U.S. Fish & Wildlife Service

Assessment of Blood Contaminant Residues in Delaware Bay Bald Eagle Nestlings

Department of the Interior
U.S. Fish & Wildlife Service
New Jersey Field Office
Ecological Services

and

New Jersey Department of
Environmental Protection
Division of Fish, Game, and Wildlife
Endangered and Nongame
Species Program

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
927 North Main Street (Bldg. D1)
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April 30, 1999

Memorandum

To: Assistant Regional Director, Ecological Services
Hadley, Massachusetts
(Attn: Tim Fannin)

From: Supervisor, New Jersey Field Office, Ecological Service
Pleasantville, New Jersey

Subject: Assessment of Blood Contaminant Residues in Delaware Bay Bald Eagle Nestlings

This memorandum transmits the technical assistance report entitled, "Assessment of Blood Contaminant Residues in Delaware Bay Bald Eagle Nestlings." This assessment was conducted to characterize contaminant concentrations in the blood of bald eagle nestling inhabiting the Delaware Bay region. The subject report is the result of a cooperative effort between the U. S. Fish and Wildlife Service's New Jersey Field Office and the New Jersey Department of Environmental Protection's Nongame and Endangered Species Program. Analytical work was conducted at the Columbia Environmental Research Center of the Biological resources Division of the U. S. Geologic Survey.

If you have further questions regarding this memorandum or the subject report, please contact Clay Stern of my staff at (609) 646-9310.

Attachment

Assessment of Blood Contaminant Residues in Delaware Bay Bald Eagle Nestlings

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April 1999

Preface

The information in this report presents a contaminants assessment of blood from bald eagle nestlings inhabiting the Delaware River Basin in New Jersey and Delaware. The purpose of this assessment was to characterize the type and extent of exposure by the nestlings to environmental contaminants. The results from the assessment document contaminant burdens in the nestlings and serve as a gauge of local environmental contamination.

This contaminants assessment was a collaborative effort between the U. S. Fish and Wildlife Service's New Jersey Field Office (NJFO), and the New Jersey Division of Fish, Game, and Wildlife's Endangered and Nongame Species Program (ENSP). Dr. Robert A. Frakes (formerly NJFO) and Kathleen Clark (ENSP) designed the study; nest monitoring, nest climbing, and sample collection were completed primarily by ENSP with the assistance of volunteer personnel. Chemical analyses were conducted at the Columbia Environmental Research Center of the U. S. Geological Survey in Columbia, Missouri. Statistical analysis was performed by Clay Stern (NJFO), and the report was co-prepared by Clay Stern (NJFO) and Kathleen Clark (ENSP). Funding for this project was provided by Region 5 of the U. S. Fish and Wildlife Service and the New Jersey Endangered Species Conservation Fund, Check-off for Wildlife.

Questions, comments, and suggestions related to this report are encouraged and should be submitted in writing to the following addresses:

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The use of trade names in this report is solely for identification purposes and does not constitute an endorsement by the U. S. Fish and Wildlife Service, or the New Jersey Department of Environmental Protection.

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Abstract

The bald eagle population around the lower Delaware River Basin is rebounding from near extirpation in the early 1970's to 14 active breeding pairs today. Environmental contaminants such as PCBs, DDT, and mercury have been implicated as affecting reproductive success, impairing behavior, and impacting metabolic functions. Between 1993 and 1996, blood was collected from 35 eaglets inhabiting the Delaware River basin of New Jersey and Delaware. Samples were examined for PCBs, chloro-substituted dibenzo-p-dioxins and dibenzofurans, pesticides, and elemental residue levels. Overall, the contaminants analyzed were below levels associated with immediate physiological or behavioral impacts; however, chronic and sublethal effects may still be manifestated by bioaccumulation, or other metabolic pathways later in the eaglet's life. Continued monitoring of contaminant residues in this population is recommended.

