NATIONAL WATER RESEARCH INSTITUTE

INSTITUT NATIONAL de RECHERCHE sur les EAUX



# INTERLABORATORY STUDY NO. G-3: ANALYSIS OF SELECTED CHLORINATED HYDROCARBONS IN SEDIMENTS

W.C. Li, A.S.Y. Chau, S. Humphrey and I. Orchard

NWRI Contribution No. 94-73

# INTERLABORATORY STUDY NO. G-3: ANALYSIS OF SELECTED CHLORINATED HYDROCARBONS IN SEDIMENTS

W.C. Li, A.S.Y. Chau, S. Humphrey [1]
and I. Orchard[1]

Aquatic Ecosystem Protection Branch

National Water Research Institute

Burlington, Ontario L7R 4A6

[1] Environment Canada

Ontario Region

Toronto, Ontario M4T 1M2

NWRI Contribution No. 94-73

## 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 sediment 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-3) will help to establish the degree of comparability of interlaboratory results among participating laboratories.

## SOMMAIRE À L'INTENTION DE LA DIRECTION

L'hexachlorobutadiène (HCBD), l'octachlorostyrène (OCS), l'hexachlorobenzène (HCB) et d'autres chlorobenzènes (CB) étaient présents dans le delta de la rivière Sainte-Clair lors de l'UGLCCS («Upper Great Lakes Connecting Channels Study»). L'étude de suivi relative au nettoyage des sédiments contaminés des zones visées a été effectuée sous les auspices du Plan d'action des Grands Lacs (PAGL).

L'efficacité du PAGL dépend du nombre et de la fiabilité des données scientifiques. Pour aider les gestionnaires de projets et les organismes de réglementation à s'assurer de la validité des données analytiques, on a mis au point et entrepris une série d'études interlaboratoires pour l'analyse d'hydrocarbures chlorés sélectionnés, présents dans les sédiments, et notamment l'HCBD, l'OCS, l'HCB et d'autres CB. La présente étude permettra d'évaluer le degré de comparabilité des résultats interlaboratoires parmi les 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-3) for the analysis of selected chlorinated hydrocarbons in sediments was designed and conducted. Nineteen laboratories were sent seven test samples including one standard solution, two sediment extracts and four naturally contaminated sediments. Each laboratory was requested to analyze HCBD, OCS, HCB and other CBs in all test samples. Fourteen out of nineteen 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 extract and sediment results were, however, less satisfactory. In each case four out of twelve parameters had deviations exceeding ± 25%.

For overall laboratory performance, all fourteen laboratories submitted satisfactory results for standard solution while for sediment extract and sediment samples, only three and two laboratories respectively provided satisfactory results

## RÉSUMÉ

On a mis au point et entrepris une série d'études (G-3) interlaboratoires pour l'analyse d'hydrocarbures chlorés sélectionnés, présents dans les sédiments, dans le cadre du programme d'assurance de la qualité/contrôle de la qualité (AQ/CQ) pour les sédiments, sous les auspices du Plan d'action des Grands Lacs (PAGL). Dix-neuf laboratoires ont ainsi reçu sept échantillons à analyser, incluant une solution étalon, deux extraits de sédiments et quatre spécimens de sédiments contaminés naturellement. On a demandé à chaque laboratoire d'analyser tous les échantillons pour le HCBD, l'OCS, le HCB et d'autres CB. Sur les dix-neuf laboratoires sollicités, quatorze ont envoyé des résultats.

Les résultats interlaboratoires pour les hydrocarbures chlorés présents dans la solution étalon étaient satisfaisants, en effet les valeurs médianes pour tous les paramètres se situaient à moins de 10 % de leur valeur nominale. Les résultats pour les extraits de sédiments et les sédiments étaient, cependant, moins bons. Dans chaque cas, quatre sur douze paramètres présentaient des écarts qui dépassaient ± 25 %.

En ce qui concerne le rendement global des laboratoires, tous les quatorze ont fourni des résultats satisfaisants pour la solution étalon, alors que pour les échantillons de sédiments et d'extraits de sédiments, seuls deux et trois laboratoires respectivement ont fourni des résultats acceptables.

# 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 of Environmental Protection - Ontario Region as part of Great Lakes Action Plan. The objectives of this program were (1) to prepare sediment reference standards and 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 Project 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-3, was distributed on January 13, 1992. 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, 1,3,5-TCB, 1,2,4-TCB, 1,2,3,-TCB, 1,2,4,5-TeCB, 1,2,3,4-TeCB and PeCB), in standard solution, sediment

extracts and naturally contaminated sediment samples. The original deadline for reporting results was on February 28, 1992. However, most laboratories were late in reporting, so the study was closed March 15, 1992. 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-3) for the analysis of HCBD, OCS, HCB and other CBs in standard solution, sediment extracts and sediments was initiated in November, 1991. About 70 governmental, industrial and private laboratories were invited to participate. From the returned questionnaires, nineteen laboratories expressed interest to participate in this study. By the time the study was closed, fourteen out of nineteen participants had submitted results. The list of participants is given in Table 1.

The study consists of seven 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 and 3 were blind duplicates sediment extracts in acetone. While samples #4 to 7 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, one pairs of blind duplicates was 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.

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 systems included mixtures of acetone and hexane, acetone and dichloromethane, dichloromethane alone, petroleum ether or benzene. Solvent was evaporated by using rotovap, Kuderna-Danish evaporator, Synder column or nitrogen evaporation with a water bath. Cleanup of sediment extracts was achieved by adsorption chromatography using silica gel, florisil or alumina. 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 one participant (G034). One participant (G003) 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, sediment extract 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 design values and interlaboratory medians for OCS, HCBD, HCB and other CBs in standard solution, sediment extracts and sediments are summarized in Tables 4-1, 4-2 and 4-3, 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 [4,5]. 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 (sediment extracts and 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, sediment extracts and sediments.

Comparison of the interlaboratory medians with design values for standard solution (Table 4-1) showed that agreement for ten out of twelve parameters was excellent with the deviations within ± 10% of the design values while two other parameters (1,4-DCB and 1,2-DCB) were within ± 15% of the design values. Interlaboratory results for the sediment

extract and sediment samples showed that wide deviations existed while the magnitude of the deviations varied for the different 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 and sediment extract samples involved more tedious sample preparation steps such as extraction, concentration and cleanup. As shown in Table 4-2, interlaboratory medians of seven out of eleven parameters studied (1,2-DCB was not calculated) for two sediment extract samples (blind duplicates) were satisfactory with the deviations falling within ±25% of the design values. However, as shown in Table 4-3, only two out of twelve parameters were satisfactory when all four sediment samples were considered with the deviations within ± 25% of the design values. The range and average values of percent recoveries of interlaboratory medians for the parameters studied in standard solution, sediment extracts and sediments are summarized in Table 5. Since different sediment samples contained various concentrations for these parameters, the average values of percent recoveries of interlaboratory medians were used for the evaluation of interlaboratory performance of sediment results. Eight out of twelve parameters were satisfactory with the deviations within ±25% of the design values. The other four parameters, namely, 1,3-DCB, 1,2-DCB, 1,2,3-TCB and 1,2,4,5-TeCB, were less satisfactory with the deviations exceeding ±25% of the design values.

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

for all twelve parameters in sediment extract and sediment samples 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, sediment extracts and sediments for the study G-3, obtained from the Tables in Appendix III, are given in Tables 7-1, 7-2 and 7-3, respectively. In the calculation of the number of results flagged in Tables 7-1 to 7-3, a very high or very low flag was counted as one flag while a high or low flag was counted as half a flag. Results of "not detected" (N) 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 appropriate performance index. The performance index used for this report was the %flags within a study. This index 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 through acceptance criteria which are shown below:

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

Results of performance index for each individual laboratory in this study are given in Tables 7-1, 7-2 and 7-3 for standard solution, sediment extracts and sediments, respectively. For the standard solution, all fourteen participating laboratories had satisfactory performance rating. In contrast, only three out of fourteen participants for sediment extracts and two participants for sediment samples demonstrated satisfactory performance. Seven participants for sediment extracts and five particpants for sediment samples had poor performance (Table 7-2). As expected, the laboratory performance of the sediment extract and sediment samples which involved more tedious sample preparation steps was less satisfactory than that for the standard solution. It should be also noted that lab G30 had satisfactory performances for standard solution, sediment extracts and sediments, but submitted only one (HCB) of twelve parameters requested. Compared to a previous study, G-2 [6], there was an improvement in the performance of the

standard solution since all laboratories demonstrated satisfactory performance. However, similar performance was obtained for the sediment samples as that in G-2. Thus for analysis of sediment samples for OCS, HCBD and CBs, 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**

The authors are grateful to the participating laboratories for the time and effort devoted to analyze the test samples and reporting the results. This interlaboratory study would not be successful without their active participation and cooperation.

## REFERENCES


1. Management Committee, UGLCCS. 1988. "Final report of the Upper Great Lakes Connecting Channel Study, Volume II", p 223-334.

2. Orchard, I. 1991. Private Communication.

3. Grubbs, F.E. 1969. Procedures for detecting outlying observations in samples. Technometrics, Vol. II, P 1-21.

4. Li, W.C., A.S.Y. Chau, H.B. Lee and E. Kokotich. 1990. Summary report for UGLCC interlaboratory studies on the analysis of chlorinated hydrocarbons in standard solutions, water and sediment samples. NWRI Contribution 90-122.

5. Li, W.C. and A.S.Y. Chau. 1991. CEPA national interlaboratory comparison study (CP-1): analysis of chlorophenols in standard solution and sediment extracts. NWRI Contribution 91-105.

