Sample #5
1,4-D CB	102.8	<46.5	<16.9	<47.8	<16.9	114.3	<46.5	<17.6	<47.8	<15.0
1,3-DCB	93.3	ND	<12.8	ND	<12.8	102.3	ND	<18.7	ND	<20.6
1,2-DCB	116.7	ND	110.0	ND	ND	109.2	ND	100.0	ND	ND
1,3,5-TCB	130.0	90.9	75.8	90.9	72.9	125.5	118.6	91.2	129.3	100.0
1,2,4-TCB	118.8	98.2	85.5	105.6	81.8	110.0	89.1	113.0	120.0	102.0
1,2,3-TCB	120.0	ND	120.0	NC	120.0	109.9	ND	105.3	NC	105.3
1,2,4,5-TeCB	105.0	90.0	100.0	85.0	94.1	101.7	103.5	101.9	101.7	105.2
1,2,3,4-TeCB	125.0	ND	97.7	ND	82.2	122.0	ND	100.0	ND	93.5
PeCB	110.0	223.5	94.7	129.4	119.3	115.7	190.8	96.6	123.6	117.2
HCB	100.0	105.5	84.1	95.5	77.1	103.1	113.3	92.1	108.0	89.6
HCBD	100.0	70.5	70.4	63.8	75.1	100.0	100.0	100.0	97.8	94.3
OCS	90.0	95.7	157.6	63.8	157.6	96.6	112.5	195.5	73.2	185.7

TABLE II - 8

% Recovery calculated from the design values and the medians

Lab No. G028

Parameter	% Recovery from Design Value					% Recvoery from Interlb. Median				
	Sample #1	Sample #2	Sample #3	Sample #4	Sample #5	Sample #1	Sample #2	Sample #3	Sample #4	Sample #5
1,4-DCB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-DCB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-DCB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-TCB	97.5	50.3	78.7	60.6	70.0	94.1	65.6	94.7	86.2	96.0
1,2,4-TCB	87.5	<37.0	24.8	55.6	38.4	81.0	<33.3	32.8	63.2	47.9
1,2,3-TCB	110.0	ND	ND	NC	<40.0	100.0	<50.0	<35.1	NC	<35.1
1,2,4,5-TeCB	85.0	22.0	47.6	30.0	39.3	82.3	25.3	48.5	35.9	43.9
1,2,3,4-TeCB	100.0	ND	54.8	ND	38.4	97.6	ND	62.5	ND	43.6
PeCB	100.0	42.4	61.7	61.2	65.8	105.2	36.2	63.0	58.4	64.7
HCB	70.0	25.1	35.8	41.9	34.8	72.2	27.0	39.2	47.4	40.5
HCBD	100.0	26.7	42.3	31.4	28.2	100.0	37.8	60.0	48.2	35.4
OCS	80.0	27.1	63.6	44.7	60.6	85.8	31.9	79.0	51.2	71.4

TABLE II - 9

% Recovery calculated from the design values and the medians

Lab No. G029

Parameter	% Recovery from Design Value					% Recvoery from Interlb. Median				
	Sample #1	Sample #2	Sample #3	Sample #4	Sample #5	Sample #1	Sample #2	Sample #3	Sample #4	Sample #5
1,4-DCB	43.1	100.0	81.0	121.1	79.7	47.9	100.0	84.2	121.1	70.5
1,3-DCB	51.3	236.6	75.3	230.9	61.4	56.3	236.6	109.7	230.9	98.8
1,2-DCB	64.2	138.6	587.0	100.0	479.0	60.1	138.6	533.6	100.0	479.0
1,3,5-TCB	142.3	138.8	172.0	141.8	177.0	137.3	181.0	207.0	201.7	242.8
1,2,4-TCB	74.4	<37.0	82.9	<37.0	80.5	68.9	<33.3	109.6	<41.7	100.5
1,2,3-TCB	410.0	2525	4100	NC	4180	327.7	2525	3544	NC	3667
1,2,4,5-TeCB	184.0	173.0	181.0	163.5	184.5	178.2	199.0	184.4	195.7	206.4
1,2,3,4-TeCB	144.0	377.3	145.2	522.2	155.1	140.5	212.5	165.6	313.3	176.3
PeCB	138.0	175.3	129.8	210.6	134.6	145.1	149.7	132.6	201.1	132.1
HCB	1990	1208	347.3	155.8	403.5	205.2	1297	380.4	176.1	468.8
HCBD	25.4	1.9	6.6	5.7	7.0	25.4	2.7	9.3	8.8	8.8
OCS	144.5	253.7	252.1	216.5	241.8	155.0	298.1	312.8	248.2	285.0