I. INTRODUCTION

Environmental contaminants are often suspected in the slow decline of many species. The number of bald eagles (*Haliaeetus leucocephalus*) inhabiting the Delaware Bay drainage has varied throughout this century. This species has survived despite loss of habitat, persecution, and impaired reproductive ability associated with organic and elemental contaminants. Currently, the bald eagle is listed under the Endangered Species Act as threatened by the United States Government, and as endangered by New Jersey. The bald eagle is the wild living symbol of the United States.

As a top predator in the aquatic food chain, it is reasonable to hypothesize that bald eagle numbers have always been relatively low. However, bounty hunting of this species was common in many states and provinces at the beginning of this century (Colborn 1991). The estimated number of bald eagles in New Jersey after World War II was 22 pairs. By 1972, when DDT use was banned, only one nesting pair remained (Clark et al. 1998).

The Endangered and Nongame Species Program (ENSP) of the New Jersey Division of Fish, Game and Wildlife (Division) has monitored active bald eagle nests in New Jersey since 1974 (Niles 1989). Between 1982 and 1989, the ENSP conducted a bald eagle restoration project resulting in new bald eagle nesting attempts (Niles et al. 1991). The New Jersey population of bald eagles steadily increased, reaching 14 nesting pairs in 1997 (Clark et al 1998). However, some nesting pairs experienced reproductive failures resulting in annual productivity below the minimum 1.0 fledgling per nest site (Wiemeyer et al 1984) needed to maintain the population.

Many factors can influence bald eagle reproductive success, and environmental contaminants frequently top the list. Contaminant residues have been implicated in impaired bald eagle reproduction in the Great Lakes region (Bowerman 1993, Dykstra 1995, Kozie and Anderson 1991), Maine (Welch 1994), the Columbia River Estuary of Oregon (Anthony et al 1993), British Columbia (Elliott et al 1996, Elliott et al 1998, Elliott and Norstrom 1998, Gill 1998), and the Delaware Bay drainage (Clark et al 1998, USFWS and NJDFG&W 1995).

Five bald eagle eggs collected between 1993 and 1997 from two New Jersey sites with depressed productivity contained elevated levels of DDE and PCBs (Clark et al 1998). The blood of 12 bald eagle nestlings collected between 1992 and 1993 in the Delaware Bay drainages of New Jersey and Delaware contained detectable amounts of DDE, DDD, PCBs, and moderate levels of mercury and selenium (USFWS and NJDFG&W 1995). In both studies the halogenated organic chemicals were implicated in reduced bald eagle reproductive success.

Eaglet blood contaminant levels were strongly correlated with productivity rates (Bowerman 1993). Given that bald eagles nesting in New Jersey are year-round residents with high trophic status, eaglet blood analysis can be an effective gauge of local environmental contamination. This assessment attempts to characterize organic and elemental contaminant blood levels of nestling bald eagles inhabiting the lower Delaware Bay drainage area.

II. METHODS

A. Sampling area

Nest sites were located on the outer coastal plains of southern New Jersey and Delaware along the Delaware River drainage, with exception of Round Valley (Figure 1). The region can be characterized as a mix of fragmented uplands, palustrine forested and estuarine emergent wetlands, successional meadows, agricultural fields, and urban development. Due to the proximity of the nest sites to both tidal and non-tidal waters, it is reasonable to assume that adult birds hunted in both habitats. The Round Valley nest site is in close proximity of a man-made reservoir in the Highlands physiographic province of New Jersey. This region is characterized by dry-mesic inland mixed forest, palustrine and riparian wetland, and open canopy shrub marsh and swamp.

