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UPPER GREAT LAKES CONNECTING CHANNELS INTERLABORATORY PERFORMANCE EVALUATION STUDY QM-6: CHLORINATED HYDROCARBONS IN SEDIMENTS AND AMPULES FINAL REPORT

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Research and Applications Branch
National Water Research Institute
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and the Quality Management Work Group

September 1987

UPPER GREAT LAKES CONNECTING CHANNELS

INTERLABORATORY PERFORMANCE EVALUATION STUDY

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The Quality Management Work Group

sent to the QMWG for review and approval

MANAGEMENT PERSPECTIVE

The Upper Great Lakes Connecting Channels (UGLCC) have been designated as "Areas of Concern" by the International Joint Commission. A Canada-U.S. binational study, involving the identification and assessment of the environmental impacts of toxic substances, in those areas, was initiated in 1984. In order to assist analytical laboratories, who are contributing data for the UGLCC study, to generate reliable and accurate data during the study, a Quality Management Work Group was formed and thirteen interlaboratory performance evaluation studies were implemented. This report describes the results from the sixth interlaboratory performance evaluation study, QM-6, which involved the analysis of 13 chlorinated hydrocarbons in sediments and in standard solutions. (Only seven laboratories provided results in this study and more than half of the data was considered unsatisfactory.)

Dr. J. Lawrence
Director, Research and Applications Branch
National Water Research Institute

PERSPECTIVE DE GESTION

Les canaux reliant les Grands Lacs d'amont ont été désignés "zone problème" par la Commission mixte internationale. Une étude binationale canado-américaine, comportant la détermination et l'évaluation ont des impacts environnementaux des substances toxiques dans cette zone, a été entreprise en 1984. Pour aider les laboratoires d'analyse qui fournissent des données pour l'étude à produire des données fiables et exactes, un groupe de travail sur la gestion de la qualité a été créé et 13 études interlaboratoires d'évaluation de rendement ont été mises sur pied. Le présent rapport donne les résultats de la sixième de ces études QM-6, qui comportait l'analyse de 13 hydrocarbures chlorés dans des sédiments ainsi que dans des solutions normalisées. (Seuls sept laboratoires ont fourni des résultats pour cette étude et plus de la moitié des données ont été considérées comme insatisfaisantes.)

ABSTRACT

The Upper Great Lakes Connecting Channels (UGLCC) study recognizes Quality Assurance/Quality Control (QA/QC) aspects as crucial elements to the overall utility of study results. As part of the QA/QC program, 13 interlaboratory performance evaluation studies were designed and conducted by the Quality Management Work Group.

This report describes the results from the sixth interlaboratory performance evaluation study, QM-6, which consisted of the analysis of 13 chlorinated hydrocarbons in sediments and ampules. Results were received from 7 out of 12 participating laboratories (4 Canadian, 3 U.S.)

The interlaboratory results for chlorinated hydrocarbons in standard solutions were satisfactory since the medians for all parameters were within 15% of their design values. The sediment results were, however, mostly unsatisfactory. A few laboratories had high detection limits and thus most of their results were "less than" values. One laboratory reported very high results while many of the other results were either low or very low. Only one laboratory provided satisfactory results for all sediment samples.

RESUME

L'étude sur les canaux reliant les Grands Lacs d'amont considère les aspects assurance de qualité/contrôle de qualité comme des éléments cruciaux pour l'utilité globale de ces résultats. Dans le cadre du programme assurance de qualité/contrôle de qualité, 13 études interlaboratoires d'évaluation de rendement ont été mises sur pied par le groupe de travail sur la gestion de la qualité.

Ce rapport donne des résultats de la sixième étude interlaboratoires, QM-6, qui consistait en l'analyse de 13 hydrocarbures chlorés dans des sédiments et dans des ampoules. Des résultats ont été reçus de 7 des 12 laboratoires participants (4 laboratoires canadiens et 3 américains).

Les résultats interlaboratoires pour les hydrocarbures chlorés dans des solutions normalisées étaient satisfaisants, étant donné que les médianes pour tous les paramètres se situaient en-deçà de 15 % de leur valeur nominale. Les résultats pour les sédiments étaient toutefois insatisfaisants pour la plupart. Quelques laboratoires ont obtenu des limites de détection élevées et, en conséquence, la majorité de leurs résultats étaient des valeurs "inférieurs à". Un laboratoire signale des valeurs très élevées tandis que beaucoup des autres résultats étaient soit faibles, soit très faibles. Seul un laboratoire a donné des résultats satisfaisants pour tous les échantillons de sédiments.

INTRODUCTION

The Upper Great Lakes Connecting Channels (UGLCC) have been designated as "Areas of Concern" by the International Joint Commission (IJC). To identify and deal with the environmental problems, a three year, binational study was initiated in 1984, involving Canadian and U.S. environmental and resource agencies, to study the St. Marys, St. Clair and Detroit Rivers and Lake St. Clair. The study involves identifying, quantifying and determining the environmental impacts of conventional and toxic substances from various sources.

The UGLCC Study recognizes Quality Assurance/Quality Control (QA/QC) aspects as crucial elements to the overall utility of study results. As part of the QA/QC program, 13 interlaboratory performance evaluation (QC) studies were designed and conducted by the Quality Management Work Group. The goal of these QC studies is to assist analytical laboratories, which are producing data for the UGLCC study, to generate reliable, accurate data and to assess their overall performance during this study. A total of some 100 parameters (organic, inorganic and physical properties) in three types of matrices (water, sediment and biota), will be assessed.

The present interlaboratory study, QM-6, was initiated on January 31, 1986. It involved the analysis of 13 chlorinated hydrocarbons in naturally contaminated sediment samples and standard solutions. The original deadline for reporting results was set for April 30, 1986. However, several laboratories were late in reporting, so the study was not closed until August 18, 1986.

STUDY PROFILE

From the returned questionnaires, the following laboratories affirmed that they would participate in this study: U001, U005, U009, U014, U072, U085, U086, U013, U049, U057, U078, U090. By the time the study closed, the last five laboratories had not sent back any results. See the list of participants at the end of this report.

Each laboratory was provided with four freeze-dried naturally contaminated sediment certified reference materials (CRM's) as described in Table 1. All samples were developed by the Research and Applications Branch (RAB) of the National Water Research Institute (NWRI). The design values of the chlorinated hydrocarbons in the CRM's (Table 2) were derived from repetitive in-house analysis using two different methodologies and by different operators. The sediment samples were sent out in blind duplicates in order to provide a rough indication of the precision of such analysis. Since erratic in-house standard solutions had been shown to be the single major source of error in previous interlaboratory studies for organic parameters, two standard solutions of chlorinated hydrocarbons in sealed glass ampules were also included in this study to evaluate the accuracy of the participants' calibration standards. These ampules were also used in a previous Upper Great Lakes Connecting Channels QC Study, QM-1.

Participants were requested to analyze samples 601 through 606 for the following 13 compounds: 1,2-, 1,3- and 1,4-dichlorobenzene (DCB), 1,3,5-, 1,2,4- and 1,2,3-trichlorobenzene (TCB), 1,2,4,5- and 1,2,3,4-tetrachlorobenzene (TeCB), pentachlorobenzene (PeCB), hexachlorobenzene (HCB), hexachloroethane (HCE), hexachlorobutadiene (HCBD), as well as octachlorostyrene (OCS). Many of the above compounds are listed as USEPA priority pollutants and are commonly found at many sites of the Great Lakes Basin.