TABLE II - 10

% Recovery calculated from the design values and the medians

Lab No. G030

Parameter	% Recovery from Design Value					% Recvoery from Interlb. Median				
	Sample #1	Sample #2	Sample #3	Sample #4	Sample #5	Sample #1	Sample #2	Sample #3	Sample #4	Sample #5
1,4-DCB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-DCB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-DCB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-TCB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-TCB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-TCB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-TeCB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4-TeCB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PeCB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HCB	66.0	586.3	870.6	854.3	825.9	68.0	629.5	953.7	965.9	959.5
HCBD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
OCS	66.7	505.3	757.6	696.8	787.9	71.4	594.8	939.8	798.8	928.6

TABLE II - 11

% Recovery calculated from the design values and the medians

Lab No. G034

Parameter	% Recovery from Design Value					% Recvoery from Interlb. Median				
	Sample #1	Sample #2	Sample #3	Sample #4	Sample #5	Sample #1	Sample #2	Sample #3	Sample #4	Sample #5
1,4-DCB	42.3	<9.3	47.6	<10.0	46.8	47.1	<9.3	49.5	<10.0	41.4
1,3-DCB	70.6	100.0	68.6	100.0	63.0	77.4	100.0	100.0	100.0	101.2
1,2-DCB	72.4	41.4	45.0	26.8	55.0	67.8	41.4	40.9	26.8	55.0
1,3,5-TCB	74.3	80.6	95.6	88.5	88.3	71.7	105.1	115.1	125.9	121.2
1,2,4-TCB	75.5	87.1	98.1	107.4	98.5	69.9	79.0	129.7	122.1	122.9
1,2,3-TCB	67.3	<25.0	118.0	NC	114.0	61.1	<25.0	104.2	NC	100.0
1,2,4,5-TeCB	75.5	84.0	96.3	101.0	84.8	73.1	96.6	98.1	120.9	94.8
1,2,3,4-TeCB	75.0	100.0	108.2	133.3	91.2	73.2	56.3	123.4	80.0	103.7
PeCB	71.5	116.5	109.9	112.9	114.4	75.2	98.4	112.2	107.9	112.3
HCB	69.0	95.5	107.7	104.0	78.3	71.1	102.5	117.9	117.6	91.0
HCBD	62.5	103.8	92.0	108.6	101.9	62.5	147.3	130.7	166.4	127.9
OCS	65.0	86.7	143.9	91.5	152.4	69.7	101.9	178.6	104.9	179.6

TABLE II - 12

% Recovery calculated from the design values and the medians

Lab No. G035

Parameter	% Recovery from Design Value					% Recvoery from Interlb. Median				
	Sample #1	Sample #2	Sample #3	Sample #4	Sample #5	Sample #1	Sample #2	Sample #3	Sample #4	Sample #5
1,4-DCB	91.7	<46.5	111.5	<47.8	115.3	102.0	<46.5	115.9	<47.8	102.0
1,3-DCB	123.3	702.4	143.6	510.8	147.4	135.2	702.4	209.4	510.8	237.1
1,2-DCB	131.7	ND	138.0	ND	143.0	123.2	ND	125.5	ND	143.0
1,3,5-TCB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-TCB	126.3	123.9	116.5	109.4	116.7	116.9	112.4	154.0	124.4	145.6
1,2,3-TCB	109.0	ND	113.2	NC	115.6	99.1	ND	100.0	NC	101.4
1,2,4,5-TeCB	167.0	156.5	172.6	142.5	169.1	161.7	179.9	175.9	170.6	189.1
1,2,3,4-TeCB	102.5	ND	119.5	ND	119.5	100.0	ND	136.3	ND	135.8
PeCB	80.5	125.9	101.2	114.0	97.7	84.7	107.5	103.4	108.9	96.0
HCB	96.5	93.1	92.5	88.4	87.6	99.5	100.0	101.4	100.0	101.7
HCBD	100.0	93.1	97.2	84.3	89.2	100.0	132.0	138.0	129.2	112.0
OCS	NA	77.7	80.6	74.5	75.2	NA	91.3	100.0	85.4	88.6