B. Sample collection and transport

Blood samples were collected in May of four consecutive years (1993-1996) from 35 eaglets at 6-8 weeks of age as part of annual banding operations conducted by the Division and the Delaware Division of Fish and Game (Table 1, and Figure 1). Approximately 10 ml of blood was drawn by syringe from the brachialus vein of each nestling, then transferred to a Vacutainer containing sodium heparin. Blood samples were then transported from the field at 4°C, and centrifuged within 24 hours of collection. The plasma and packed cells were frozen separately at -20°C until transported on dry ice to the Columbia Environmental Research Center (CERC) of the Biological Resources Division of the U. S. Geological Survey, Columbia, Missouri. Upon receipt, the samples were stored at -80°C pending further preparation. The plasma and packed cells from each eaglet were recombined and homogenized prior to analysis.

C. Chemical Analysis

Eaglet blood samples were analyzed for a suite of organic and elemental contaminants. Specific analyte detection and quantitation, method detection limit (MDL), and analytical quality control protocols are described in the appendices.

D. Statistical Analysis

Residue levels were transformed to common logarithms; geometric means and 95% confidence levels were then calculated. Chlorinated hydrocarbon concentrations were not lipid normalized due to lack of significant correlation with blood lipid levels (Herbert and Keenlyside 1995). Residue concentrations less than the MDL were assigned a value of one-half the MDL except were otherwise noted. Dioxin-like equivalency values (TCDD-eq) were calculated using the World Health Organization (WHO) toxic equivalency factors (TEFs) for birds (Van den Berg et al 1998). All values are reported on a wet-weight basis.

Table 1. Nestling Identification					
year	Leg-band #	Nest Location	Sex	~age (days)	CERC #
1	629-32120	Stow Creek	M	49	14982
9	629-32122	Stow Creek	F	48	14983
9	629-33938	Appoquinimink Creek (DE)	F	51	14986
3	629-32125	Bear Swamp	M	60	14985
	629-33934	Murderkill (DE)	M	52	14986
	629-39833	Cohansey River	M	40	14952
	629-39834	Cohansey River	M	38	14953
1	629-39835	Stow Creek	F	47	14954
9	629-39836	Stow Creek	M	46	14955
9	629-39838	Bear Swamp	F	47	14956
4	629-39839	Union Lake	F	42	14957
	629-39840	Union Lake	M	47	14958
	629-39841	Belleplain	M	51	14959
	629-39842	Belleplain	M	45	14960
	629-39843	Cohansey River	M	49	14961
	629-39844	Cohansey River	F	47	14962
	629-39845	Stow Creek	F	41	14963
	629-39846	Stow Creek	M	40	14964
	629-39847	Stow Creek	F	41	14965
	629-39848	Belleplain	U	43	14966
1	629-39849	Belleplain	M	41	14967
9	629-39850	Bear Swamp	F	43	14968
9	629-39851	Bear Swamp	M	39	14969
5	629-39852	Union Lake	F	52	14970
	629-39853	Union Lake	F	51	14971
	629-39854	Union Lake	F	46	14972
	629-39855	Maurice River	M	56	14973
	629-39856	Maurice River	F	55	14974
	629-39857	Round Valley	F	51	14975
	629-39858	Round Valley	F	54	14976
1	629-39859	Bear Swamp	U	52	14977
9	629-39860	Union Lake	M	42	14978
9	629-39861	Maurice River	M	53	14979
6	629-39862	Maurice River	M	55	14980
	629-39863	Stow Creek	F	43	14981

Figure 1. Location of Bald Eagle Nest Sites

III. RESULTS

A. Organochlorine Pesticides

The DDT metabolite, p,p'-DDE, was the predominant organochlorine pesticide present. This analyte was detected in all samples, except nestling 629-39862-Maurice River, with a geometric mean concentration of 12.28 ng/g, and a 95% confidence interval of 9.2 to 16.3 ng/g. Nestling 629-39851-Bear Swamp had the highest p,p'-DDE concentration (141 ng/g), 12 times the geometric mean concentration and almost 4 times that of any other sample. Measurable levels of o,p'-DDE and p,p'-DDD were found in most samples; measurable levels of o,p'-DDD were found in approximately one-quarter of the samples. Levels of p,p'-DDT and o,p'-DDT were below their respective MDLs in all 35 samples (see Table 2).