RESULTS AND DISCUSSION

Analytical Methodology

Sediment samples were extracted by a soxhlet apparatus, sonicator, or by mechanical mixing using mixtures of acetone and hexane, ethyl ether and hexane, or acetone alone. Solvent was evaporated by using rotavap, Kuderna-Danish evaporator or nitrogen with a water bath. Cleanup of sediment extracts was done by gel permeation chromatography or by adsorption chromatography using silica gel or Florisil. All

participants used either single or dual capillary columns for the separation of the chlorinated hydrocarbons. Although one laboratory used a mass spectrometer for detection, the rest of the laboratories used electron capture detection for sample analysis. See Tables 3a and 3b for the analytical methodology used by each participant for chlorinated hydrocarbon analysis.

Data Evaluation

All raw data submitted by the participants are listed by parameter in the data summary (Appendix II). Because of the small number of results available for this study, the Youden ranking technique for the detection of bias, as well as the computerized flagging procedure were not used for data evaluation. Instead, the percent recoveries for each parameter based on the design values and interlaboratory medians were calculated (Table 4) to evaluate the precision and accuracy of the interlaboratory data.

General Comments

When the final data summary was prepared, results from six laboratories (U001, U005, U009, U014, U072 and U086) had been received. Another laboratory (U085) submitted data after the closing date. Their results were not included in the final data summary and subsequently not in this report. The data and the methodology for laboratory U085 can be found in Appendix III as late results. All laboratories except U085 submitted data for both sediment and ampule samples; U085 only provided results for the sediments.

An extra set of samples was requested by laboratory U005. Computer printouts of the raw data were sent to all reporting laboratories for verification in July, 1986. All laboratories returned their results verified, except for laboratories U001 and U014, whose results were verified by telephone. A change occurred. Laboratory U014 originally reported their values in the wrong units for the ampules.

A final data summary was sent to the participating laboratories, the Quality Management Work Group, the Work Chairmen, the Management Committee and Activity Integration Committee Chairmen on September 15, 1986.

Among the participants, only U072 and U086 analyzed all parameters. U001 did not provide results for 1,2,4,5-tetrachlorobenzene and the dichlorobenzenes were not analyzed by U009. Both U005 and U014 only analyzed the priority pollutants listed in USEPA Method 612. U085 did not analyze octachlorostyrene in this study.

As shown in Table 2b, the interlaboratory medians agreed very well with the design values in the two ampule samples. Medians of 9 out of 13 parameters were within ± 10% of the design values. The other four parameters, namely, 1,3,5- and 1,2,3-trichlorobenzene, 1,2,4,5-tetrachlorobenzene and octachlorostyrene, were lower by about 15%. Compared to a previous study, QM-1, there was a slight improvement in the ampule results since the medians in QM-6 are closer to the design values. For each chlorinated hydrocarbon, the interlaboratory relative standard deviation was generally between 20 and 30%, which is similar to those in QM-1.

Although six laboratories reported results for the four sediment samples, the number of usable results was usually less than six for each parameter except for hexachlorobenzene because some participants did not analyze all the parameters. This situation was worsened by the fact that laboratories U014 and U072 had very high detection limits for most of the parameters in this study. As a consequence, the less than values reported by these laboratories were not usable for data evaluation. Although interlaboratory medians were calculated for each chlorinated hydrocarbon in samples 601 through 604, those for the dichlorobenzenes, trichlorobenzenes, tetrachlorobenzenes and hexachloroethane should not be taken seriously since they were derived from three or less usable results. In these cases, the results were best evaluated by % recovery on an individual basis. For pentachlorobenzene, hexachlorobenzene, hexachlorobutadiene and

octachlorostyrene, the interlaboratory medians were in excellent agreement with the design values, indicating accuracy of the interlaboratory results.

Lab - specific comments

To provide a semi-quantitative evaluation of the data, the results were designated very low, low, high and very high, based on the reported results as a percent of the design value as shown below:

$\geq$	150%	very high
	149% - 125%	high
	124% - 76%	satisfactory
	75% - 51%	low
$\leq$	50%	very Low

See Table 5 for the summary of each laboratory's results.

U001

The ampule results were low for the trichlorobenzenes, 1,2,3,4-tetrachlorobenzene, hexachlorobutadiene, as well as octachlorostyrene and satisfactory for the other parameters reported by this laboratory. The sediment results were less satisfactory. Results for dichlorobenzene, trichlorobenzenes and 1,2,3,4-tetrachlorobenzene were mostly low or very low while the results for hexachlorobenzene were very high for sample 601 and high for sample 602. Precision between duplicates was also low for all hexachlorobenzene results in the sediments. Since the recoveries were lower for the more volatile compounds, it is likely that some of the lower molecular weight chlorinated compounds were lost during solvent evaporation.

U005

This laboratory only analyzed the priority pollutants listed in USEPA Method 612, namely, 1,4-, 1,3- and 1,2-dichlorobenzene, 1,2,4-trichlorobenzene, hexachlorobenzene, hexachloroethane and hexachlorobutadiene. The ampule results for the dichlorobenzenes were slightly high and those for 1,2,4 -trichlorobenzene were very high. Results for hexachlorobenzene and hexachlorobutadiene were also very high in sample 605 while the same parameters in sample 606 were not detected. Hexachloroethane was also not detected in both samples 605 and 606. The sediment results reported were entirely unsatisfactory. The calculated percent recoveries based on the design values ranged from 769% to over 2000%. Precision was also poor in many cases (see Table 4).

U009

This laboratory did not provide any results for the dichlorobenzenes. For the rest of the parameters in the ampule samples, the results were satisfactory except for hexachlorobenzene which was low in both samples 605 and 606. The result was also low for 1,2,4,5-tetrachlorobenzene in sample 605. The hexachloroethane result was high for 606. For the sediment samples, the results were very low for the trichlorobenzenes and 1,2,4,5-tetrachlorobenzene. Results were also low for hexachlorobutadiene (except for sample 604) and 1,2,3,4-tetrachlorobenzene (except for sample 603). Other than those cases stated above, the rest of the sediment data was satisfactory. Except for two cases, the sediment results were precise.

U014

This laboratory only analyzed the priority pollutants in USEPA Method 612. The ampule results for 1,2-dichlorobenzene and hexachlorobutadiene were very high for sample 605. There were four less than values in sample 606 because of the high detection limits set by this laboratory. For the sediment samples only the results for hexachlorobenzene and 1,2,4-trichlorobenzene in samples 602 and 604 were without less than values. The hexachlorobenzene results were both precise and accurate while the results for 1,2,4-trichlorobenzene were precise but very high (155% recovery). The rest of the results were unusable for data evaluation.

U072

This laboratory provided results for all 13 parameters in the ampule samples and their results were quite accurate (90% - 122%). However, they had relatively high detection limits for all di-, tri- and tetra-chlorobenzenes. Therefore, most of their results for such parameters were less than values and unusable for data evaluation. For the rest of the sediment data, the results were generally satisfactory in precision and accuracy with the exception of one very high result for octachlorostyrene in sample 603.

U086

This laboratory analyzed all 13 chlorinated hydrocarbons in the 6 samples. The ampule results were completely satisfactory. Other than the dichlorobenzene results which were high or very high for 1,2-dichlorobenzene and very high for 1,4-dichlorobenzene in samples 601 and 603, the other sediment data was both precise and accurate. Among all participants in this study, U086 was the best since it provided more usable and accurate results than the rest.