TABLE II - 13

% Recovery calculated from the design values and the medians

Lab No. G040

Parameter	% Recovery from Design Value					% Recvoery from Interlb. Median				
	Sample #1	Sample #2	Sample #3	Sample #4	Sample #5	Sample #1	Sample #2	Sample #3	Sample #4	Sample #5
1,4-DCB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-DCB	91.2	127.8	21.6	ND	15.0	100.0	127.8	31.5	ND	24.0
1,2-DCB	106.8	68.8	102.9	ND	70.6	100.0	68.8	93.6	ND	70.6
1,3,5-TCB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-TCB	118.8	165.1	71.8	124.7	78.1	110.0	149.8	94.8	141.8	97.4
1,2,3-TCB	111.4	216.0	132.7	NC	121.8	101.2	216.0	117.2	NC	106.8
1,2,4,5-TeCB	113.7	94.4	100.0	82.1	106.6	110.1	108.5	101.9	98.3	119.2
1,2,3,4-TeCB	101.0	ND	76.3	ND	86.8	98.5	ND	87.1	ND	98.8
PeCB	95.2	117.8	103.5	117.6	110.3	100.1	100.5	105.6	112.3	108.3
HCB	108.0	109.1	98.6	131.1	105.4	111.3	117.2	108.0	148.2	122.5
HCBD	110.2	97.5	94.7	72.4	84.2	110.2	138.4	134.5	110.9	105.7
OCS	91.4	84.5	97.2	100.0	100.1	98.2	99.3	120.6	114.6	117.9

TABLE II - 14

% Recovery calculated from the design values and the medians

Lab No. G041

Parameter	% Recovery from Design Value					% Recvoery from Interlb. Median				
	Sample #1	Sample #2	Sample #3	Sample #4	Sample #5	Sample #1	Sample #2	Sample #3	Sample #4	Sample #5
1,4-DCB	130.6	ND	132.5	79.0	168.3	145.2	ND	137.7	79.0	148.9
1,3-DCB	76.7	ND	49.1	ND	63.0	84.1	ND	71.6	ND	101.2
1,2-DCB	91.7	ND	ND	ND	ND	85.8	ND	ND	ND	ND
1,3,5-TCB	118.3	65.5	51.6	42.4	71.4	114.1	85.4	62.1	60.3	98.0
1,2,4-TCB	108.0	122.2	67.2	88.9	85.6	100.0	110.9	88.8	101.1	106.8
1,2,3-TCB	115.8	<15.0	80.0	NC	108.0	105.2	<15.0	70.7	NC	94.7
1,2,4,5-TeCB	221.5	223.0	164.3	178.5	197.6	214.5	256.3	167.4	213.6	221.0
1,2,3,4-TeCB	110.5	177.8	75.6	200.0	88.0	107.8	100.0	86.3	120.0	100.0
PeCB	101.5	131.8	97.9	104.7	103.3	106.7	112.5	100.0	100.0	101.4
HCB	105.0	115.6	90.1	99.2	90.6	108.3	124.1	98.6	112.1	105.2
HCBD	102.0	85.7	61.5	62.9	92.0	102.0	121.6	87.3	96.4	115.5
OCS	117.0	100.0	125.5	87.2	149.7	125.5	117.5	155.6	100.0	176.4

APPENDIX III

LAB-SPECIFIC APPRAAISAL FOR FLAG STATMENTS

GLOSSARY OF TERMS

Codes

VH:	very high
VL:	very low
H:	high
L:	low
S:	Satisfactory
NA:	not analyzed
ND:	not detected
NC:	not calculated