6. Li, W.C., A.S.Y. Chau, S. Humphrey and I. Orchard. 1994. Interlaboratory study No. G-2: analysis of selected chlorinated hydrocarbons in sediments. NWRI Contribution 94-63.

**Table 1. List of the participating laboratories.**

Federal Government:

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

2. Dept. of Fisheries & Oceans
   Winnipeg, Manitoba

Provincial Governments:

3. Environment Quebec
   Ste-Foy, Quebec

4. Alberta Agriculture
   Food Laboratory Services Branch
   Edmonton, Alberta

Private Laboratories:

5. Enviroclean
   London, Ontario

6. Walker Laboratories
   Thorold, Ontario

7. Novalab Ltd.
   Lachine, Quebec

8. Mann Testing Laboratories Ltd.
   Mississauga, Ontario

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. Eli Eco Logic International Inc.
    Rockwood, Ontario

14. Gore & Storrie Ltd.
    Toronto, Ontario

**Table 2. Samples distributed in study G-3.**

| Sample No. | Description |
|---|---|
| 1 | Mixed standard solution, CH-3S |
| 2 | Sediment extract RM, SE-21 |
| 3 | Same as sample #2 |
| 4 | Freeze-dried sediment RM, EC-6 |
| 5 | Freeze-dried sediment RM, EC-7 |
| 6 | Freeze-dried sediment CRM, EC-3 |
| 7 | Same as sample #6 |

Table 3. Analytical methodology used by participating Laboratories.

| Lab | Extraction Method | Solvent System | Cleanup | Evaporation Technique | Detection | |
|---|---|---|---|---|---|---|
| | | | | | Separation | Measurement |
| G005 | Shaker | 1:2 acetone/hexane | Florisil column | Rotary evaporation | Dual capillary columns, DB-5 and DB-17, 30 m x 0.25 mm i.d., each | GC/ECD |
| 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 | Rotary evaporation; Nitrogen evaporation | Dual capillary columns 25 m HP17 and 25 m Ultra-2 | GC/ECD |
| G014 | Soxhlet | Dichloromethane | Florisil column | | DB-5, 60 m x 0.25 mm i.d. | GC/ECD |
| G016A | Shaking | 80:20 hexane/methylene chloride | 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 |
| G023 | Shaking | Petroleum ether | Florisil column | Rotary evaporation | DB-5, 30 m x 0.325 mm i.d. x 1 μm coating | GC/ECD |

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

| Lab | Extraction Method | Solvent System | Cleanup | Evaporation Technique | Detection | |
|---|---|---|---|---|---|---|
| | | | | | Separation | Measurement |
| G024 | Soxhlet | Dichloromethane | Activated copper; 40% $H_2SO_4$ silica & 5% deactivated florisil | Synder column | DB-5 and DB-17, 30 m x 0.25 mm i.d. x 0.25 µm film, each | GC/ECD |
| G029 | Soxhlet | 60:40 acetone/hexane | 3% silica gel | | DB-1 & DB-1701 | GC/ECD |
| G030 | | 2:1 methylene chloride/methanol | Florisil column | | DB-17 capillary column | GC/ECD |
| G034 | Steam distillation | | Activated copper | Nitrogen evaporation | DB-5, 60 m | GC/MS |
| G035 | Soxhlet | Acetonitrile | Alumina column; Hg treatment | | 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 DB-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 | 155.7 (86.5) |
| 1,3-DCB | 150 | 143.5 (95.7) |
| 1,2-DCB | 120 | 140.0 (116.7) |
| 1,3,5-TCB | 40 | 42.3 (105.8) |
| 1,2,4-TCB | 80 | 78.7 (98.4) |
| 1,2,3-TCB | 40 | 39.9 (99.8) |
| 1,2,4,5-TeCB | 20 | 19.0 (95.0) |
| 1,2,3,4-TeCB | 20 | 20.8 (104.0) |
| PeCB | 20 | 18.4 (92.0) |
| HCB | 20 | 20.0 (100.0) |
| HCBD | 20 | 20.2 (101.0) |
| OCS | 20 | 19.0 (95.0) |

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

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

| Parameter | Sample #2 & 3 | | |
|---|---|---|---|
| | Design value | Interlab. Median | |
| 1,4-DCB | 13.4 | 13.2 (98.5) | 12.4 (92.5) |
| 1,3-DCB | 12.8 | 7.2 (56.3) | 8.3 (64.8) |
| 1,2-DCB | 10.1 | NC | NC |
| 1,3,5-TCB | 30.3 | 34.1 (112.5) | 35.0 (115.6) |
| 1,2,4-TCB | 8.6 | 13.9 (161.2) | 16.8 (195.3) |
| 1,2,3-TCB | 2.1 | 4.2 (200.0) | 3.0 (142.9 ) |
| 1,2,4,5-TeCB | 38.2 | 34.0 (89.0) | 35.8 (93.7) |
| 1,2,3,4-TeCB | 1.7 | 3.3 (194.1) | 3.3 (194.1) |
| PeCB | 22.5 | 22.5 (100.0) | 23.4 (104.0) |
| HCB | 125.8 | 116.0 (92.2) | 124.0 (96.9) |
| HCBD | 19.9 | 20.1 (101.0) | 21.4 (107.5) |
| OCS | 39.2 | 30.0 (76.5) | 34.5 (88.0) |

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

**Table 4-3. Design values and interlaboratory medians for OCS, HCBD, HCB and other chlorobenzenes in sediments (all values are in ng/g).**

| Parameter | Sample #4 | | Sample #5 | | Samples #6 & 7 | | |
|---|---|---|---|---|---|---|---|
| | Design value | Interlab. medians | Design value | Interlab. medians | Design value | Interlab. medians | |
| 1,4-DCB | NA | 15.0 | NA | 18.7 | 107 | 83.6 (78.1) | 84.8 (79.3) |
| 1,3-DCB | NA | 15.8 | NA | 3.0 | 99 | 63.0 (63.6) | 68.0 (68.7) |
| 1,2-DCB | NA | NC | NA | 4.9 | 16 | 19.0 (118.8) | 21.7 (135.6) |
| 1,3,5-TCB | 1.9 | 2.2 (115.8) | 16.5 | 14.5 (87.9) | 98 | 74.0 (75.5) | 64.0 (65.3) |
| 1,2,4-TCB | 2.6 | 3.5 (134.6) | 5.4 | 4.0 (74.1) | 118 | 80.7 (68.4) | 79.0 (66.9) |
| 1,2,3-TCB | NA | 0.7 | NA | 0.5 | 8 | 5.5 (68.8) | 5.8 (72.5) |
| 1,2,4,5-TeCB | 1.7 | 1.7 (100.0) | 20.0 | 10.3 (51.5) | 146 | 60.5 (41.4) | 60.7 (41.6) |
| 1,2,3,4-TeCB | 0.4 | 0.41 (102.5) | 0.9 | 1.0 (111.1) | 41 | 22.8 (55.6) | 24.7 (60.2) |
| PeCB | 1.5 | 2.1 (140.0) | 8.5 | 8.2 (96.5) | 61 | 40.1 (65.7) | 42.4 (69.5) |
| HCB | 4.5 | 3.0 (66.7) | 59.7 | 47.8 (80.1) | 254 | 190 (74.8) | 216.5 (85.2) |
| HCBD | 0.8 | 1.0 (125.0) | 10.5 | 8.0 (76.2) | 59 | 43.1 (73.1) | 36.2 (61.4) |
| OCS | 3.2 | 2.5 (78.1) | 18.8 | 15.4 (81.9) | 45 | 36.7 (81.6) | 38.7 (86.0) |

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

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

| Parameter | Standard Solution | | Sediment Extracts | | Sediments | |
|---|---|---|---|---|---|---|
| | Range | Average | Range | Average | Range | Average |
| 1,4-DCB | - | 86.5 (1) | 92.5 - 98.5 | 95.5 (2) | 78.1 - 79.3 | 78.7 (2) |
| 1,3-DCB | - | 95.7 (1) | 56.3 - 64.8 | 60.6 (2) | 63.6 -68.7 | 66.2 (2) |
| 1,2-DCB | - | 116.7 (1) | - | - | 118.8 -135.6 | 127.2 (2) |
| 1,3,5-TCB | - | 105.8 (1) | 112.5 - 115.6 | 114.1 (2) | 65.3 - 115.8 | 86.1 (4) |
| 1,2,4-TCB | - | 98.4 (1) | 161.2 - 195.3 | 134.6 (2) | 66.9 - 134.6 | 86.0 (4) |
| 1,2,3-TCB | - | 99.8 (1) | 142.9 - 200.0 | 178.3 (2) | 68.8 - 72.5 | 70.7 (2) |
| 1,2,4,5-TeCB | - | 95.0 (1) | 89.0 - 93.7 | 85.6 (2) | 41.4 - 100.0 | 58.6 (4) |
| 1,2,3,4-TeCB | - | 104.0 (1) | 194.1 -194.1 | 194.1 (2) | 55.6 - 111.1 | 82.4 (4) |
| PeCB | - | 92.0 (1) | 100.0 - 104.0 | 102.0 (2) | 65.7 - 140.0 | 92.9 (4) |
| HCB | - | 100.0 (1) | 92.2 - 96.9 | 94.6 (2) | 66.7 - 85.2 | 76.7 (4) |
| HCBD | - | 101.0 (1) | 101.0 -107.5 | 104.3 (2) | 61.4 - 125.0 | 83.9 (4) |
| OCS | - | 95.0 (1) | 76.5 - 88.0 | 82.3 (2) | 78.1 - 86.0 | 81.9 (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, sediment extracts and sediments.**