Table 2. Total PCB and Organochlorine Pesticide Residues found in blood of Delaware Bay Bald Eagle Nestlings, 1993-1996.

	ng/g (ppb)					Frequency of values greater than MDL
	Geo.mean	95% C.I	Minimum	Maximum	Median	
t-PCB	60.8	48.9 - 75.7	<16.3	395	65.0	34/35
p,p'-DDE	12.3	9.2 - 16.3	<2.6	141	12.8	34/35
p,p'-DDD	3.2	2.4 - 4.2	<2.6	30.4	3.1	24/35
p,p'-DDT	<2.05	ND	<2.05	<2.05	<2.05	0/35
o,p'-DDE	0.57	0.40 - 0.83	<3.0	6.6	0.7	25/35
o,p'-DDD	0.33	ND	<0.5	4.9	<0.5	9/35
o,p'-DDT	0.21	ND	<0.4	5.6	<0.4	3/35
PCA	0.44	0.33 - 0.57	0.1	4.9	0.40	35/35
Lindane	3.10	2.50 - 3.80	0.8	9.3	3.6	35/35
Dieldrin	1.00	0.84 - 1.30	0.2	10.3	1.2	35/35
HCB	0.40	0.32 - 0.49	<0.3	1.5	0.4	28/35
A BHC	0.24	0.19 - 0.29	<0.2	0.80	0.2	28/35
B BHC	0.40	0.28 - 0.58	<0.4	13.4	<0.4	17/35
D BHC	0.31	0.23 - 0.41	<0.1	2.6	0.3	33/35
Heptachlor	0.32	0.26 - 0.39	<0.4	1.2	<0.4	17/35
Heptachlor Epoxide	0.33	ND	<0.5	1.3	<0.5	10/35
Oxychlordane	0.17	0.13 - 0.22	<0.1	1.8	0.2	31/35
cis-chloradane	1.12	0.86 - 1.48	<0.3	7.7	1.2	33/35
trans-chloradane	ND	ND	<1.9	<1.9	<1.9	0/35
cis-nonachlor	0.53	0.43 - 0.67	<0.3	5.6	0.6	32/35
trans-nonachlor	1.20	0.96 - 1.50	0.3	14.2	1.2	35/35
Methyloxychlor	<1.2	ND	<1.2	1.6	<1.2	1/35
Endrin	ND	ND	<2.2	<2.2	<2.2	0/35
Mirex	ND	ND	<0.9	<0.9	<0.9	0/35
Dacthal	<1.1	ND	<1.1	3.8	<1.1	5/35

Measurable levels of pentachloroanisole (PCA), lindane, and dieldrin were found in all 35 blood samples (see Table 2). Measurable levels of chlordane related contaminants, hexachlorobenzene (HCB), alpha, beta, and delta BHC were found in most samples (see Table 2). Levels of *trans*-chlordane, endrin, mirex, and methoxychlor were below their respective MDL in all 35 samples.

B. Polychlorinated Biphenyls

Measurable levels of PCB congeners were found in all 35 blood samples. PCB 138 was always the dominant congener, followed by PCB 153 and PCB 180. PCB congener values were summed to determine the total PCB concentrations. The sample set geometric mean concentration for total PCBs was 60.85 ng/g, with a 95% confidence interval of 48.9 to 75.7 ng/g. Nestling 629-39858-Round Valley, was the only sample having a total PCB concentration less than the reportable MDL of 16 ng/g. Nestling 629-39851-Bear Swamp had the highest total PCB concentration (395 ng/g), 6 times the geometric mean concentration and 3 times that of any other sample.

C. Non-*ortho*-PCBs

The selected non-*ortho*-PCBs were detectable in the pg/g range, and were typically approaching or below the MDL established by analysis of the QC blank samples. Geometric mean concentrations, 95% confidence intervals, minimum, median, maximum values, and TCDD-eq are present in Table 3.