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LIST OF PARTICIPANTS

The Bionetics Corp., Chicago, Illinois

Michigan Department of Natural Resources, Lansing, Michigan

Michigan Department of Public Health, Lansing, Michigan

National Water Research Institute, Burlington, Ontario (2 participants)

Ontario Ministry of the Environment, Rexdale, Ontario

Water Quality National Laboratory, Burlington, Ontario

The following laboratories were sent samples but did not submit any results:

Barringer-Magenta Ltd., Rexdale, Ontario

Beak Consultants Ltd., Mississauga, Ontario

Mann Testing Laboratories, Mississauga, Ontario

Raytheon/USEPA LLRS, Grosse Ile, Michigan

U.S. Army Corps of Engineers, Detroit, Michigan

TABLE 1

Samples Distributed for Analysis in QM-6

Sample	Description
601	EC-2 Freeze dried sediment CRM
602	EC-3 Freeze dried sediment CRM
603	Same as 601
604	Same as 602
605	Standard solution of 13 chlorinated hydrocarbons in isooctane (same as sample 109 in Study QM-1)
606	Sample 605 after dilution to 15% (same as sample 110 in Study QM-1)

TABLE 2a

Design Values and Interlaboratory Medians for Chlorinated Hydrocarbons
(All values are in ng/g unless stated)

Parameter	Design Value	Interlab Median		Design Value	Interlab Median	
		601	603		602	604
1,4-Dichlorobenzene	59	100*	100*	107	110*	110*
1,3-Dichlorobenzene	78	47*	47*	99	100*	110*
1,2-Dichlorobenzene	10	22*	23*	16	20*	18*
1,3,5-Trichlorobenzene	34.3	21.7*	24.0*	98	76*	72*
1,2,4-Trichlorobenzene	80.7	63.0*	65.0*	118	157*	162**
1,2,3-Trichlorobenzene	5	4*	4*	8	5*	5*
1,2,4,5-Tetrachlorobenzene	84.0	75.0*	72.0*	146	110*	96.5*
1,2,3,4-Tetrachlorobenzene	36.5	27.0*	30.0*	41	23*	27*
Pentachlorobenzene	48.6	48.7	47.7	61	52	51
Hexachlorobenzene	201	211	195	254	265	256
Hexachloroethane	NA	.88*	.75*	NA	3.8*	3.5*
Hexachlorobutadiene	21.3	16.0	15.0	59	50	57
Octachlorostyrene	33	34	34	45	43	39

NA = not available

* Derived from 3 or less usable results

** Derived from 4 usable results but one of them is an obvious outlier.

TABLE 2b

Design Values and Interlaboratory Medians for Chlorinated Hydrocarbons
(All values are in pg/ul unless stated)

Parameter	Sample Number 605		Sample Number 606	
	Design Value	Interlab Median	Design Value	Interlab Median
1,4-Dichlorobenzene	1013	1000	152	150
1,3-Dichlorobenzene	952	1020	143	130
1,2-Dichlorobenzene	1050	1200	158	160
1,3,5-Trichlorobenzene	213	187	32.0	25.5
1,2,4-Trichlorobenzene	200	203	30.0	24.0
1,2,3-Trichlorobenzene	208	180	31.2	26.5
1,2,4,5-Tetrachlorobenzene	101	86.0	15.1	13.0
1,2,3,4-Tetrachlorobenzene	97.9	89.0	14.7	13.5
Pentachlorobenzene	98.6	91.5	14.8	13.5
Hexachlorobenzene	51.8	47.5	7.77	6.94
Hexachloroethane	40.1	40.0	6.02	5.60
Hexachlorobutadiene	49.5	47.0	7.42	6.60
Octachlorostyrene	104	84.5	15.6	13.0

TABLE 3a

Analytical Methodology for Chlorinated Hydrocarbons (sediments - extraction and cleanup)

Lab No.	Extraction Method	Solvent System	Cleanup	Evaporation Technique
U001	Sonicator	A	GPC eluted with 1:1 dichloromethane: cyclohexane mixture	Rotavap
U005	Soxhlet 16 hrs.	A	None	
U009	Sonifier 2 x 3 min	B	(1) (100% activated) Florisil eluted with hexane (2) Hg	Rotavap
U014	Soxhlet 18 hrs	A	(1) (Biobeads SX-3, 200 - 400 mesh) GPC eluted with 1:1 methylene chloride:hexane (2) (100% activated) Silica Gel eluted with hexane	Kuderna-Danish
U072	Rotary Mix 3 x 20 min.	C	Florisil eluted with hexane	Nitrogen/ Water Bath
U086	Soxhlet 24 hr	A*	(1) (40% H_2SO_4/ silica gel) Acidic Silica Gel eluted with hexane (2) Hg	Snyder column

Solvent system:

A 1:1 acetone:hexane

A* 59:41 acetone:hexane

B acetone

C 1:1 ethyl ether: hexane

TABLE 3b

Analytical Methodology for Chlorinated Hydrocarbons used for Analysis of Sediments and Ampules (Instrumentation)

Lab No.	GC Column Type	Detector
U001	Dual capillary SPB-1, SPB-5, 30m x 0.25 mm id, each	$Ni^{63}EC$
U005	Capillary DB-5, 30m x 0.32 mm id	MS
U009	Dual capillary DB-1701, SE-54, 30m	$Ni^{63}EC$
U014	Capillary fused silica SPB-5, SPB-608, 30m x 0.25 mm id, each	$Ni^{63}EC$
U072	DB-5 capillary column	$Ni^{63}EC$
U086	Dual capillary fused silica OV-1, SE-54, 25m x 0.2 mm id, each	$Ni^{63}EC$

TABLE 4 - 1

% Recovery Calculated from the Design Values and the Medians

$$\frac{\text{Reported Value}}{\text{Design/Median}} \times 100$$

LAB NO. U001

PARAMETER	% Recovery from from Design Value				% Recovery from Interlaboratory Median			
	601	603	602	604	601	603	602	604
1,4-Dichlorobenzene	55.1	60.7	55.1	46.7	32.5	35.8	53.6	45.5
1,3-Dichlorobenzene	32.7	38.1	57.5	53.0	54.3	63.2	56.9	47.7
1,2-Dichlorobenzene	99.0	97.9	124	86.3	45.0	42.6	99.5	76.7
1,3,5-Trichlorobenzene	47.8	55.1	55.9	45.8	75.6	78.8	72.1	62.4
1,2,4-Trichlorobenzene	43.4	57.5	66.4	54.2	55.6	71.4	49.9	39.4
1,2,3-Trichlorobenzene	57.4	64.4	51.1	38.5	71.8	80.5	81.8	61.6
1,2,4,5-Tetrachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4-Tetrachlorobenzene	65.8	106	53.2	49.5	88.9	129	94.8	75.2
Pentachlorobenzene	104	110	83.1	64.8	103	112	97.5	77.5
Hexachlorobenzene	156	115	136	91.3	149	119	131	90.6
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	85.4	64.8	83.4	80.0	114	92.0	98.4	82.8
Octachlorostyrene	93.0	68.8	78.0	77.1	90.3	66.8	81.6	89.0

* See Appendix I for explanation of codes.

TABLE 4 - 2

% Recovery Calculated from the Design Values and the Medians

$$\frac{\text{Reported Value}}{\text{Design/Median}} \times 100$$

LAB NO. U001

PARAMETER	% Recovery from Design Value		% Recovery from Interlaboratory Median	
	605	606	605	606
1,4-Dichlorobenzene	82.7	70.4	83.8	71.3
1,3-Dichlorobenzene	89.0	76.9	83.0	84.6
1,2-Dichlorobenzene	84.7	72.2	74.1	71.3
1,3,5-Trichlorobenzene	73.2	66.9	83.4	83.9
1,2,4-Trichlorobenzene	71.0	63.0	70.0	78.8
1,2,3-Trichlorobenzene	73.6	66.3	85.0	78.1
1,2,4,5-Tetrachlorobenzene	NA	NA	NA	NA
1,2,3,4-Tetrachlorobenzene	66.1	68.0	72.7	74.1
Pentachlorobenzene	77.1	76.4	83.1	83.7
Hexachlorobenzene	91.7	84.6	100	94.7
Hexachloroethane	NA	NA	NA	NA
Hexachlorobutadiene	70.3	67.4	74.0	75.8
Octachlorostyrene	68.0	63.2	83.7	75.8

* See Appendix I for explanation of codes.