| Parameter | Standard Solution | | Sediment Extracts | | Sediments | |
|---|---|---|---|---|---|---|
| | Range | Average | Range | Average | Range | Average |
| 1,4-DCB | - | 8.9 (1) | 44.7 - 53.3 | 49.0 (2) | 35.8 - 61.2 | 49.0 (4) |
| 1,3-DCB | - | 10.2 (1) | 72.3 - 83.3 | 77.8 (2) | 3.3 - 50.5 | 29.9 (4) |
| 1,2-DCB | - | 8.2 (1) | - | - | 34.8 - 49.0 | 42.7 (3) |
| 1,3,5-TCB | - | 12.8 (1) | 25.0 - 29.8 | 27.4 (2) | 32.9 - 52.2 | 40.7 (4) |
| 1,2,4-TCB | - | 16.2 (1) | 48.1 - 65.3 | 56.7 (2) | 45.1 - 57.1 | 51.3 (4) |
| 1,2,3-TCB | - | 10.2 (1) | 129.5 - 131.6 | 130.6 (2) | 4.3 - 52.5 | 35.7 (4) |
| 1,2,4,5-TeCB | - | 33.7 (1) | 52.6 - 61.3 | 57.0 (2) | 53.5 -82.6 | 64.3 (4) |
| 1,2,3,4-TeCB | - | 14.1 (1) | 66.7 - 84.1 | 75.4 (2) | 39.1 - 45.3 | 42.8 (4) |
| PeCB | - | 11.8 (1) | 37.7 - 37.9 | 37.9 (2) | 28.2 - 36.0 | 31.6 (4) |
| HCB | - | 15.6 (1) | 28.4 - 33.3 | 30.9 (2) | 30.0 - 38.9 | 34.8 (4) |
| HCBD | - | 11.6 (1) | 33.5 - 44.2 | 38.9 (2) | 42.5 - 58.3 | 47.4 (4) |
| OCS | - | 19.1 (1) | 52.8 - 60.8 | 56.8 (2) | 28.2 - 77.1 | 44.6 (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-3.**

| Lab Code | Flags | | | Comment |
|---|---|---|---|---|
| | No. of results reported | No. of* results flagged | % flags (Performance Index) | |
| G003 | 12 | 1.0 | 8.3 | Satisfactory |
| G005 | 12 | 0.5 | 4.2 | Satisfactory |
| G006 | 8 | 1.0 | 12.5 | Satisfactory |
| G009 | 12 | 0.5 | 4.2 | Satisfactory |
| G014 | 6 | 1.0 | 16.7 | Satisfactory |
| G016A | 12 | 0.0 | 0.0 | Satisfactory |
| G017 | 9 | 0.0 | 0.0 | Satisfactory |
| G023 | 9 | 1.0 | 11.1 | Satisfactory |
| G024 | 12 | 1.5 | 12.5 | Satisfactory |
| G029 | 12 | 2.0 | 16.7 | Satisfactory |
| G030 | 1 | 0.0 | 0.0 | Satisfactory |
| G034 | 12 | 0.0 | 0.0 | Satisfactory |
| G035 | 11 | 0.5 | 4.5 | Satisfactory |
| G041 | 12 | 0.5 | 4.2 | 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 sediment extracts in study G-3.**

| Lab Code | Flags | | | Comment |
|---|---|---|---|---|
| | No. of results reported | No. of* results flagged | % flags (Performance Index) | |
| G003 | 16 | 5.5 | 34.4 | Moderate |
| G005 | 20 | 18 | 90.0 | Poor |
| G006 | 16 | 7.5 | 46.9 | Moderate |
| G009 | 22 | 10.5 | 47.7 | Moderate |
| G014 | 12 | 9.0 | 75.0 | Poor |
| G016A | 14 | 3.0 | 21.4 | Satisfactory |
| G017 | 17 | 10.0 | 58.8 | Poor |
| G023 | 12 | 6.5 | 54.2 | Poor |
| G024 | 20 | 10.5 | 52.5 | Poor |
| G029 | 12 | 7.0 | 58.3 | Poor |
| G030 | 2 | 0.0 | 0.0 | Satisfactory |
| G034 | 22 | 5.0 | 22.7 | Satisfactory |
| G035 | 13 | 3.5 | 26.9 | Moderate |
| G041 | 20 | 16.0 | 80.0 | Poor |

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

**Table 7-3. Performance of individual laboratory for sediments in study G-3.**

| Lab Code | Flags | | | Comment |
|---|---|---|---|---|
| | No. of results reported | No. of* results flagged | % flags (Performance Index) | |
| G003 | 37 | 27.0 | 73.0 | Poor |
| G005 | 30 | 20.5 | 68.3 | Poor |
| G006 | 26 | 12.0 | 46.3 | Moderate |
| G009 | 47 | 35.5 | 75.5 | Poor |
| G014 | 24 | 8.5 | 35.4 | Moderate |
| G016A | 33 | 10.0 | 30.3 | Moderate |
| G017 | 35 | 13.5 | 38.6 | Moderate |
| G023 | 22 | 15.5 | 70.5 | Poor |
| G024 | 47 | 19.5 | 41.5 | Moderate |
| G029 | 29 | 9.5 | 32.8 | Moderate |
| G030 | 4 | 0.5 | 12.5 | Satisfactory |
| G034 | 46 | 11.5 | 25.0 | Satisfactory |
| G035 | 32 | 24 | 75.0 | Poor |
| G041 | 41 | 15.5 | 37.8 | 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 1,4-dichlorobenzene in test samples.

| Lab No. | Sample #1 | Sample #2 | Sample #3 | Sample #4 | Sample #5 | Sample #6 | Sample #7 | D.L. for sediments |
|---|---|---|---|---|---|---|---|---|
| | (ng/mL) | (ng/mL) | | (ng/g) | | | | |
| G003 | 190 | <3000 | <620 | <620 | <620 | <620 | <620 | 620 |
| G005 | 151 | 386* | 327* | 60* | 80* | 108 | 123 | 30 |
| G006 | NA | NA | NA | NA | NA | NA | NA | - |
| G009 | 155.6 | 7.27 | 5.74 | 5.99 | ND | 23.81 | 48.96 | 0.70 |
| G014 | NA | NA | NA | NA | NA | NA | NA | - |
| G016A | 150 | <50 | <50 | <25 | <25 | 52 | 49 | 25 |
| G017 | NA | NA | NA | NA | NA | NA | NA | - |
| G023 | NA | NA | NA | NA | NA | NA | NA | - |
| G024 | 162 | 1480* | 1530* | 18.2 | 25.4 | 191 | 232 | 6 |
| G029 | 140 | - | - | - | - | - | - | 70 |
| G030 | NA | NA | NA | NA | NA | NA | NA | - |
| G034 | 140 | 19 | 19 | ND | 12 | 120 | 140 | 2 |
| G035 | 160 | ND | ND | ND | ND | 43.2 | 45.1 | 10.0 |
| G041 | 170 | <1.2 | <1.2 | 15 | <15 | 83.6 | 84.8 | 15 |
| Mean | 158.2 | 13.2 | 12.4 | 13.1 | 18.7 | 88.8 | 103.3 | - |
| S.D. | 14.1 | 5.9 | 6.6 | 5.2 | 6.7 | 52.7 | 63.2 | - |
| Median | 155.7 | 13.2 | 12.4 | 15.0 | 18.7 | 83.6 | 84.8 | - |
| Design | 180.0 | 13.4 | 13.4 | NA | NA | 107 | 107 | - |

Table I-2. Results for 1,3-dichlorobenzene in test samples.

| Lab No. | Sample #1 | Sample #2 | Sample #3 | Sample #4 | Sample #5 | Sample #6 | Sample #7 | D.L. for sediments |
|---|---|---|---|---|---|---|---|---|
| | (ng/mL) | (ng/mL) | | (ng/g) | | | | |
| G003 | 350* | <50 | <50 | <10 | <10 | 64 | 69 | 10 |
| G005 | 137 | - | 138* | - | - | 62 | 67 | 30 |
| G006 | NA | NA | NA | NA | NA | NA | NA | - |
| G009 | 117.25 | 11.42 | 12.54 | ND | 1.61* | 23.44 | 35.20 | 0.70 |
| G014 | NA | NA | NA | NA | NA | NA | NA | - |
| G016A | 140 | <50 | <50 | <25 | <25 | 60 | 50 | 25 |
| G017 | NA | NA | NA | NA | NA | NA | NA | - |
| G023 | NA | NA | NA | NA | NA | NA | NA | - |
| G024 | 155 | <30 | <30 | <3 | 3.09 | 75.9 | 84.0 | 3 |
| G029 | 150 | - | - | - | - | - | - | 50 |
| G030 | NA | NA | NA | NA | NA | NA | NA | - |
| G034 | 120 | 3 | 4 | 14 | 3 | 120 | 110 | 1 |
| G035 | 152 | ND | ND | 161* | ND | 26.8 | 33.2 | 10.0 |
| G041 | 140 | <1.3 | <1.3 | 17.6 | <10 | 107 | 139 | 10 |
| Mean | 138.9 | 7.2 | 8.3 | 15.8 | 3.0 | 67.4 | 73.4 | - |
| S.D. | 14.1 | 6.0 | 6.0 | 2.5 | 0.1 | 34.0 | 36.7 | - |
| Median | 143.5 | 7.2 | 8.3 | 15.8 | 3.0 | 63.0 | 68.0 | - |
| Design | 150.0 | 12.8 | 12.8 | NA | NA | 99 | 99 | - |

Table I-3. Results for 1,2-dichlorobenzene in test samples.