Table 3. Non-*ortho*-PCBs and TCDD-eq levels of Delaware Bay Bald Eagle Nestlings, 1993-1996.

	pg/g (ppt)					Mean and *range* of percent contribution to non-*ortho* TCDD-eq
	Geo.mean	**95% C.I**	**Minimum**	**Maximum**	**Median**	
PCB 77	42.7	34.8 - 52.3	20	309	38	46 (*35.6 - 81.1*)
PCB 126	17.0	15.1 - 19.2	11	59	16	36 (*11.6 - 47.4*)
PCB 81	7.4	6.4 - 8.4	<1.5	18	8	16 (*2.1 - 24.5*)
PCB 169	3.4	3.0 - 3.8	<1.5	9	3	1 (*0.02 - 0.13*)
TCDD-eq (non-ortho)	4.6	4.0 - 5.4	2.8	19.1	4.3	
TCDD-eq (PCDDs & PCDFs)	0.83	ND	0.34	2.8	0.84	
Total TCDD-eq	**5.5**	**4.7 - 6.4**	**3.2**	**20.1**	**5.3**	

The non-*ortho*-PCB concentration gradient found in 34 of 35 samples was PCB 77 > PCB 126 > PCB 81 > PCB 169; in the remaining sample the gradient was PCB 77 > PCB 126 > PCB 169 > PCB 81. Polychlorinated biphenyl 77 levels were less 100 pg/g, except for samples 629-39841-Belleplain (309 pg/g), 629-39851-Bear Swamp (177 pg/g), and 629-39845 and 629-39863-Stow Creek (150 and 128 pg/g). In all 35 samples, PCB 126, PCB 81, and PCB 169 concentrations were less than 60, 20, and 10 pg/g respectively.

D. Dibenzo-p-dioxins (PCDD) and Dibenzofurans (PCDF)

Measurable levels of 2,3,7,8-substituted dibenzo-p-dioxins and dibenzofurans (PCDD and PCDF) were typically below 1.0 pg/g, and occasionally below the MDL established by the QC blank. Because of the minuscule amounts of analyte detected by this method, and the dilutional effects of applying the TEF, measured values were used rather than one-half the MDL to calculate the TCDD-eq. The sum of the PCDD and PCDF TCDD-eq for any individual eaglet was less than 1.5 pg/g, except for 629-39852 Bear Swamp (2.8 pg/g), 629-39834-Cohansey River and 629-39863-Stow Creek (1.9 pg/g), and 629-39850-Bear Swamp (1.7 pg/g). The geometric mean of the PCDD / PCDF TCDD-eq was 0.83 pg/g (range = 0.34 - 2.8 pg/g), representing 5 - 22% of the total TCDD-eq (PCDD and PCDF TCDD-eq + non-*ortho*-PCBs TCDD-eq).

E. Elemental Constituents

Geometric mean concentrations, 95% confidence intervals, and minimum, median, and maximum values of selected elements are present in Table 4.

Table 4. Select Elemental Contaminant Residues found in blood of Delaware Bay Bald Eagle Nestlings, 1993-1996.

	ug/L (ppb)					Frequency of values greater than (MDL)
	Geo.mean	95% C.I	Minimum	Maximum	Median	
Arsenic	26.8	19.2 - 31.8	<MDL	167	30	19/35 (27.4)
Cadmium	0.46	0.25 - 0.69	0.05	20	0.6	27/35 (0.1)
Mercury	154.6	102.2 - 193.4	38.5	1549	129	35/35 (1.28)
Lead	19.8	17.0 - 23.0	6	50	20	35/35 (1.0)
Selenium	704.1	669.5 - 740.4	498	950	696	35/35 (6.87)
Tin	5.5	4.80 - 6.08	3	10	5	35/35 (0.1)

1. Arsenic, Selenium, and Mercury

Arsenic and selenium concentrations were determined by flow-injection hydride generation atomic spectroscopy. Mercury concentrations were determined by flow-injection cold vapor atomic spectroscopy.