TABLE 4 - 3

% Recovery Calculated from the Design Values and the Medians

$$\frac{\text{Reported Value}}{\text{Design/Median}} \times 100$$

LAB NO. U005

PARAMETER	% Recovery from Design Value				% Recovery from Interlaboratory Median			
	601	603	602	604	601	603	602	604
1,4-Dichlorobenzene	1525	1356	1776	935	900	800	1727	909
1,3-Dichlorobenzene	897	769	1919	1010	1489	1277	1900	909
1,2-Dichlorobenzene	t(2000)	t(1000)	3125	t(1250)	t(909)	t(435)	2500	t(1111)
1,3,5-Trichlorobenzene	NRA	NRA	NRA	NRA	NRA	NRA	NRA	NRA
1,2,4-Trichlorobenzene	1363	1115	2288	1441	1746	1385	1720	1049
1,2,3-Trichlorobenzene	NRA	NRA	NRA	NRA	NRA	NRA	NRA	NRA
1,2,4,5-Tetrachlorobenzene	NRA	NRA	NRA	NRA	NRA	NRA	NRA	NRA
1,2,3,4-Tetrachlorobenzene	NRA	NRA	NRA	NRA	NRA	NRA	NRA	NRA
Pentachlorobenzene	NRA	NRA	NRA	NRA	NRA	NRA	NRA	NRA
Hexachlorobenzene	1194	896	1575	1260	1137	923	1509	1250
Hexachlorethane	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	ND	1878	2203	1525	ND	2667	2600	1579
Octachlorostyrene	NRA	NRA	NRA	NRA	NRA	NRA	NRA	NRA

* See Appendix I for explanation of codes.

TABLE 4 - 4

% Recovery Calculated from the Design Values and the Medians

$$\frac{\text{Reported Value}}{\text{Design/Median}} \times 100$$

LAB NO. U005

PARAMETER	% Recovery from Design Value		% Recovery from Interlaboratory Median	
	605	606	605	606
1,4-Dichlorobenzene	118	132	120	133
1,3-Dichlorobenzene	116	140	108	154
1,2-Dichlorobenzene	133	127	117	125
1,3,5-Trichlorobenzene	NRA	NRA	NRA	NRA
1,2,4-Trichlorobenzene	150	t(333)	148	t(417)
1,2,3-Trichlorobenzene	NRA	NRA	NRA	NRA
1,2,4,5-Tetrachlorobenzene	NRA	NRA	NRA	NRA
1,2,3,4-Tetrachlorobenzene	NRA	NRA	NRA	NRA
Pentachlorobenzene	NRA	NRA	NRA	NRA
Hexachlorobenzene	t(193)	ND	t(211)	ND
Hexachloroethane	ND	ND	ND	ND
Hexachlorobutadiene	t(202)	ND	t(213)	ND
Octachlorostyrene	NRA	NRA	NRA	NRA

* See Appendix I for explanation of codes.

TABLE 4 - 5

% Recovery Calculated from the Design Values and the Medians

$$\frac{\text{Reported Value}}{\text{Design/Median}} \times 100$$

LAB NO. U009

PARAMETER	% Recovery from Design value				% Recovery from Interlaboratory Median			
	601	603	602	604	601	603	602	604
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trichlorobenzene	W(2.92)	W(2.92)	W(1.02)	W(1.02)	W(4.61)	W(4.17)	W(1.32)	W(1.39)
1,2,4-Trichlorobenzene	W(1.24)	W(1.24)	W(0.847)	W(0.847)	W(1.59)	W(1.54)	W(0.637)	W(0.617)
1,2,3-Trichlorobenzene	W(20.0)	W(20.0)	W(12.5)	W(12.5)	W(25.0)	W(25.0)	W(20.0)	W(20.0)
1,2,4,5-Tetrachlorobenzene	W(1.19)	W(1.19)	W(0.685)	W(0.685)	W(1.33)	W(1.39)	W(0.909)	W(1.04)
1,2,3,4-Tetrachlorobenzene	74.0	82.2	56.1	100	100	100	100	100
Pentachlorobenzene	105	121	111	111	105	124	131	133
Hexachlorobenzene	84.6	94.5	48.0	94.9	80.6	97.4	46.0	94.1
Hexachlorethane	NC	NC	NC	NC	W(114)	W(133)	W(26.3)	W(28.6)
Hexachlorobutadiene	65.7	70.4	42.4	103	87.5	100	50.0	107
Octachlorostyrene	124	127	133	111	121	124	140	128

* See Appendix I for explanation of codes.

TABLE 4 - 6

% Recovery Calculated from the Design Values and the Medians

$$\frac{\text{Reported Value}}{\text{Design/Median}} \times 100$$

LAB NO. U009

PARAMETER	% Recovery from Design Value		% Recovery from Interlaboratory Median	
	605	606	605	606
1,4-Dichlorobenzene	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA
1,3,5-Trichlorobenzene	95.3	78.1	109	98.0
1,2,4-Trichlorobenzene	92.5	80.0	91.1	100
1,2,3-Trichlorobenzene	91.3	92.9	106	109
1,2,4,5-Tetrachlorobenzene	67.3	79.5	79.1	92.3
1,2,3,4-Tetrachlorobenzene	91.9	95.2	101	104
Pentachlorobenzene	99.4	94.6	107	104
Hexachlorobenzene	63.7	64.4	69.5	72.0
Hexachloroethane	112	133	113	143
Hexachlorobutadiene	94.9	94.3	100	106
Octachlorostyrene	82.7	76.9	102	92.3

* See Appendix I for explanation of codes.

TABLE 4 - 7

% Recovery Calculated from the Design Values and the Medians

$$\frac{\text{Reported Value}}{\text{Design/Median}} \times 100$$

LAB NO. U014

PARAMETER	% Recovery from Design Value				% Recovery from Interlaboratory Median			
	601	603	602	604	601	603	602	604
1,4-Dichlorobenzene	LTV	LTV	LTV	LTV	LTV	LTV	LTV	LTV
1,3-Dichlorobenzene	LTV	LTV	LTV	LTV	LTV	LTV	LTV	LTV
1,2-Dichlorobenzene	LTV	LTV	LTV	LTV	LTV	LTV	LTV	LTV
1,3,5-Trichlorobenzene	NRA	NRA	NRA	NRA	NRA	NRA	NRA	NRA
1,2,4-Trichlorobenzene	LTV	LTV	155	155	LTV	LTV	117	113
1,2,3-Trichlorobenzene	NRA	NRA	NRA	NRA	NRA	NRA	NRA	NRA
1,2,4,5-Tetrachlorobenzene	NRA	NRA	NRA	NRA	NRA	NRA	NRA	NRA
1,2,3,4-Tetrachlorobenzene	NRA	NRA	NRA	NRA	NRA	NRA	NRA	NRA
Pentachlorobenzene	NRA	NRA	NRA	NRA	NRA	NRA	NRA	NRA
Hexachlorobenzene	105	92.5	110	107	100	95.4	105	107
Hexachlorethane	NC	NC	NC	NC	LTV	LTV	LTV	LTV
Hexachlorobutadiene	LTV	LTV	LTV	LTV	LTV	LTV	LTV	LTV
Octachlorostyrene	NRA	NRA	NRA	NRA	NRA	NRA	NRA	NRA

* See Appendix I for explanation of codes.