| Lab No. | Sample #1 | Sample #2 | Sample #3 | Sample #4 | Sample #5 | Sample #6 | Sample #7 | D.L. for sediments |
|---|---|---|---|---|---|---|---|---|
| | (ng/mL) | (ng/mL) | | (ng/g) | | | | |
| G003 | 150 | <50 | <50 | <10 | <10 | 33 | 33 | 10 |
| G005 | 120 | - | - | - | - | - | - | 30 |
| G006 | NA | NA | NA | NA | NA | NA | NA | - |
| G009 | 130.26 | 52.15 | 55.57 | ND | 3.20 | 6.70 | 13.75 | 0.70 |
| G014 | NA | NA | NA | NA | NA | NA | NA | - |
| G016A | 140 | <50 | <50 | <25 | <25 | <25 | <25 | 25 |
| G017 | NA | NA | NA | NA | NA | NA | NA | - |
| G023 | NA | NA | NA | NA | NA | NA | NA | - |
| G024 | 140 | <30 | <30 | <3 | 6.58 | 18.3 | 21.7 | 3 |
| G029 | 125 | - | - | - | - | - | - | 50 |
| G030 | NA | NA | NA | NA | NA | NA | NA | - |
| G034 | 120 | ND | ND | ND | ND | 22 | 27 | 15 |
| G035 | 144 | ND | ND | ND | ND | 19.6 | 61.1* | 10.0 |
| G041 | 142 | <1.5 | <1.5 | 23.1 | <10 | 13.3 | 16.6 | 10 |
| Mean | 134.6 | NC | NC | NC | 4.9 | 18.8 | 22.4 | - |
| S.D. | 11.0 | NC | NC | NC | 2.4 | 8.3 | 7.8 | - |
| Median | 140.0 | NC | NC | NC | 4.9 | 19.0 | 21.7 | - |
| Design | 120.0 | 10.1 | 10.1 | NA | NA | 16 | 16 | - |

Table I-4. Results for 1,3,5-trichlorobenzene in test samples.

| Lab No. | Sample #1 | Sample #2 | Sample #3 | Sample #4 | Sample #5 | Sample #6 | Sample #7 | D.L. for sediments |
|---|---|---|---|---|---|---|---|---|
| | (ng/mL) | (ng/mL) | | (ng/g) | | | | |
| G003 | 50 | 41 | 36 | 4.4 | 10 | 43 | 47 | 1.0 |
| G005 | 50 | 1250* | 90* | - | 20 | 49 | 57 | 8 |
| G006 | NA | NA | NA | NA | NA | NA | NA | - |
| G009 | 34.35 | 22.19 | 21.99 | 0.87 | 5.55 | 20.22 | 34.63 | 0.10 |
| G014 | NA | NA | NA | NA | NA | NA | NA | - |
| G016A | 47 | 43 | 43 | <3 | 13 | 74 | 64 | 3 |
| G017 | 41.8 | 21.2 | 44.8 | 2.4 | 9.3 | 58.6 | 52.1 | 1.6 |
| G023 | 168* | NA | NA | NA | NA | NA | NA | - |
| G024 | 42.3 | 40.3 | 46.0 | 1.83 | 14.5 | 78.8 | 85.6 | 0.6 |
| G029 | 50 | 30 | 18 | - | 21 | 80 | 84 | 7 |
| G030 | NA | NA | NA | NA | NA | NA | NA | - |
| G034 | 40 | 35 | 34 | 2 | 18 | 110 | 97 | 0.1 |
| G035 | NA | NA | NA | NA | NA | NA | NA | - |
| G041 | 39.9 | 33.2 | 33.0 | 2.5 | 15.4 | 93.4 | 94.6 | 0.8 |
| Mean | 43.9 | 33.2 | 34.6 | 2.3 | 14.1 | 67.4 | 68.4 | - |
| S.D. | 5.6 | 8.3 | 10.3 | 1.2 | 5.2 | 27.5 | 22.5 | - |
| Median | 42.3 | 34.1 | 35.0 | 2.2 | 14.5 | 74.0 | 64.0 | - |
| Design | 40.0 | 30.3 | 30.3 | 1.9 | 16.5 | 98 | 98 | - |

Table I-5. Results for 1,2,4-trichlorobenzene in test samples.

| Lab No. | Sample #1 | Sample #2 | Sample #3 | Sample #4 | Sample #5 | Sample #6 | Sample #7 | D.L. for sediments |
|---|---|---|---|---|---|---|---|---|
| | (ng/mL) | (ng/mL) | | (ng/g) | | | | |
| G003 | 74 | 165* | 144* | 10* | 3.7 | 52 | 57 | 1.0 |
| G005 | 77 | 43 | 23 | - | - | - | 59 | 8 |
| G006 | 64 | 20 | 20 | 3 | 9 | 73 | 81 | 3 |
| G009 | 79.38 | 11.20 | 9.87 | 1.56 | 1.96 | 41.44 | 62.14 | 0.10 |
| G014 | NA | NA | NA | NA | NA | NA | NA | - |
| G016A | 97 | 18 | 16 | <3 | 4 | 98 | 90 | 3 |
| G017 | 93.8 | 7.4 | 16.0 | 1.6 | 3.9 | 81.3 | 70.4 | 1.6 |
| G023 | 64.6 | NA | NA | NA | NA | NA | NA | - |
| G024 | 91.6 | 37.7 | 37.9 | 4.24 | 7.20 | 150 | 159 | 0.6 |
| G029 | 62 | - | - | - | - | 80 | 79 | 5 |
| G030 | NA | NA | NA | NA | NA | NA | NA | - |
| G034 | 93 | 12 | 12 | 4 | 6 | 180 | 180 | 0.1 |
| G035 | 95.5 | 10.4 | ND | ND | 3.28 | 47.3 | 52.0 | 2.0 |
| G041 | 78.1 | 13.9 | 13.6 | 6.8 | 7.3 | 163 | 172 | 0.8 |
| Mean | 80.8 | 19.3 | 18.5 | 3.5 | 5.1 | 96.6 | 96.5 | - |
| S.D. | 13.1 | 12.6 | 8.9 | 2.0 | 2.3 | 50.3 | 49.0 | - |
| Median | 78.7 | 13.9 | 16.8 | 3.5 | 4.0 | 80.7 | 79.0 | - |
| Design | 80.0 | 8.6 | 8.6 | 2.6 | 5.4 | 118 | 118 | - |

Table I-6. Results for 1,2,3-trichlorobenzene in test samples.

| Lab No. | Sample #1 | Sample #2 | Sample #3 | Sample #4 | Sample #5 | Sample #6 | Sample #7 | D.L. for sediments |
|---|---|---|---|---|---|---|---|---|
| | (ng/mL) | (ng/mL) | | (ng/g) | | | | |
| G003 | 38 | <5 | <5 | <1.0 | <1.0 | 4.7 | 4.5 | 1.0 |
| G005 | 44 | 975* | - | - | - | - | - | 8 |
| G006 | 36 | 3 | 3 | ND | ND | 5 | 5 | 3 |
| G009 | 32.38 | 0.45 | 0.34 | ND | 0.26 | 1.95 | 3.46 | 0.10 |
| G014 | NA | NA | NA | NA | NA | NA | NA | - |
| G016A | 40 | <6 | <6 | <3 | <3 | 6 | 5 | 3 |
| G017 | 44.3 | 4.2 | <2.4 | <2.4 | <2.4 | 3.1 | 3.4 | 2.4 |
| G023 | 41.6 | 23.6 | 31.2 | ND | ND | ND | ND | 3 |
| G024 | 42.7 | 4.65 | 12.7 | 0.747 | 0.515 | 7.31 | 8.07 | 0.3 |
| G029 | 48 | - | - | - | - | 11 | 7 | 4 |
| G030 | NA | NA | NA | NA | NA | NA | NA | - |
| G034 | 39 | 2 | 2 | 0.7 | 0.7 | 10 | 10 | 0.1 |
| G035 | 39.1 | 4.63 | ND | ND | ND | 2.32 | 2.60 | 2.0 |
| G041 | 39.7 | <1.2 | <1.2 | <0.60 | <0.60 | 7.4 | 9.9 | 0.60 |
| Mean | 40.4 | 6.1 | 9.8 | 0.7 | 0.5 | 5.9 | 5.9 | - |
| S.D. | 4.1 | 7.9 | 12.9 | 0.03 | 0.2 | 3.1 | 2.7 | - |
| Median | 39.9 | 4.2 | 3.0 | 0.7 | 0.5 | 5.5 | 5.8 | - |
| Design | 40.0 | 2.1 | 2.1 | NA | NA | 8 | 8 | - |

Table I-7. Results for 1,2,4,5-tetrachlorobenzene in test samples.