The geometric mean concentration of the sample set for arsenic was 24.7 ug/L, with a 95% confidence interval of 19.2 to 31.8 ug/L. Arsenic levels were less than 100 ug/L, except in 629-39859-Bear Swamp (167 ug/L), and 629-39848 and 629-39849-Belleplain (137 and 109 ug/L). It is interesting to note that 4 of the 5 highest arsenic levels were detected in the 4 Belleplain nestling samples submitted.

The geometric mean concentration of the sample set for selenium was 704.1 ug/L, with a 95% confidence interval of 669.5 to 740.4 ug/L. Selenium levels were less than 900 ug/L, except in 629-39859 and 629-32125-Bear Swamp (950 and 924 ug/L).

The geometric mean concentration of the sample set for mercury was 140.6 ug/L, with a 95% confidence interval of 102.2 to 193.4 ug/L. Mercury levels were generally below 300 ug/L; however, the five highest mercury concentrations, ranging from 756 to 1549 ug/L, were found in 5 of 6 Union Lake nestlings.

2. Semi-quantitative ICP-MS scan of elements

The semi-quantitative ICP-MS scan demonstrated uniform levels of the major cations in all samples, with sodium at 3,000 mg/L, potassium at 2,000 mg/L, calcium at 90 to 100 mg/L, and magnesium at 70 to 80 mg/L. Rubidium and zinc levels were generally 1,000 to 10,000 ug/L. Titanium concentrations were consistently between 2,000 to 3,000 ug/L. Aluminum, chromium, copper, strontium, and vanadium levels were typically 100 to 1,000 ug/L; manganese ranged from 40 to 100 ug/L; and antimony, cerium, cesium, cobalt, gallium, lithium, molybdenum, silver, tin, and zirconium were generally less than 10 ug/L. The remaining elements included in the scan were typically below their respective MDLs.

IV. DISCUSSION

The determination of the impact of any given contaminant on the well being of an individual is complicated by it's interactions with other contaminants, such as in the case of DDE and PCBs on reproductive success. The eaglets examined during this study do not exhibit blood contaminant levels of immediate lethal concern; this does not preclude chronic or sub-lethal effects.

Analysis of blood contaminants levels in nestling bald eagles is reflective of local contamination and represents recent exposures. Blood contaminant concentrations will rise in a fasting bird due to diffusion of contaminants from adipose tissue into the blood. When the blood and adipose contaminant concentrations approach equilibrium, blood contaminant levels can approximate body burden (Gill 1998, Phillips et al 1989). The levels of contaminants in blood are also strongly influenced by the timing and composition of the individual's last meal, as well as variation in contaminant metabolic uptake and excretion rates. Unfortunately, the practicality of collecting blood samples from fasting eaglets in the wild is often beyond the control of the researcher. Nevertheless, the sampling regimen employed in this investigation is useful in detecting inordinate contaminant loading in the sampling area.

A. Organochlorine Pesticides

The DDT metabolite, DDE, was the predominant organochlorine pesticide present in the Delaware Bay nestlings. The concentration gradient observed was DDE > DDD > DDT, suggesting an older source of contamination. This is consistent with the national trend of declining environmental levels of DDT. This study suggests that eaglets in the Delaware Bay region have not had recent exposure to fresh DDT.