Lab-specific Appraisal for Flag Statement

Lab Code: G006

Parameter	Standard Solution	Sediments
1,4-DCB	NA	NA
1,3-DCB	NA	NA
1,2-DCB	NA	NA
1,3,5-TCB	NA	NA
1,2,4-TCB	VL	2 L; 2VL
1,2,3-TCB	S	1 L
1,2,4,5-TeCB	S	4 VL
1,2,3,4-TeCB	H	2 L
PeCB	S	S
HCB	H	2 L
HCBD	S	3 L
OCS	S	S

Lab-specific Appraisal for Flag Statement

Lab Code: G009

Parameter	Standard Solution	Sediments
1,4-DCB	S	2 L
1,3-DCB	L	1 L; 3 VL
1,2-DCB	S	S
1,3,5-TCB	S	3 L
1,2,4-TCB	S	1 L
1,2,3-TCB	S	1 VL
1,2,4,5-TeCB	S	2 L
1,2,3,4-TeCB	VH	S
PeCB	S	1 L
HCB	S	4 L
HCBD	VH	4 VL
OCS	L	2 L; 2VL

Lab-specific Appraisal for Flag Statement

Lab Code: G016A

Parameter	Standard Solution	Sediments
1,4-DCB	L	ND
1,3-DCB	S	ND
1,2-DCB	S	ND
1,3,5-TCB	NA	NA
1,2,4-TCB	H	2 VH; 2 VL
1,2,3-TCB	S	ND
1,2,4,5-TeCB	NA	NA
1,2,3,4-TeCB	S	2 L
PeCB	S	2 L
HCB	S	1 L; 1 VL
HCBD	S	2 L; 2VL
OCS	S	4 L

Lab-specific Appraisal for Flag Statement

Lab Code: G017

Parameter	Standard Solution	Sediments
1,4-DCB	NA	NA
1,3-DCB	NA	NA
1,2-DCB	NA	NA
1,3,5-TCB	S	2 L
1,2,4-TCB	S	1 L
1,2,3-TCB	S	S
1,2,4,5-TeCB	S	2 L; 2 VL
1,2,3,4-TeCB	S	1 VH
PeCB	S	1 ND(VL)
HCB	S	1 ND(VL)
HCBD	S	1 L
OCS	S	2 L

Lab-specific Appraisal for Flag Statement

Lab Code: G020

Parameter	Standard Solution	Sediments
1,4-DCB	S	1 H; 2 VH; 1 L
1,3-DCB	S	1 L
1,2-DCB	H	1 ND (VL)
1,3,5-TCB	S	1 H
1,2,4-TCB	H	1 VH; 1 L
1,2,3-TCB	S	2 VH
1,2,4,5-TeCB	S	2 V H
1,2,3,4-TeCB	S	1 H
PeCB	S	4 H
HCB	S	4 VH
HCBD	ND	ND
OCS	NA	S

Lab-specific Appraisal for Flag Statement

Lab Code: G023

Parameter	Standard Solution	Sediments
1,4-DCB	NA	NA
1,3-DCB	NA	NA
1,2-DCB	NA	NA
1,3,5-TCB	NA	NA
1,2,4-TCB	NA	NA
1,2,3-TCB	NA	NA
1,2,4,5-TeCB	NA	NA
1,2,3,4-TeCB	NA	NA
PeCB	VL	4 VL
HCB	L	1 H; 1 L; 1 VL
HCBD	L	2 ND(VL); 2 VL
OCS	S	1 VH

Lab-specific Appraisal for Flag Statement

Lab Code: G025

Parameter	Standard Solution	Sediments
1,4-DCB	S	4 ND(VL)
1,3-DCB	S	2 ND(VL)
1,2-DCB	S	S
1,3,5-TCB	H	1 L
1,2,4-TCB	S	S
1,2,3-TCB	S	S
1,2,4,5-TeCB	S	S
1,2,3,4-TeCB	H	S
PeCB	S	1 VH; 1 H
HCB	S	S
HCBD	S	3 VL
OCS	S	2 VH; 1L