| Lab No. | Sample #1 | Sample #2 | Sample #3 | Sample #4 | Sample #5 | Sample #6 | Sample #7 | D.L. for sediments |
|---|---|---|---|---|---|---|---|---|
| | (ng/mL) | (ng/mL) | | (ng/g) | | | | |
| G003 | 19 | 44 | 57 | 4.5 | 14 | 46 | 49 | 0.80 |
| G005 | 22 | 92 | 72 | - | 10 | 63 | 71 | 4 |
| G006 | 7 | 16 | 16 | ND | 7 | 24 | 25 | 2 |
| G009 | 15.85 | 19.16 | 16.04 | 0.73 | 5.44 | 39.20 | 55.07 | 0.05 |
| G014 | 11.03 | 45.2 | 34.6 | 0.89 | 9.54 | 57.9 | 60.7 | 0.10 |
| G016A | 22 | 44 | 44 | <3 | 16 | 96 | 91 | 3 |
| G017 | 20.7 | 15.2 | 35.8 | 1.4 | 10.6 | 85.3 | 70.0 | 0.8 |
| G023 | 22.6 | 61.0 | 45.9 | ND | 21.0 | ND | 50.2 | 15 |
| G024 | 10.6 | 26.0 | 25.5 | 0.395 | 7.33 | 36.3 | 40.1 | 0.1 |
| G029 | 13 | 11.4 | 7.9 | 3 | 29 | 140 | 148 | 2 |
| G030 | NA | NA | NA | NA | NA | NA | NA | - |
| G034 | 19 | 34 | 36 | 2 | 17 | 140 | 130 | 0.1 |
| G035 | 16.7 | 29.4 | 24.4 | ND | 7.72 | 44.4 | 50.8 | 1.0 |
| G041 | 28.0 | 70.0 | 64.5 | 5.6 | 38.4* | 170 | 185 | 1.0 |
| Mean | 17.5 | 39.0 | 36.9 | 2.3 | 12.9 | 78.5 | 78.9 | - |
| S.D. | 5.9 | 23.9 | 19.4 | 1.9 | 6.9 | 48.1 | 47.2 | - |
| Median | 19.0 | 34.0 | 35.8 | 1.7 | 10.3 | 60.5 | 60.7 | - |
| Design | 20.0 | 38.2 | 38.2 | 1.7 | 20.0 | 146 | 146 | - |

Table I-8. Results for 1,2,3,4-tetrachlorobenzene in test samples.

| Lab No. | Sample #1 | Sample #2 | Sample #3 | Sample #4 | Sample #5 | Sample #6 | Sample #7 | D.L. for sediments |
|---|---|---|---|---|---|---|---|---|
| | (ng/mL) | (ng/mL) | | (ng/g) | | | | |
| G003 | 21 | 7 | 10 | <0.60 | 1.5 | 18 | 19 | 0.60 |
| G005 | 20 | 33* | 16 | - | - | 17 | 19 | 4 |
| G006 | 22 | 11 | 11 | ND | ND | 23 | 22 | 2 |
| G009 | 26.35 | 3.23 | 1.53 | 0.37 | 0.40 | 20.83 | 29.22 | 0.05 |
| G014 | 25.2 | 4.03 | 3.07 | 0.40 | 0.98 | 41.3 | 43.2 | 0.10 |
| G016A | 20 | <6 | <6 | <3 | <3 | 27 | 24 | 3 |
| G017 | 20.8 | <0.8 | <0.8 | <0.8 | 1.6 | 18.5 | 15.7 | 0.8 |
| G023 | 16.4 | ND | ND | ND | ND | ND | ND | 2.0 |
| G024 | 20.2 | 2.96 | 3.49 | 0.405 | 1.09 | 22.5 | 25.4 | 0.2 |
| G029 | 26 | - | - | - | - | 26 | 39 | 2 |
| G030 | NA | NA | NA | NA | NA | NA | NA | - |
| G034 | 20 | 2 | 2 | 0.6 | 1 | 52 | 52 | 0.1 |
| G035 | 17.8 | ND | ND | ND | ND | 12.2 | 15.2 | 1.0 |
| G041 | 21.3 | 3.3 | 3.2 | 0.95 | 2.8* | 42.4 | 45.2 | 0.30 |
| Mean | 21.3 | 4.8 | 6.3 | 0.55 | 1.1 | 26.7 | 29.1 | - |
| S.D. | 3.0 | 3.2 | 5.3 | 0.24 | 0.43 | 12.1 | 12.6 | - |
| Median | 20.8 | 3.3 | 3.3 | 0.41 | 1.0 | 22.8 | 24.7 | - |
| Design | 20.0 | 1.7 | 1.7 | 0.4 | 0.9 | 41 | 41 | - |

Table I-9. Results for pentachlorobenzene in test samples.

| Lab No. | Sample #1 | Sample #2 | Sample #3 | Sample #4 | Sample #5 | Sample #6 | Sample #7 | D.L. for sediments |
|---|---|---|---|---|---|---|---|---|
| | (ng/mL) | (ng/mL) | | (ng/g) | | | | |
| G003 | 18 | 23 | 23 | 2.3 | 8.2 | 30 | 31 | 0.40 |
| G005 | 20 | 45 | 43 | - | 8 | 39 | 43 | 4 |
| G006 | 19 | 22 | 23 | ND | 10 | 35 | 40 | 3 |
| G009 | 15.29 | 17.56 | 18.13 | 0.97 | 3.99 | 30.76 | 33.17 | 0.05 |
| G014 | 22.2 | 56.20* | 46.3 | 2.06 | 12.0 | 59.6 | 61.6 | 0.10 |
| G016A | 17 | 19 | 20 | 1.6 | 7.6 | 34 | 35 | 0.5 |
| G017 | 18.4 | 9.7 | 23.4 | 1.7 | 7.4 | 42.2 | 35.1 | 1.6 |
| G023 | 21.6 | 29.0 | 36.5 | 7.2* | 5.2 | 44.9 | 42.5 | 5.0 |
| G024 | 19.2 | 25.6 | 26.5 | 2.08 | 10.1 | 40.1 | 42.4 | 0.2 |
| G029 | 16 | 15 | 12 | 2.7 | 14 | 55 | 50 | 1 |
| G030 | NA | NA | NA | NA | NA | NA | NA | - |
| G034 | 18 | 23 | 24 | 2 | 12 | 64 | 65 | 0.1 |
| G035 | 16.0 | 21.4 | 18.9 | 2.13 | 4.79 | 32.2 | 36.8 | 1.0 |
| G041 | 20.7 | 28.2 | 25.5 | 3.1 | 12.4 | 79.6 | 69.2 | 0.30 |
| Mean | 18.6 | 23.2 | 26.2 | 2.1 | 8.9 | 45.1 | 45.0 | - |
| S.D. | 2.2 | 8.8 | 9.9 | 0.6 | 3.2 | 15.1 | 12.7 | - |
| Median | 18.4 | 22.5 | 23.4 | 2.1 | 8.2 | 40.1 | 42.4 | - |
| Design | 20.0 | 22.5 | 22.5 | 1.5 | 8.5 | 61 | 61 | - |

Table I-10. Results for hexachlorobenzene in test samples.

| Lab No. | Sample #1 | Sample #2 | Sample #3 | Sample #4 | Sample #5 | Sample #6 | Sample #7 | D.L. for sediments |
|---|---|---|---|---|---|---|---|---|
| | (ng/mL) | (ng/mL) | | (ng/g) | | | | |
| G003 | 20 | 97 | 102 | 4.4 | 39 | 110 | 120 | 0.30 |
| G005 | 20 | 185 | 126 | 2 | 51 | 153 | 168 | 2 |
| G006 | 22 | 91 | 81 | 3 | 48 | 190 | 220 | 1 |
| G009 | 17.03 | 81.17 | 82.07 | 2.95 | 33.25 | 156.17 | 160.54 | 0.05 |
| G014 | 22.9 | 197 | 157 | 2.06 | 42.9 | 151 | 161 | 0.10 |
| G016A | 20 | 140 | 137 | 2.5 | 40 | 215 | 214 | 0.5 |
| G017 | 22.3 | 78.3 | 173 | 3.8 | 61.1 | 283 | 219 | 0.8 |
| G023 | 23.6 | 161 | 174 | 12.2* | 29.7 | 221 | 234 | 5.0 |
| G024 | 14.9 | 97.2 | 96.6 | 2.21 | 47.6 | 163 | 172 | 0.1 |
| G029 | 28 | 100 | 93 | 6 | 82 | 288 | 346 | 1 |
| G030 | 20 | 128 | 122 | 3 | 66 | 272 | 256 | 1 |
| G034 | 20 | 140 | 150 | 4 | 64 | 230 | 240 | 0.1 |
| G035 | 17.3 | 104 | 95.1 | 4.14 | 33.4 | 133 | 156 | 1.0 |
| G041 | 19.6 | 200 | 183 | 6.1 | 96.1 | 416* | 376 | 0.20 |
| Mean | 20.5 | 128.5 | 126.6 | 3.6 | 52.4 | 197.3 | 217.3 | - |
| S.D. | 3.2 | 42.8 | 36.0 | 1.4 | 19.4 | 59.1 | 72.4 | - |
| Median | 20.0 | 116.0 | 124.0 | 3.0 | 47.8 | 190 | 216.5 | - |
| Design | 20.0 | 125.8 | 125.8 | 4.5 | 59.7 | 254 | 254 | - |

Table I-11. Results for hexachlorobutadiene in test samples.