TABLE 4 - 8

% Recovery Calculated from the Design Values and the Medians

$$\frac{\text{Reported Value}}{\text{Design/Median}} \times 100$$

LAB NO. U014

PARAMETER	% Recovery from Design Value		% Recovery from Interlaboratory Median	
	605	606	605	606
1,4-Dichlorobenzene	98.7	132	100	133
1,3-Dichlorobenzene	107	LTV	100	LTV
1,2-Dichlorobenzene	154	127	135	125
1,3,5-Trichlorobenzene	NRA	NRA	NRA	NRA
1,2,4-Trichlorobenzene	110	133	108	167
1,2,3-Trichlorobenzene	NRA	NRA	NRA	NRA
1,2,4,5-Tetrachlorobenzene	NRA	NRA	NRA	NRA
1,2,3,4-Tetrachlorobenzene	NRA	NRA	NRA	NRA
Pentachlorobenzene	NRA	NRA	NRA	NRA
Hexachlorobenzene	104	LTV	114	LTV
Hexachloroethane	97.3	LTV	97.5	LTV
Hexachlorobutadiene	166	LTV	174	LTV
Octachlorostyrene	NRA	NRA	NRA	NRA

* See Appendix I for explanation of codes.

TABLE 4 - 9

% Recovery Calculated from the Design Values and the Medians

$$\frac{\text{Reported Value}}{\text{Design/Median}} \times 100$$

LAB NO. U072

PARAMETER	% Recovery from Design Value				% Recovery from Interlaboratory Median			
	601	603	602	604	601	603	602	604
1,4-Dichlorobenzene	LTV	LTV	LTV	LTV	LTV	LTV	LTV	LTV
1,3-Dichlorobenzene	LTV	LTV	LTV	LTV	LTV	LTV	LTV	LTV
1,2-Dichlorobenzene	LTV	LTV	LTV	LTV	LTV	LTV	LTV	LTV
1,3,5-Trichlorobenzene	LTV	LTV	LTV	LTV	LTV	LTV	LTV	LTV
1,2,4-Trichlorobenzene	LTV	LTV	LTV	LTV	LTV	LTV	LTV	LTV
1,2,3-Trichlorobenzene	LTV	LTV	LTV	LTV	LTV	LTV	LTV	LTV
1,2,4,5-Tetrachlorobenzene	LTV	LTV	<(48%)	50.0	LTV	LTV	<(64%)	75.6
1,2,3,4-Tetrachlorobenzene	LTV	LTV	LTV	LTV	LTV	LTV	LTV	LTV
Pentachlorobenzene	92.6	78.2	83.6	73.8	92.4	79.7	98.1	88.2
Hexachlorobenzene	79.6	99.5	82.7	90.6	75.8	103	79.2	89.8
Hexachlorethane	NC	NC	NC	NC	LTV	LTV	LTV	LTV
Hexachlorobutadiene	79.8	65.7	84.7	83.1	106	93.3	100	86.0
Octachlorostyrene	112	152	113	97.8	109	147	119	113

* See Appendix I for explanation of codes.

TABLE 4 - 10

% Recovery Calculated from the Design Values and the Medians

$$\frac{\text{Reported Value}}{\text{Design/Median}} \times 100$$

LAB NO. U072

PARAMETER	% Recovery from Design Value		% Recovery from Interlaboratory Median	
	605	606	605	606
1,4-Dichlorobenzene	118	98.7	120	100
1,3-Dichlorobenzene	110	97.9	103	108
1,2-Dichlorobenzene	114	101	100	100
1,3,5-Trichlorobenzene	103	106	118	133
1,2,4-Trichlorobenzene	110	110	108	138
1,2,3-Trichlorobenzene	111	119	128	140
1,2,4,5-Tetrachlorobenzene	99.0	119	116	138
1,2,3,4-Tetrachlorobenzene	112	122	124	133
Pentachlorobenzene	112	115	120	126
Hexachlorobenzene	94.6	99.1	103	111
Hexachloroethane	102	93.0	103	100
Hexachlorobutadiene	105	98.4	111	111
Octachlorostyrene	96.2	89.7	118	108

* See Appendix I for explanation of codes.

TABLE 4 - 11

% Recovery Calculated from the Design Values and the Medians

$$\frac{\text{Reported Value}}{\text{Design/Median}} \times 100$$

LAB NO. U086

PARAMETER	% Recovery from Design Value				% Recovery from Interlaboratory Median			
	601	603	602	604	601	603	602	604
1,4-Dichlorobenzene	169	169	103	103	100	100	100	100
1,3-Dichlorobenzene	60.3	60.3	101	111	100	100	100	100
1,2-Dichlorobenzene	350	360	125	144	159	157	100	128
1,3,5-Trichlorobenzene	78.7	84.5	99.0	102	124	121	128	139
1,2,4-Trichlorobenzene	78.1	80.5	110	119	100	100	82.8	86.4
1,2,3-Trichlorobenzene	96.0	108	86.3	96.3	120	135	138	154
1,2,4,5-Tetrachlorobenzene	89.3	85.7	75.3	82.2	100	100	100	124
1,2,3,4-Tetrachlorobenzene	79.5	79.5	82.9	87.8	107	96.7	148	133
Pentachlorobenzene	96.7	86.4	86.9	93.4	96.5	88.1	102	112
Hexachlorobenzene	104	89.6	98.4	106	99.5	92.3	94.3	105
Hexachlorethane	NC	NC	NC	NC	100	100	100	100
Hexachlorobutadiene	70.4	70.4	89.8	96.6	93.8	100	106	100
Octachlorostyrene	81.8	78.8	75.6	75.6	79.4	76.5	79.1	87.2

* See Appendix I for explanation of codes.

TABLE 4 - 12

% Recovery Calculated from the Design Values and the Medians

$$\frac{\text{Reported Value}}{\text{Design/Median}} \times 100$$

LAB NO. U086

PARAMETER	% Recovery from Design Value		% Recovery from Interlaboratory Median	
	605	606	605	606
1,4-Dichlorobenzene	77.0	85.5	78.0	86.7
1,3-Dichlorobenzene	75.6	83.9	70.6	92.3
1,2-Dichlorobenzene	77.1	82.3	67.5	81.3
1,3,5-Trichlorobenzene	79.8	81.3	90.9	102
1,2,4-Trichlorobenzene	80.0	80.0	78.8	100
1,2,3-Trichlorobenzene	81.7	76.9	94.4	90.6
1,2,4,5-Tetrachlorobenzene	85.1	86.1	100	100
1,2,3,4-Tetrachlorobenzene	89.9	88.4	98.9	96.3
Pentachlorobenzene	86.2	87.8	92.9	96.3
Hexachlorobenzene	79.2	94.0	86.3	105
Hexachloroethane	79.8	79.7	80.0	85.7
Hexachlorobutadiene	90.9	83.6	95.7	93.9
Octachlorostyrene	79.8	109	98.2	131

* See Appendix I for explanation of codes.

TABLE 5 - 1

Summary of Laboratory Results Based on the Percentage Recovery of the Design Value
(see page 5)

Lab No.	Parameter	Comments
U001	1,4-DCB	601, 603, 602, 606 - low; 604 - very low
	1,3-DCB	601, 603 - very low; 602, 604 - low
	1,2-DCB	606 - low
	1,3,5-TCB	601, 604 - very low; 603, 602, 605, 606 - low
	1,2,4-TCB	601 - very low; 603, 602, 604, 605, 606 - low
	1,2,3-TCB	601, 603, 602, 605, 606 - low; 604 - very low
	1,2,3,4-TeCB	601, 602, 605, 606 - low; 604 - very low
	PeCB	604 - low
	HCB	601 - very high; 602 - high
	HCBD	603, 605, 606 - low
	OCS	603, 605, 606 - low
U005	1,4-DCB	601, 603, 602, 604 - very high (>900%); 606 - high
	1,3-DCB	601, 603, 602, 604 - very high (>750%); 606 - high
	1,2-DCB	601, 603, 604 - very high (t codes, >999%); 602 - very high (3125%); 605, 606 - high
	1,2,4-TCB	601, 603, 602, 604 - very high (>1000%); 605 - very high; 606 - very high (t code, 333%)
	HCB	601, 603, 602, 604 - very high (>850%); 605 - very high (t code); 606 - ND
	HCE	601, 603, 602, 604, 605, 606 - ND
	HCBD	601, 606 - ND; 603, 602, 604 - very high (>1500%); 605 - very high (t code)