Lab-specific Appraisal for Flag Statement

Lab Code: G028

Parameter	Standard Solution	Sediments
1,4-DCB	NA	NA
1,3-DCB	NA	NA
1,2-DCB	NA	NA
1,3,5-TCB	S	3 L
1,2,4-TCB	S	2 ND(VL); 2 L; 1 VL
1,2,3-TCB	S	3 ND(VL)
1,2,4,5-TeCB	S	4 VL
1,2,3,4-TeCB	S	1 L; 1 VL
PeCB	S	3 L; 1 VL
HCB	L	4 VL
HCBD	S	4 VL
OCS	S	2 L; 2 VL

Lab-specific Appraisal for Flag Statement

Lab Code: G029

Parameter	Standard Solution	Sediments
1,4-DCB	VL	S
1,3-DCB	L	2 VH; 1 L
1,2-DCB	L	1 H; 1 VH
1,3,5-TCB	H	2 H; 2 VH
1,2,4-TCB	L	2 ND(VL)
1,2,3-TCB	VH	3 VH
1,2,4,5-TeCB	VH	4 VH
1,2,3,4-TeCB	H	1 H; 3 VH
PeCB	H	2 H; 2VH
HCB	VH	4 VH
HCBD	VL	4 VL
OCS	H	4 VH

Lab-specific Appraisal for Flag Statement

Lab Code: G030

Parameter	Standard Solution	Sediments
1,4-DCB	NA	NA
1,3-DCB	NA	NA
1,2-DCB	NA	NA
1,3,5-TCB	NA	NA
1,2,4-TCB	NA	NA
1,2,3-TCB	NA	NA
1,2,4,5-TeCB	NA	NA
1,2,3,4-TeCB	NA	NA
PeCB	NA	NA
HCB	L	4 VH
HCBD	NA	NA
OCS	L	4 VH

Lab-specific Appraisal for Flag Statement

Lab Code: G034

Parameter	Standard Solution	Sediments
1,4-DCB	VL	2 ND(VL); 2 VL
1,3-DCB	L	2 L
1,2-DCB	L	1 L; 3 VL
1,3,5-TCB	L	S
1,2,4-TCB	S	S
1,2,3-TCB	L	1 ND(VL)
1,2,4,5-TeCB	S	S
1,2,3,4-TeCB	L	1 H
PeCB	L	S
HCB	L	S
HCBD	L	S
OCS	L	1 H; 1 VH

Lab-specific Appraisal for Flag Statement

Lab Code: G035

Parameter	Standard Solution	Sediments
1,4-DCB	S	2 ND(VL)
1,3-DCB	S	2 H; 2VH
1,2-DCB	H	2 H
1,3,5-TCB	NA	NA
1,2,4-TCB	H	S
1,2,3-TCB	S	S
1,2,4,5-TeCB	VH	1 H; 3 VH
1,2,3,4-TeCB	S	S
PeCB	S	1 H
HCB	S	S
HCBD	S	S
OCS	NA	1 L

Lab-specific Appraisal for Flag Statement

Lab Code: G040

Parameter	Standard Solution	Sediments
1,4-DCB	NA	NA
1,3-DCB	S	1 H; 2 VL
1,2-DCB	S	2 L
1,3,5-TCB	NA	NA
1,2,4-TCB	S	1 VH; 1 L
1,2,3-TCB	S	1 H; 1VH
1,2,4,5-TeCB	S	S
1,2,3,4-TeCB	S	S
PeCB	S	S
HCB	S	1 H
HCBD	S	1 L
OCS	S	S

Lab-specific Appraisal for Flag Statement

Lab Code: G041

Parameter	Standard Solution	Sediments
1,4-DCB	H	1 H; 1 VH
1,3-DCB	S	1 L; 1 VL
1,2-DCB	S	S
1,3,5-TCB	S	3 L; 1 VL
1,2,4-TCB	S	1 L
1,2,3-TCB	S	1 ND(VL)
1,2,4,5-TeCB	VH	4 VH
1,2,3,4-TeCB	S	2 VH
PeCB	S	1 H
HCB	S	S
HCBD	S	2 L
OCS	S	2 H

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