| Lab No. | Sample #1 | Sample #2 | Sample #3 | Sample #4 | Sample #5 | Sample #6 | Sample #7 | D.L. for sediments |
|---|---|---|---|---|---|---|---|---|
| | (ng/mL) | (ng/mL) | | (ng/g) | | | | |
| G003 | 17 | 19 | 19 | 0.70 | 5.0 | 25 | 27 | 0.15 |
| G005 | 11* | 28 | 9 | - | 3 | 10 | 14 | 1 |
| G006 | 22 | 21 | 21 | 1 | 8 | 28 | 30 | 1 |
| G009 | 21.29 | 14.14 | 14.16 | 0.29 | 3.15 | 18.05 | 31.79 | 0.05 |
| G014 | 23.3 | 58.2* | 42.1 | 1.29 | 10.8 | 50.2 | 53.9 | 0.10 |
| G016A | 22 | 22 | 24 | 0.7 | 8.1 | 45 | 39 | 0.5 |
| G017 | 20.4 | 10.2 | 25.6 | 0.8 | 7.5 | 42.2 | 36.2 | 0.8 |
| G023 | 20.7 | 21.1 | 21.4 | ND | 5.1 | ND | 4.8 | 1.0 |
| G024 | 19.2 | 21.0 | 21.6 | 1.84 | 9.43 | 47.6 | 50.6 | 0.5 |
| G029 | 15 | 11 | 8.2 | 0.9 | 10 | 44 | 44 | 0.5 |
| G030 | NA | NA | NA | NA | NA | NA | NA | - |
| G034 | 20 | 29 | 28 | 2 | 12 | 61 | 58 | 0.1 |
| G035 | 19.2 | 15.9 | 12.6 | ND | 3.33 | 20.3 | 23.0 | 1.0 |
| G041 | 18.1 | 31.0 | 32.2 | 2.5 | 9.4 | 52.4 | 54.5 | 0.30 |
| Mean | 19.8 | 20.3 | 21.5 | 1.2 | 7.3 | 37.0 | 35.9 | - |
| S.D. | 2.3 | 6.8 | 9.5 | 0.7 | 3.1 | 16.0 | 16.3 | - |
| Median | 20.2 | 20.1 | 21.4 | 1.0 | 8.0 | 43.1 | 36.2 | - |
| Design | 20.0 | 19.9 | 19.9 | 0.8 | 10.5 | 59 | 59 | - |

Table I-12. Results for octachlorostyrene in test samples.

| Lab No. | Sample #1 | Sample #2 | Sample #3 | Sample #4 | Sample #5 | Sample #6 | Sample #7 | D.L. for sediments |
|---|---|---|---|---|---|---|---|---|
| | (ng/mL) | (ng/mL) | | (ng/g) | | | | |
| G003 | 16 | 29 | 33 | 2.2 | 15 | 23 | 24 | 0.50 |
| G005 | 24 | 86 | 77 | 9 | 35* | 59 | 61 | 1 |
| G006 | 21 | 8 | 5 | 3 | 18 | 33 | 35 | 1 |
| G009 | 17.76 | 28.76 | 29.20 | 1.87 | 13.05 | 29.97 | 30.88 | 0.05 |
| G014 | 23.5 | 120* | 104* | 1.81 | 22.0 | 37.7 | 39.2 | 0.10 |
| G016A | 19 | 38 | 37 | 2 | 14 | 38 | 34 | 1 |
| G017 | 22.3 | 18.9 | 48.7 | 2.6 | 15.8 | 48.2 | 38.7 | 0.8 |
| G023 | 21.5 | 55.9 | 52.0 | 9.5 | 13.8 | 63.2 | 60.4 | 5.0 |
| G024 | 14.1 | 20.9 | 21.4 | 1.61 | 10.5 | 20.8 | 21.7 | 0.1 |
| G029 | 16 | 20 | 19 | 5.2 | 17 | 40 | 45 | 0.5 |
| G030 | NA | NA | NA | NA | NA | NA | NA | - |
| G034 | 16 | 40 | 36 | 2 | 22 | 36 | 40 | 0.1 |
| G035 | 13.5 | 31.0 | 28.8 | 2.47 | 10.4 | 25.6 | 27.1 | 1.0 |
| G041 | 21.2 | 67.5 | 60.7 | 2.7 | 24.6 | 85.1* | 73.2 | 0.8 |
| Mean | 18.9 | 37.0 | 37.3 | 3.5 | 16.3 | 37.9 | 40.8 | - |
| S.D. | 3.6 | 22.5 | 19.7 | 2.7 | 4.6 | 13.3 | 15.5 | - |
| Median | 19.0 | 30.0 | 34.5 | 2.5 | 15.4 | 36.7 | 38.7 | - |
| Design | 20.0 | 39.2 | 39.2 | 3.2 | 18.8 | 45 | 45 | - |

# APPENDIX II

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

TABLE II-1

% Recovery calculated from the design values

Lab No. G003

| Parameter | Standard solution | Sediment extracts | | Sediments | | | |
|---|---|---|---|---|---|---|---|
| | Sample #1 | Sample #2 | Sample #3 | Sample #4 | Sample #5 | Sample #6 | Sample #7 |
| 1,4-DCB | 105.6 | ND | ND | ND | ND | ND | ND |
| 1,3-DCB | 233.3 | ND | ND | ND | ND | 64.6 | 70.0 |
| 1,2-DCB | 125.0 | ND | ND | NC | ND | 206.3 | 206.3 |
| 1,3,5-TCB | 125.0 | 135.3 | 118.8 | 231.6 | 60.6 | 43.9 | 48.0 |
| 1,2,4-TCB | 92.5 | 1919 | 1674 | 385 | 68.5 | 44.1 | 48.3 |
| 1,2,3-TCB | 95.0 | ND | ND | ND | ND | 58.8 | 56.3 |
| 1,2,4,5-TeCB | 95.0 | 115.2 | 149.2 | 264.7 | 70.0 | 31.5 | 33.6 |
| 1,2,3,4-TeCB | 105.0 | 411.8 | 588.2 | ND | 166.7 | 43.9 | 46.3 |
| PeCB | 90.0 | 102.2 | 102.2 | 153.3 | 96.5 | 49.2 | 50.8 |
| HCB | 100.0 | 77.1 | 81.1 | 97.8 | 65.3 | 43.3 | 47.2 |
| HCBD | 85.0 | 95.5 | 95.5 | 87.5 | 47.0 | 42.4 | 45.8 |
| OCS | 80.0 | 74.0 | 84.2 | 68.8 | 79.8 | 51.1 | 53.3 |

TABLE II-2

% Recovery calculated from the design values

Lab No. G005

| Parameter | Standard solution | Sediment extracts | | Sediments | | | |
|---|---|---|---|---|---|---|---|
| | Sample #1 | Sample #2 | Sample #3 | Sample #4 | Sample #5 | Sample #6 | Sample #7 |
| 1,4-DCB | 83.9 | 2881 | 2440 | 400 | 428 | 100.9 | 115.0 |
| 1,3-DCB | 91.3 | ND | 1078 | ND | ND | 62.6 | 67.7 |
| 1,2-DCB | 100.0 | ND | ND | NC | ND | ND | ND |
| 1,3,5-TCB | 125.0 | 4125 | 297 | ND | 121.2 | 50.0 | 58.2 |
| 1,2,4-TCB | 96.3 | 500.0 | 267.4 | ND | ND | <6.8 | 50.0 |
| 1,2,3-TCB | 110.0 | 46428 | ND | ND | ND | ND | ND |
| 1,2,4,5-TeCB | 110.0 | 240.8 | 188.5 | ND | 50.0 | 43.2 | 48.6 |
| 1,2,3,4-TeCB | 100.0 | 1941 | 941 | ND | ND | 41.5 | 46.3 |
| PeCB | 100.0 | 200.0 | 191.1 | ND | 94.1 | 63.9 | 70.5 |
| HCB | 100.0 | 147.1 | 100.2 | 44.4 | 85.4 | 60.2 | 66.1 |
| HCBD | 55.0 | 140.7 | 45.2 | ND | 28.6 | 16.9 | 23.7 |
| OCS | 120.0 | 219.4 | 196.4 | 281.3 | 186.2 | 131.1 | 135.6 |

TABLE II-3

% Recovery calculated from the design values

Lab No. G006

| Parameter | Standard solution | Sediment extracts | | Sediments | | | |
|---|---|---|---|---|---|---|---|
| | Sample #1 | Sample #2 | Sample #3 | Sample #4 | Sample #5 | Sample #6 | Sample #7 |
| 1,4-DCB | NA | NA | NA | NA | NA | NA | NA |
| 1,3-DCB | NA | NA | NA | NA | NA | NA | NA |
| 1,2-DCB | NA | NA | NA | NA | NA | NA | NA |
| 1,3,5-TCB | NA | NA | NA | NA | NA | NA | NA |
| 1,2,4-TCB | 99.2 | 130.2 | 114.8 | 60.0 | 36.3 | 35.1 | 52.7 |
| 1,2,3-TCB | 90.0 | 142.9 | 142.9 | ND | ND | 62.5 | 62.5 |
| 1,2,4,5-TeCB | 35.0 | 41.9 | 41.9 | ND | 35.0 | 16.4 | 17.1 |
| 1,2,3,4-TeCB | 110.0 | 647.1 | 647.1 | ND | ND | 56.1 | 53.7 |
| PeCB | 95.0 | 97.8 | 102.2 | ND | 117.6 | 57.4 | 65.6 |
| HCB | 110.0 | 72.3 | 64.4 | 66.7 | 80.4 | 74.8 | 86.6 |
| HCBD | 110.0 | 105.5 | 105.5 | 125.0 | 76.2 | 47.5 | 50.8 |
| OCS | 105.0 | 20.4 | 12.8 | 93.8 | 95.7 | 73.3 | 77.8 |