TABLE 5 - 2

Summary of Laboratory Results Based on the Percentage Recovery of the Design Value
(see page 5)

Lab No.	Parameter	Comments
U009	1,3,5-TCB	601, 603, 602, 604 - very low (w codes, < 3%)
	1,2,4,-TCB	601, 603, 602, 604 - very low (w codes, < 2%)
	1,2,3-TCB	601, 603, 602, 604 - very low (w codes, < 25%)
	1,2,4,5-TeCB	601, 603, 602, 604 - very low (w codes, < 2%); 605 - low
	1,2,3,4,-TeCB	601, 602, 604 - low
	HCB	602 - very low; 605, 606 - low
	HCE	606 - high
	HCBD	601, 603 - low; 602 - very low
	OCS	603, 602 - high
U014	1,4-DCB	601, 603, 602, 604 - LTV; 606 - high
	1,3-DCB	601, 603, 602, 604, 606 - LTV
	1,2-DCB	601, 603, 602, 604 - LTV; 605 - very high; 606 - high
	1,2,4-TCB	601, 603 - LTV; 602, 604 - very high; 606 - high
	HCB, HCE)	606 - LTV
	HCBD	601, 603, 602, 604, 606 - LTV; 605 - very high
U072	1,4-DCB, 1,3-DCB, 1,2-DCB, 1,3,5-TCB, 1,2,4-TCB, 1,2,3-TCB	601, 603, 602, 604 - LTV

TABLE 5 - 3

Summary of Laboratory Results Based on the Percentage Recovery of the Design Value
(see page 5)

Lab No.	Parameter	Comments
U072	1,2,4,5-TeCB	601, 603 - LTV; 602 - LTV (<48%); 604 - very low
	1,2,3,4-TeCB	601, 603, 602, 604 - LTV
	PeCB	604 - low
	HCBD	603 - low
	OCS	603 - very high
U086	1,4-DCB	601, 603 - very high
	1,3-DCB	601, 603 - low
	1,2-DCB	601, 603 - very high (>349%); 602, 604 - high
	HCBD	601, 603 - low

APPENDIX I

GLOSSARY OF TERMS

APPENDIX I

Glossary of Terms

Codes:

w: A "w" code is used with a reported result when no measurement was possible due to no response of the instrument to the sample. The "w" is preceded by the smallest determinative division that can be used in the units used in reporting.

t: The "t" code is used with values between the Criterion of Detection and the "w" value. The Criterion of Detection is commonly thought of by many as the limit of detection.

NA: Not analyzed.

NRA: Not routinely analyzed.

ND: Not detected.

NC*: Non-calculable.

H: High

VH: Very high

L: Low

VL: Very low

LTV: Less than value (<)

* A design value is unavailable for this particular parameter listed as "LOW CONCENTRATION" on the final data summary. Nevertheless, a result was reported by the lab.

APPENDIX II

FINAL DATA SUMMARY FOR

UGLCC INTERLABORATORY STUDY

QM-6

QM6 CHLORINATED HYDROCARBONS IN SEDIMENT AND AMPULES

PRINTOUT PREPARED: 86/11/20.

PARAMETER: 1,4-DICHLOROBENZENE NG/G

SAMPLE RESULTS

LAB	601	602	603	604
U001	32.5	59.0	35.8	50.0
U005	900.	1900.	800.	1000.
U014	<1000.	<1000.	<1000.	<1000.
U072	< 800.	< 800.	< 800.	< 800.
U086	100.	110.	100.	110.
TOTAL LABS REPORTING	5	5	5	5
TOTAL LABS USED	3	3	3	3
MEAN	344.16667	689.66667	311.93333	386.66667
STD DEV	482.54749	1048.48955	423.89529	532.00877
MEDIAN	100.00000	110.00000	100.00000	110.00000
DESIGN VALUE	59	107	59	107

QM6 CHLORINATED HYDROCARBONS IN SEDIMENT AND AMPULES

PRINTOUT PREPARED: 86/11/20.

PARAMETER: 1,3-DICHLOROBENZENE NG/G

SAMPLE RESULTS

LAB	601	602	603	604
U001	25.5	56.9	29.7	52.5
U005	700.	1900.	600.	1000.
U014	<1000.	<1000.	<1000.	<1000.
U072	< 400.	< 400.	< 400.	< 400.
U086	47.	100.	47.	110.
TOTAL LABS REPORTING	5	5	5	5
TOTAL LABS USED	3	3	3	3
MEAN	257.50000	685.63333	225.56667	387.50000
STD DEV	383.36699	1051.89315	324.38413	531.21912
MEDIAN	47.00000	100.00000	47.00000	110.00000
DESIGN VALUE	78	99	78	99

QM6 CHLORINATED HYDROCARBONS IN SEDIMENT AND AMPULES

PRINTOUT PREPARED: 86/11/20.

PARAMETER: 1,2-DICHLOROBENZENE NG/G

SAMPLE RESULTS

LAB	601	602	603	604
U001	9.9	19.9	9.79	13.8
U005	T 200.	500.	T 100.	T 200.
U014	<1000.	<1000.	<1000.	<1000.
U072	< 500.	< 500.	< 500.	< 500.
U086	35.	20.	36.	23.
TOTAL LABS REPORTING	5	5	5	5
TOTAL LABS USED	2	3	2	2
MEAN	22.45000	179.96667	22.89500	18.40000
STD DEV	17.74838	277.15700	18.53327	6.50538
MEDIAN	22.45000	20.00000	22.89500	18.40000
DESIGN VALUE	10	16	10	16

QM6 CHLORINATED HYDROCARBONS IN SEDIMENT AND AMPULES

PRINTOUT PREPARED: 86/11/20.

PARAMETER: 1,3,5-TRICHLOROBENZENE NG/G

SAMPLE RESULTS

LAB	601	602	603	604
U001	16.4	54.8	18.9	44.9
U009	W 1.	W 1.	W 1.	W 1.
U072	< 100.	< 100.	< 100.	< 100.
U086	27.	97.	29.	100.
TOTAL LABS REPORTING	4	4	4	4
TOTAL LABS USED	2	2	2	2
MEAN	21.70000	75.90000	23.95000	72.45000
STD DEV	7.49533	29.83991	7.14178	38.96158
MEDIAN	21.70000	75.90000	23.95000	72.45000
DESIGN VALUE	34.3	98	34.3	98

QM6 CHLORINATED HYDROCARBONS IN SEDIMENT AND AMPULES

PRINTOUT PREPARED: 86/11/20.

PARAMETER: 1,2,4-TRICHLOROBENZENE NG/G

SAMPLE RESULTS

LAB	601	602	603	604
U001	35.0	78.4	46.4	63.9
U005	1100.	2700.	900.	1700.
U009	W 1.	W 1.	W 1.	W 1.
U014	< 100.	183.	< 100.	183.
U072	< 200.	< 200.	< 200.	< 200.
U086	63.	130.	65.	140.
TOTAL LABS REPORTING	6	6	6	6
TOTAL LABS USED	3	4	3	4
MEAN	399.33333	772.85000	337.13333	521.72500
STD DEV	606.95662	1285.47619	487.54554	787.05872
MEDIAN	63.00000	156.50000	65.00000	161.50000
DESIGN VALUE	80.7	118	80.7	118

QM6 CHLORINATED HYDROCARBONS IN SEDIMENT AND AMPULES

PRINTOUT PREPARED: 86/11/20.