TABLE II-4

% Recovery calculated from the design values

Lab No. G009

| Parameter | Standard solution | Sediment extracts | | Sediments | | | |
|---|---|---|---|---|---|---|---|
| | Sample #1 | Sample #2 | Sample #3 | Sample #4 | Sample #5 | Sample #6 | Sample #7 |
| 1,4-DCB | 86.5 | 54.3 | 42.8 | 39.9 | < 3.7 | 22.3 | 45.8 |
| 1,3-DCB | 78.2 | 89.2 | 98.0 | < 4.4 | 53.7 | 23.7 | 35.6 |
| 1,2-DCB | 108.6 | NC | NC | NC | 65.3 | 41.9 | 85.9 |
| 1,3,5-TCB | 85.9 | 73.2 | 72.6 | 45.8 | 33.6 | 20.6 | 35.3 |
| 1,2,4-TCB | 99.2 | 130.2 | 114.8 | 60.0 | 36.3 | 35.1 | 52.7 |
| 1,2,3-TCB | 81.0 | 21.4 | 16.2 | < 14.3 | 52.0 | 24.4 | 43.3 |
| 1,2,4,5-TeCB | 79.3 | 50.2 | 42.0 | 42.9 | 27.2 | 26.8 | 37.7 |
| 1,2,3,4-TeCB | 131.8 | 190.0 | 90.0 | 92.5 | 44.4 | 50.8 | 71.3 |
| PeCB | 76.5 | 78.0 | 80.6 | 64.7 | 46.9 | 50.4 | 54.4 |
| HCB | 85.2 | 64.5 | 65.2 | 65.6 | 55.7 | 61.5 | 63.2 |
| HCBD | 106.5 | 71.1 | 71.2 | 36.3 | 30.0 | 30.6 | 53.9 |
| OCS | 88.8 | 73.4 | 74.5 | 58.4 | 69.4 | 66.6 | 68.6 |

TABLE II-5

% Recovery calculated from the design values

Lab No. G014

| Parameter | Standard solution | Sediment extracts | | Sediments | | | |
|---|---|---|---|---|---|---|---|
| | Sample #1 | Sample #2 | Sample #3 | Sample #4 | Sample #5 | Sample #6 | Sample #7 |
| 1,4-DCB | NA | NA | NA | NA | NA | NA | NA |
| 1,3-DCB | NA | NA | NA | NA | NA | NA | NA |
| 1,2-DCB | NA | NA | NA | NA | NA | NA | NA |
| 1,3,5-TCB | NA | NA | NA | NA | NA | NA | NA |
| 1,2,4-TCB | NA | NA | NA | NA | NA | NA | NA |
| 1,2,3-TCB | NA | NA | NA | NA | NA | NA | NA |
| 1,2,4,5-TeCB | 55.2 | 118.3 | 90.6 | 52.4 | 47.7 | 39.7 | 41.6 |
| 1,2,3,4-TeCB | 126.0 | 237.1 | 180.6 | 100.0 | 108.9 | 100.7 | 105.4 |
| PeCB | 111.0 | 250 | 205.8 | 137.3 | 141.2 | 97.7 | 101.0 |
| HCB | 114.5 | 156.6 | 124.8 | 45.8 | 71.9 | 59.4 | 63.4 |
| HCBD | 116.5 | 292 | 211.6 | 161.3 | 102.9 | 85.1 | 91.4 |
| OCS | 117.5 | 306 | 265 | 56.6 | 117.0 | 83.8 | 87.1 |

TABLE II-6

% Recovery calculated from the design values

Lab No. G016A

| Parameter | Standard solution | Sediment extracts | | Sediments | | | |
|---|---|---|---|---|---|---|---|
| | Sample #1 | Sample #2 | Sample #3 | Sample #4 | Sample #5 | Sample #6 | Sample #7 |
| 1,4-DCB | 83.3 | ND | ND | ND | ND | 48.6 | 45.8 |
| 1,3-DCB | 93.3 | ND | ND | ND | ND | 60.6 | 50.5 |
| 1,2-DCB | 116.7 | ND | ND | ND | ND | ND | ND |
| 1,3,5-TCB | 117.5 | 141.9 | 141.9 | ND | 78.8 | 75.5 | 65.3 |
| 1,2,4-TCB | 121.3 | 209.3 | 186.0 | ND | 74.1 | 83.1 | 76.3 |
| 1,2,3-TCB | 100.0 | ND | ND | ND | ND | 75.0 | 62.5 |
| 1,2,4,5-TeCB | 110.0 | 115.2 | 115.2 | ND | 80.0 | 65.8 | 62.3 |
| 1,2,3,4-TeCB | 100.0 | ND | ND | ND | ND | 65.9 | 58.5 |
| PeCB | 85.0 | 84.4 | 88.9 | 106.7 | 89.4 | 55.7 | 57.4 |
| HCB | 100.0 | 111.3 | 108.9 | 55.6 | 67.0 | 84.6 | 84.3 |
| HCBD | 110.0 | 110.6 | 120.6 | 87.5 | 77.1 | 76.3 | 66.1 |
| OCS | 95.0 | 96.9 | 94.4 | 62.5 | 74.5 | 84.4 | 75.6 |

TABLE II-7

% Recovery calculated from the design values

Lab No. G017

| Parameter | Standard solution | Sediment extracts | | Sediments | | | |
|---|---|---|---|---|---|---|---|
| | Sample #1 | Sample #2 | Sample #3 | Sample #4 | Sample #5 | Sample #6 | Sample #7 |
| 1,4-DCB | NA | NA | NA | NA | NA | NA | NA |
| 1,3-DCB | NA | NA | NA | NA | NA | NA | NA |
| 1,2-DCB | NA | NA | NA | NA | NA | NA | NA |
| 1,3,5-TCB | 104.5 | 70.0 | 147.9 | 126.3 | 56.4 | 59.8 | 53.2 |
| 1,2,4-TCB | 117.3 | 86.0 | 186.0 | 61.5 | 72.2 | 68.9 | 59.7 |
| 1,2,3-TCB | 110.8 | 200.0 | ND | ND | ND | 38.8 | 42.5 |
| 1,2,4,5-TeCB | 103.5 | 39.8 | 93.7 | 82.4 | 53.0 | 58.4 | 47.9 |
| 1,2,3,4-TeCB | 104.0 | < 47.1 | < 47.1 | ND | 177.8 | 45.1 | 38.3 |
| PeCB | 92.0 | 431 | 104.0 | 113.3 | 87.1 | 69.2 | 57.5 |
| HCB | 111.5 | 62.2 | 137.5 | 84.4 | 102.3 | 111.4 | 86.2 |
| HCBD | 102.0 | 51.3 | 128.6 | 100.0 | 71.4 | 71.5 | 61.4 |
| OCS | 111.5 | 48.2 | 124.2 | 81.3 | 84.0 | 107.1 | 86.0 |

TABLE II-8

% Recovery calculated from the design values

Lab No. G023

| Parameter | Standard solution | Sediment extracts | | Sediments | | | |
|---|---|---|---|---|---|---|---|
| | Sample #1 | Sample #2 | Sample #3 | Sample #4 | Sample #5 | Sample #6 | Sample #7 |
| 1,4-DCB | NA | NA | NA | NA | NA | NA | NA |
| 1,3-DCB | NA | NA | NA | NA | NA | NA | NA |
| 1,2-DCB | NA | NA | NA | NA | NA | NA | NA |
| 1,3,5-TCB | 420 | NA | NA | NA | NA | NA | NA |
| 1,2,4-TCB | 80.8 | NA | NA | NA | NA | NA | NA |
| 1,2,3-TCB | 104.0 | 1123 | 1486 | ND | ND | < 37.5 | < 37.5 |
| 1,2,4,5-TeCB | 113.0 | 159.7 | 120.2 | ND | 105.0 | < 10.3 | 34.4 |
| 1,2,3,4-TeCB | 82.0 | ND | ND | ND | ND | < 4.9 | < 4.9 |
| PeCB | 108.0 | 128.9 | 162.2 | 480 | 61.2 | 73.6 | 69.7 |
| HCB | 118.0 | 128.0 | 138.3 | 271 | 49.7 | 87.0 | 92.1 |
| HCBD | 103.5 | 106.0 | 107.5 | ND | 48.6 | < 1.7 | 8.1 |
| OCS | 107.5 | 142.6 | 132.7 | 296.9 | 73.4 | 140.4 | 134.2 |

TABLE II-9

% Recovery calculated from the design values

Lab No. G024

| Parameter | Standard solution | Sediment extracts | | Sediments | | | |
|---|---|---|---|---|---|---|---|
| | Sample #1 | Sample #2 | Sample #3 | Sample #4 | Sample #5 | Sample #6 | Sample #7 |
| 1,4-DCB | 90.0 | 11045 | 11428 | 121.3 | 135.9 | 178.5 | 216.8 |
| 1,3-DCB | 103.3 | ND | ND | < 19.0 | 103.0 | 76.7 | 84.8 |
| 1,2-DCB | 116.7 | ND | ND | NC | 134.3 | 114.4 | 135.6 |
| 1,3,5-TCB | 105.8 | 133.0 | 151.8 | 96.3 | 87.9 | 80.4 | 87.3 |
| 1,2,4-TCB | 114.5 | 438 | 441 | 163.1 | 133.3 | 127.1 | 134.7 |
| 1,2,3-TCB | 106.8 | 221.4 | 605 | 106.7 | 103.0 | 91.4 | 100.9 |
| 1,2,4,5-TeCB | 53.0 | 68.1 | 66.8 | 23.2 | 36.7 | 24.9 | 27.5 |
| 1,2,3,4-TeCB | 101.0 | 174.1 | 205.3 | 101.3 | 121.1 | 54.9 | 62.0 |
| PeCB | 96.0 | 113.8 | 117.8 | 138.7 | 118.8 | 65.7 | 69.5 |
| HCB | 74.5 | 77.3 | 76.8 | 49.1 | 79.7 | 64.2 | 67.7 |
| HCBD | 96.0 | 105.5 | 108.5 | 230.0 | 89.8 | 80.7 | 85.8 |
| OCS | 70.5 | 53.3 | 54.6 | 50.3 | 55.9 | 46.2 | 48.2 |

TABLE II-10

% Recovery calculated from the design values

Lab No. G029

| Parameter | Standard solution | Sediment extracts | | Sediments | | | |
|---|---|---|---|---|---|---|---|
| | Sample #1 | Sample #2 | Sample #3 | Sample #4 | Sample #5 | Sample #6 | Sample #7 |
| 1,4-DCB | 80.6 | ND | ND | ND | ND | ND | ND |
| 1,3-DCB | 100.0 | ND | ND | ND | ND | ND | ND |
| 1,2-DCB | 104.2 | ND | ND | ND | ND | ND | ND |
| 1,3,5-TCB | 125.0 | 99.0 | 59.4 | ND | 127.3 | 81.6 | 85.7 |
| 1,2,4-TCB | 77.5 | ND | ND | ND | ND | 67.8 | 66.9 |
| 1,2,3-TCB | 120.0 | ND | ND | ND | ND | 137.5 | 87.5 |
| 1,2,4,5-TeCB | 65.0 | 29.8 | 20.7 | 176.5 | 145.0 | 95.9 | 101.4 |
| 1,2,3,4-TeCB | 130.0 | ND | ND | ND | ND | 63.4 | 95.1 |
| PeCB | 80.0 | 66.7 | 53.3 | 180.0 | 164.7 | 90.2 | 82.0 |
| HCB | 140.0 | 79.5 | 73.9 | 133.3 | 137.4 | 113.4 | 136.2 |
| HCBD | 75.0 | 55.3 | 41.2 | 112.5 | 95.2 | 74.6 | 74.6 |
| OCS | 80.0 | 51.0 | 48.5 | 162.5 | 90.4 | 88.9 | 100.0 |

TABLE II-11

% Recovery calculated from the design values

Lab No. G030

| Parameter | Standard solution | Sediment extracts | | Sediments | | | |
|---|---|---|---|---|---|---|---|
| | Sample #1 | Sample #2 | Sample #3 | Sample #4 | Sample #5 | Sample #6 | Sample #7 |
| 1,4-DCB | NA | NA | NA | NA | NA | NA | NA |
| 1,3-DCB | NA | NA | NA | NA | NA | NA | NA |
| 1,2-DCB | NA | NA | NA | NA | NA | NA | NA |
| 1,3,5-TCB | NA | NA | NA | NA | NA | NA | NA |
| 1,2,4-TCB | NA | NA | NA | NA | NA | NA | NA |
| 1,2,3-TCB | NA | NA | NA | NA | NA | NA | NA |
| 1,2,4,5-TeCB | NA | NA | NA | NA | NA | NA | NA |
| 1,2,3,4-TeCB | NA | NA | NA | NA | NA | NA | NA |
| PeCB | NA | NA | NA | NA | NA | NA | NA |
| HCB | 100.0 | 101.7 | 97.0 | 66.7 | 110.6 | 107.1 | 100.8 |
| HCBD | NA | NA | NA | NA | NA | NA | NA |
| OCS | NA | NA | NA | NA | NA | NA | NA |

TABLE II-12

% Recovery calculated from the design values

Lab No. G034

| Parameter | Standard solution | Sediment extracts | | Sediments | | | |
|---|---|---|---|---|---|---|---|
| | Sample #1 | Sample #2 | Sample #3 | Sample #4 | Sample #5 | Sample #6 | Sample #7 |
| 1,4-DCB | 77.8 | 141.8 | 141.8 | < 13.3 | 64.2 | 112.1 | 130.8 |
| 1,3-DCB | 80.0 | 23.4 | 31.3 | 88.6 | 100.0 | 121.2 | 111.1 |
| 1,2-DCB | 100.0 | ND | ND | NC | ND | 137.5 | 168.8 |
| 1,3,5-TCB | 100.0 | 115.5 | 112.2 | 105.3 | 109.1 | 112.2 | 99.0 |
| 1,2,4-TCB | 116.3 | 139.5 | 139.5 | 153.8 | 111.1 | 152.5 | 152.5 |
| 1,2,3-TCB | 97.5 | 95.2 | 95.2 | 100.0 | 140.0 | 125.0 | 125.0 |
| 1,2,4,5-TeCB | 95.0 | 89.0 | 94.2 | 117.6 | 85.0 | 95.9 | 89.0 |
| 1,2,3,4-TeCB | 100.0 | 117.6 | 117.6 | 150.0 | 111.1 | 126.8 | 126.8 |
| PeCB | 90.0 | 102.2 | 106.7 | 133.3 | 141.2 | 104.9 | 106.6 |
| HCB | 100.0 | 111.3 | 119.2 | 88.9 | 107.2 | 90.6 | 94.5 |
| HCBD | 100.0 | 145.7 | 140.7 | 250.0 | 114.3 | 103.4 | 98.3 |
| OCS | 80.0 | 102.0 | 91.8 | 62.5 | 117.0 | 80.0 | 88.9 |

TABLE II-13

% Recovery calculated from the design values

Lab No. G035

| Parameter | Standard solution | Sediment extracts | | Sediments | | | |
|---|---|---|---|---|---|---|---|
| | Sample #1 | Sample #2 | Sample #3 | Sample #4 | Sample #5 | Sample #6 | Sample #7 |
| 1,4-DCB | 88.9 | ND | ND | ND | ND | 40.4 | 42.1 |
| 1,3-DCB | 101.1 | ND | ND | 101.9 | ND | 27.1 | 33.5 |
| 1,2-DCB | 120.0 | ND | ND | NC | ND | 122.5 | 382 |
| 1,3,5-TCB | NA | NA | NA | NA | NA | NA | NA |
| 1,2,4-TCB | 119.4 | 120.9 | < 23.3 | ND | 60.7 | 40.1 | 44.1 |
| 1,2,3-TCB | 97.8 | 220.5 | ND | ND | ND | 29.0 | 32.5 |
| 1,2,4,5-TeCB | 83.5 | 77.0 | 63.9 | ND | 38.6 | 30.4 | 34.8 |
| 1,2,3,4-TeCB | 89.0 | ND | ND | ND | ND | 29.8 | 37.1 |
| PeCB | 80.0 | 95.1 | 84.0 | 142.0 | 56.4 | 52.8 | 60.3 |
| HCB | 86.5 | 82.7 | 75.6 | 92.0 | 55.9 | 52.4 | 61.4 |
| HCBD | 96.0 | 79.9 | 63.3 | ND | 31.7 | 34.4 | 39.0 |
| OCS | 67.5 | 79.1 | 73.5 | 77.2 | 55.3 | 56.9 | 60.2 |

TABLE II-14

% Recovery calculated from the design values

Lab No. G041

| Parameter | Standard solution | Sediment extracts | | Sediments | | | |
|---|---|---|---|---|---|---|---|
| | Sample #1 | Sample #2 | Sample #3 | Sample #4 | Sample #5 | Sample #6 | Sample #7 |
| 1,4-DCB | 94.4 | < 9.1 | < 9.1 | 100.0 | ND | 78.1 | 79.3 |
| 1,3-DCB | 93.3 | < 10.2 | < 10.2 | 111.4 | ND | 108.1 | 140.4 |
| 1,2-DCB | 118.3 | ND | ND | 100.0 | ND | 83.1 | 103.8 |
| 1,3,5-TCB | 99.8 | 109.6 | 108.9 | 131.6 | 93.3 | 95.3 | 96.5 |
| 1,2,4-TCB | 97.6 | 161.6 | 158.1 | 261.5 | 135.2 | 138.1 | 145.8 |
| 1,2,3-TCB | 99.3 | ND | ND | ND | ND | 92.5 | 123.8 |
| 1,2,4,5-TeCB | 140.0 | 183.2 | 168.9 | 329 | ND | 116.4 | 126.7 |
| 1,2,3,4-TeCB | 106.5 | 194.1 | 188.2 | 237.5 | 311 | 103.4 | 110.2 |
| PeCB | 103.5 | 125.3 | 113.3 | 206.7 | 145.9 | 130.5 | 113.4 |
| HCB | 98.0 | 159.0 | 145.5 | 135.6 | 161.0 | 163.8 | 148.0 |
| HCBD | 90.5 | 155.8 | 161.8 | 313 | 89.5 | 88.8 | 92.4 |
| OCS | 106.0 | 172.2 | 154.8 | 84.4 | 130.9 | 189.1 | 162.7 |

# 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: G003

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

## Lab-specific Appraisal for Flag Statement

**Lab Code:** G005

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

## Lab-specific Appraisal for Flag Statement

Lab Code: G006

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

## Lab-specific Appraisal for Flag Statement

**Lab Code:** G009

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

Lab-specific Appraisal for Flag Statement

Lab Code: G014

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

## Lab-specific Appraisal for Flag Statement

Lab Code: G016A

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

## Lab-specific Appraisal for Flag Statement

Lab Code: G017

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

## Lab-specific Appraisal for Flag Statement

Lab Code: G023

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

## Lab-specific Appraisal for Flag Statement

**Lab Code:** G024

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

## Lab-specific Appraisal for Flag Statement

**Lab Code:** G029

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

## Lab-specific Appraisal for Flag Statement

Lab Code: G030

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

## Lab-specific Appraisal for Flag Statement

**Lab Code:** G034

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

## Lab-specific Appraisal for Flag Statement

**Lab Code:** G035

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

## Lab-specific Appraisal for Flag Statement

Lab Code: G041

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

NATIONAL WATER RESEARCH INSTITUTE
P.O. BOX 5050, BURLINGTON, ONTARIO L7R 4A6

Environment Canada Environnement Canada

Canada

INSTITUT NATIONAL DE RECHERCHE SUR LES EAUX
C.P. 5050, BURLINGTON (ONTARIO) L7R 4A6

*Think Recycling!*

*Pensez à recycler !*