PARAMETER: 1,2,3-TRICHLOROBENZENE NG/G

SAMPLE RESULTS

LAB	601	602	603	604
U001	2.87	4.09	3.22	3.08
U009	W 1.	W 1.	W 1.	W 1.
U072	< 100.	< 100.	< 100.	< 100.
U086	4.8	6.9	5.4	7.7
TOTAL LABS REPORTING	4	4	4	4
TOTAL LABS USED	2	2	2	2
MEAN	3.83500	5.49500	4.31000	5.39000
STD DEV	1.36472	1.98697	1.54149	3.26683
MEDIAN	3.83500	5.49500	4.31000	5.39000
DESIGN VALUE	5	8	5	8

QM6 CHLORINATED HYDROCARBONS IN SEDIMENT AND AMPULES

PRINTOUT PREPARED: 86/11/20.

PARAMETER: 1,2,4,5-TETRACHLOROBENZENE NG/G

SAMPLE RESULTS

LAB		601	602	603	604
U009	W	1.	1.	1.	1.
U072	<	70.	70.	70.	73.
U086		75.	110.	72.	120.
TOTAL LABS REPORTING		3	3	3	3
TOTAL LABS USED		1	1	1	2
MEAN		75.00000	110.00000	72.00000	96.50000
STD DEV		0.00000	0.00000	0.00000	33.23402
MEDIAN		75.00000	110.00000	72.00000	96.50000
DESIGN VALUE		84.0	146	84.0	146

QM6 CHLORINATED HYDROCARBONS IN SEDIMENT AND AMPULES

PRINTOUT PREPARED: 86/11/20.

PARAMETER: 1,2,3,4-TETRACHLOROBENZENE NG/G

SAMPLE RESULTS

LAB		601		602		603		604
U001		24.0		21.8		38.7		20.3
U009		27.		23.		30.		27.
U072	<	50.	<	50.	<	50.	<	50.
U086		29.		34.		29.		36.
TOTAL LABS REPORTING		4		4		4		4
TOTAL LABS USED		3		3		3		3
MEAN		26.66667		26.26667		32.56667		27.76667
STD DEV		2.51661		6.72409		5.33510		7.87803
MEDIAN		27.00000		23.00000		30.00000		27.00000
DESIGN VALUE		36.5		41		36.5		41

QM6 CHLORINATED HYDROCARBONS IN SEDIMENT AND AMPULES

PRINTOUT PREPARED: 86/11/20.

PARAMETER: PENTACHLOROBENZENE NG/G

SAMPLE RESULTS

LAB	601	602	603	604
U001	50.4	50.7	53.4	39.5
U009	51.	68.	59.	68.
U072	45.	51.	38.	45.
U086	47.	53.	42.	57.
TOTAL LABS REPORTING	4	4	4	4
TOTAL LABS USED	4	4	4	4
MEAN	48.35000	55.67500	48.10000	52.37500
STD DEV	2.84429	8.27985	9.76593	12.72383
MEDIAN	48.70000	52.00000	47.70000	51.00000
DESIGN VALUE	48.6	61	48.6	61

QM6 CHLORINATED HYDROCARBONS IN SEDIMENT AND AMPULES

PRINTOUT PREPARED: 86/11/20.

PARAMETER: HEXACHLOROBENZENE NG/G

SAMPLE RESULTS

LAB	601	602	603	604
U001	314.	346.	232.	232.
U005	2400.	4000.	1800.	3200.
U009	170.	122.	190.	241.
U014	211.	279.	186.	273.
U072	160.	210.	200.	230.
U086	210.	250.	180.	270.
TOTAL LABS REPORTING	6	6	6	6
TOTAL LABS USED	6	6	6	6
MEAN	577.50000	867.83333	464.66667	741.00000
STD DEV	894.50316	1536.24431	654.43553	1204.80272
MEDIAN	210.50000	264.50000	195.00000	255.50000
DESIGN VALUE	201	254	201	254

QM6 CHLORINATED HYDROCARBONS IN SEDIMENT AND AMPULES

PRINTOUT PREPARED: 86/11/20.

PARAMETER: HEXACHLOROETHANE NG/G

SAMPLE RESULTS

LAB	601	602	603	604
U005	NW 1.	NW 1.	NW 1.	NW 1.
U009	< 100.	< 100.	< 100.	< 100.
U014	< 5.0	< 5.0	< 5.0	< 5.0
U072	.88	3.8	.75	3.5
U086				
TOTAL LABS REPORTING	5	5	5	5
TOTAL LABS USED	1	1	1	1
MEAN	.88000	3.80000	.75000	3.50000
STD DEV	0.00000	0.00000	0.00000	0.00000
MEDIAN	.88000	3.80000	.75000	3.50000
DESIGN VALUE	---------- LOW CONCENTRATION ----------			

QM6 CHLORINATED HYDROCARBONS IN SEDIMENT AND AMPULES

PRINTOUT PREPARED: 86/11/20.

PARAMETER: HEXACHLOROBUTADIENE NG/G

SAMPLE RESULTS

LAB		601	602	603	604
U001		18.2	49.2	13.8	47.2
U005	N		1300.	400.	900.
U009		14.	25.	15.	61.
U014	<	100.	< 100.	< 100.	< 100.
U072		17.	50.	14.	49.
U086		15.	53.	15.	57.
TOTAL LABS REPORTING		6	6	6	6
TOTAL LABS USED		4	5	5	5
MEAN		16.05000	295.44000	91.56000	222.84000
STD DEV		1.90000	561.67844	172.42409	378.58635
MEDIAN		16.00000	50.00000	15.00000	57.00000
DESIGN VALUE		21.3	59	21.3	59

QM6 CHLORINATED HYDROCARBONS IN SEDIMENT AND AMPULES

PRINTOUT PREPARED: 86/11/20.

PARAMETER: OCTACHLOROSTYRENE NG/G

SAMPLE RESULTS

LAB	601	602	603	604
U001	30.7	35.1	22.7	34.7
U009	41.	60.	42.	50.
U072	37.	51.	50.	44.
U086	27.	34.	26.	34.
TOTAL LABS REPORTING	4	4	4	4
TOTAL LABS USED	4	4	4	4
MEAN	33.92500	45.02500	35.17500	40.67500
STD DEV	6.26811	12.64921	12.98932	7.70860
MEDIAN	33.85000	43.05000	34.00000	39.35000
DESIGN VALUE	33	45	33	45

QM6 CHLORINATED HYDROCARBONS IN SEDIMENT AND AMPULES

PRINTOUT PREPARED: 86/11/20.

PARAMETER: 1,4-DICHLOROBENZENE PG/UL

SAMPLE RESULTS

LAB	605	606
U001	838.	107.
U005	1200.	200.
U014	1000.	200.
U072	1200.	150.
U086	780.	130.
TOTAL LABS REPORTING	5	5
TOTAL LABS USED	5	5
MEAN	1003.60000	157.40000
STD DEV	196.58281	41.75883
MEDIAN	1000.00000	150.00000
DESIGN VALUE	1013	152

QM6 CHLORINATED HYDROCARBONS IN SEDIMENT AND AMPULES

PRINTOUT PREPARED: 86/11/20.

PARAMETER: 1,3-DICHLOROBENZENE PG/UL

SAMPLE RESULTS

LAB	605	606
U001	847.	110.
U005	1100.	200.
U014	1020.	< 200.
U072	1050.	140.
U086	720.	120.
TOTAL LABS REPORTING	5	5
TOTAL LABS USED	5	4
MEAN	947.40000	142.50000
STD DEV	158.80428	40.31129
MEDIAN	1020.00000	130.00000
DESIGN VALUE	952	143

QM6 CHLORINATED HYDROCARBONS IN SEDIMENT AND AMPULES

PRINTOUT PREPARED: 86/11/20.

PARAMETER: 1,2-DICHLOROBENZENE PG/UL

SAMPLE RESULTS

LAB	605	606
U001	889.	114.
U005	1400.	200.
U014	1620.	200.
U072	1200.	160.
U086	810.	130.
TOTAL LABS REPORTING	5	5
TOTAL LABS USED	5	5
MEAN	1183.80000	160.80000
STD DEV	340.55425	39.41066
MEDIAN	1200.00000	160.00000
DESIGN VALUE	1050	158

QM6 CHLORINATED HYDROCARBONS IN SEDIMENT AND AMPULES

PRINTOUT PREPARED: 86/11/20.

PARAMETER: 1,3,5-TRICHLOROBENZENE PG/UL

SAMPLE RESULTS

LAB	605	606
U001	156.	21.4
U009	203.	25.
U072	220.	34.
U086	170.	26.
TOTAL LABS REPORTING	4	4
TOTAL LABS USED	4	4
MEAN	187.25000	26.60000
STD DEV	29.40947	5.31413
MEDIAN	186.50000	25.50000
DESIGN VALUE	213	32.0

QM6 CHLORINATED HYDROCARBONS IN SEDIMENT AND AMPULES

PRINTOUT PREPARED: 86/11/20.

PARAMETER: 1,2,4-TRICHLOROBENZENE PG/UL

SAMPLE RESULTS

LAB	605	606
U001	142.	18.9
U005	300.	T 100.
U009	185.	24.
U014	220.	40.
U072	220.	33.
U086	160.	24.
TOTAL LABS REPORTING	6	6
TOTAL LABS USED	6	5
MEAN	204.50000	27.98000
STD DEV	56.33383	8.42330
MEDIAN	202.50000	24.00000
DESIGN VALUE	200	30.0

QM6 CHLORINATED HYDROCARBONS IN SEDIMENT AND AMPULES

PRINTOUT PREPARED: 86/11/20.

PARAMETER: 1,2,3-TRICHLOROBENZENE PG/UL

SAMPLE RESULTS

LAB	605	606
U001	153.	20.7
U009	190.	29.
U072	230.	37.
U086	170.	24.
TOTAL LABS REPORTING	4	4
TOTAL LABS USED	4	4
MEAN	185.75000	27.67500
STD DEV	33.14991	7.09149
MEDIAN	180.00000	26.50000
DESIGN VALUE	208	31.2

QM6 CHLORINATED HYDROCARBONS IN SEDIMENT AND AMPULES

PRINTOUT PREPARED: 86/11/20.

PARAMETER: 1,2,4,5-TETRACHLOROBENZENE PG/UL

SAMPLE RESULTS

LAB	605	606
U009	68.	12.
U072	100.	18.
U086	86.	13.
TOTAL LABS REPORTING	3	3
TOTAL LABS USED	3	3
MEAN	84.66667	14.33333
STD DEV	16.04161	3.21455
MEDIAN	86.00000	13.00000
DESIGN VALUE	101	15.1

QM6 CHLORINATED HYDROCARBONS IN SEDIMENT AND AMPULES

PRINTOUT PREPARED: 86/11/20.

PARAMETER: 1,2,3,4-TETRACHLOROBENZENE PG/UL

SAMPLE RESULTS

LAB	605	606
U001	64.7	10.0
U009	90.	14.
U072	110.	18.
U086	88.	13.
TOTAL LABS REPORTING	4	4
TOTAL LABS USED	4	4
MEAN	88.17500	13.75000
STD DEV	18.53616	3.30404
MEDIAN	89.00000	13.50000
DESIGN VALUE	97.9	14.7

QM6 CHLORINATED HYDROCARBONS IN SEDIMENT AND AMPULES

PRINTOUT PREPARED: 86/11/20.

PARAMETER: PENTACHLOROBENZENE PG/UL

SAMPLE RESULTS

LAB	605	606
U001	76.0	11.3
U009	98.	14.
U072	110.	17.
U086	85.	13.
TOTAL LABS REPORTING	4	4
TOTAL LABS USED	4	4
MEAN	92.25000	13.82500
STD DEV	14.88568	2.39217
MEDIAN	91.50000	13.50000
DESIGN VALUE	98.6	14.8

QM6 CHLORINATED HYDROCARBONS IN SEDIMENT AND AMPULES

PRINTOUT PREPARED: 86/11/20.

PARAMETER: HEXACHLOROBENZENE PG/UL

SAMPLE RESULTS

LAB	605		606
U001	47.5		6.57
U005	T 100.	N	
U009	33.		5.
U014	54.	<	20.
U072	49.		7.7
U086	41.		7.3
TOTAL LABS REPORTING	6		6
TOTAL LABS USED	5		4
MEAN	44.90000		6.64250
STD DEV	8.11172		1.19075
MEDIAN	47.50000		6.93500
DESIGN VALUE	51.8		7.77

QM6 CHLORINATED HYDROCARBONS IN SEDIMENT AND AMPULES

PRINTOUT PREPARED: 86/11/20.

PARAMETER: HEXACHLOROETHANE PG/UL

SAMPLE RESULTS

LAB	605		606
U005	N		N
U009	45.		8.
U014	39.	<	20.
U072	41.		5.6
U086	32.		4.8
TOTAL LABS REPORTING	5		5
TOTAL LABS USED	4		3
MEAN	39.25000		6.13333
STD DEV	5.43906		1.66533
MEDIAN	40.00000		5.60000
DESIGN VALUE	40.1		6.02

QM6 CHLORINATED HYDROCARBONS IN SEDIMENT AND AMPULES

PRINTOUT PREPARED: 86/11/20.

PARAMETER: HEXACHLOROBUTADIENE PG/UL

SAMPLE RESULTS

LAB	605		606
U001	34.8		5.00
U005	T 100.	N	
U009	47.		7.
U014	82.	<	20.
U072	52.		7.3
U086	45.		6.2
TOTAL LABS REPORTING	6		6
TOTAL LABS USED	5		4
MEAN	52.16000		6.37500
STD DEV	17.81651		1.02754
MEDIAN	47.00000		6.60000
DESIGN VALUE	49.5		7.42

QM6 CHLORINATED HYDROCARBONS IN SEDIMENT AND AMPULES

PRINTOUT PREPARED: 86/11/20.

PARAMETER: OCTACHLOROSTYRENE PG/UL

SAMPLE RESULTS

LAB	605	606
U001	70.7	9.86
U009	86.	12.
U072	100.	14.
U086	83.	17.
TOTAL LABS REPORTING	4	4
TOTAL LABS USED	4	4
MEAN	84.92500	13.21500
STD DEV	12.03422	3.03725
MEDIAN	84.50000	13.00000
DESIGN VALUE	104	15.6

APPENDIX III

LATE DATA SUBMITTED FOR

UGLCC INTERLABORATORY STUDY

QM-6

APPENDIX III

LATE DATA SUBMITTED BY LABORATORY U085

(received on November 7, 1986)

Parameter	Sample (ng/g)				Detection Limit
	601	602	603	604	
1,4-DCB	260	190	130	LTV	150
1,3-DCB	ND	LTV	LTV	ND	150
1,2-DCB	ND	ND	ND	ND	150
1,3,5-TCB	24	79	23	70	10
1,2,4-TCB	98	100	49	88	10
1,2,3-TCB	4.0	ND	2.6	ND	10
1,2,4,5-TeCB	55	86	55	76	10
1,2,3,4-TeCB	29	31	28	26	10
PeCB	40	44	40	38	1.0
HCB	140	170	130	150	1.0
HCE	3.0	8.4	4.8	6.7	1.0
HCBD	18	43	14	41	1.0
OCS	NA	NA	NA	NA	NA

LTV - less than value
ND - not detected
NA - not analyzed

Methodology

Gas chromatography; polytron extraction and activated acidic silica gel cleanup.