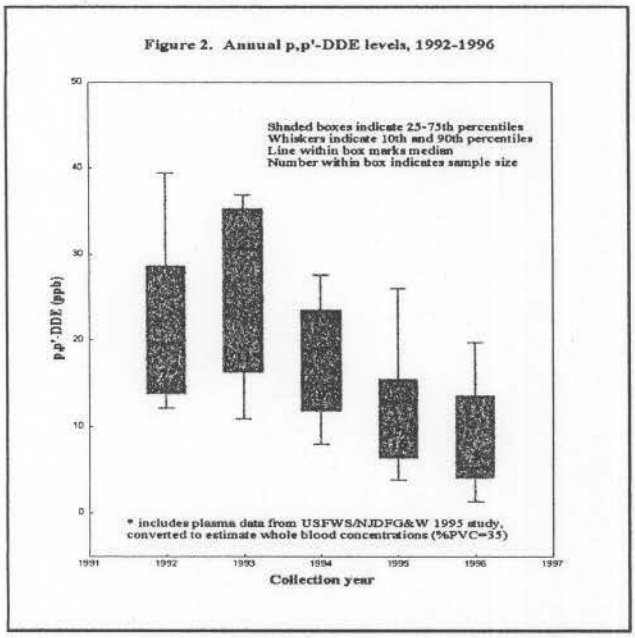
Levels of DDE found in the Delaware Bay nestlings were less than those found in Maine (USFWS 1994), the Great Lakes region (Bowerman et al 1994), and parts of British Columbia (Gill 1998), but greater than levels found on the west coast of the United States (Anthony et al 1993, Frenzel and Anthony 1989), parts of British Columbia (Elliott and Norstrom 1998), and the Great Lakes interior (Bowerman et al 1994) (Table 5). The highest DDE level detected in the Delaware Bay nestlings was 141 ppb; less than the critical level of 170 ppb suggested (Elliott and Norstrom 1998, Wiemeyer et al 1984) to cause significant population effects.

Table 5. Comparison of DDE, t-PCB, and Mercury with other bald eagle nestling contaminant studies					
	ug/g (ppb)				
Whole blood based	DDE	t-PCB	Mercury	n	Reference
Delaware Bay, '93-'96	11.1	60.8	140.6	35	Current Study
Maine '91 (State wide)	30	90	148	52	USFWS, 1994
Maine '92 (State wide)	81	184	178	55	USFWS, 1994
Columbia River, OR	50	40	470	15	Anthony, et al, 1993
Klamath Basin, OR & CA	30	14	2,170	15	Frenzel and Anthony, 1989
Florida	---	---	130	48	Wood, et al, 1996
Washington	---	---	230	9	Wiemeyer, et al , 1989
Oregon	---	---	1,200	82	Wiemeyer, et al, 1989
Plasma based analyzes					
Current Study -calculated *	~ 17	~ 94	~ 400	35	
Delaware Bay, '92-'93	32	120	233	12	USFWS and NJDFG&W, 1995
British Columbia	62**	127**	---	18	Gill, 1998
British Columbia	22.3*	56**	---	51	Elliott and Norstrom, 1998
Great Lakes (shore)	61	183	----	42	Bowerman, et al, 1994
Great Lakes (interior)	20	24	---	79	Bowerman, et al, 1994

* Calculated values based on a mean hematocrit of 35.
** Highest mean of multiple study groups used.

Although a sufficient number of sampling years is not available to statistically establish any trend, the stem and whiskers diagram (Figure 2) suggests that the overall levels of blood p,p'-DDE are declining. The lower 50% percentile range and median values seen in 1992 could be attributed to variation in the nest site sampling regimen of that year, and the fact that all nest sites could not be uniformly represented in each sampling year. Additionally for comparison, the values of all the 1992 samples, and 6 of 11 of the 1993 samples (USFWS/NJDFG&W 1995) were transformed (using a %PCV of 35) to approximate whole blood values. Data provided from additional sampling are necessary to establish the trend of p,p'-DDE levels. DDE is lipophilic and known to bioaccumulate, therefore it is not unreasonable to preclude that the Delaware Bay nestlings are still at risk from impacts associated with elevated DDE body burdens.

Figure 2. Annual p,p'-DDE levels, 1992-1996



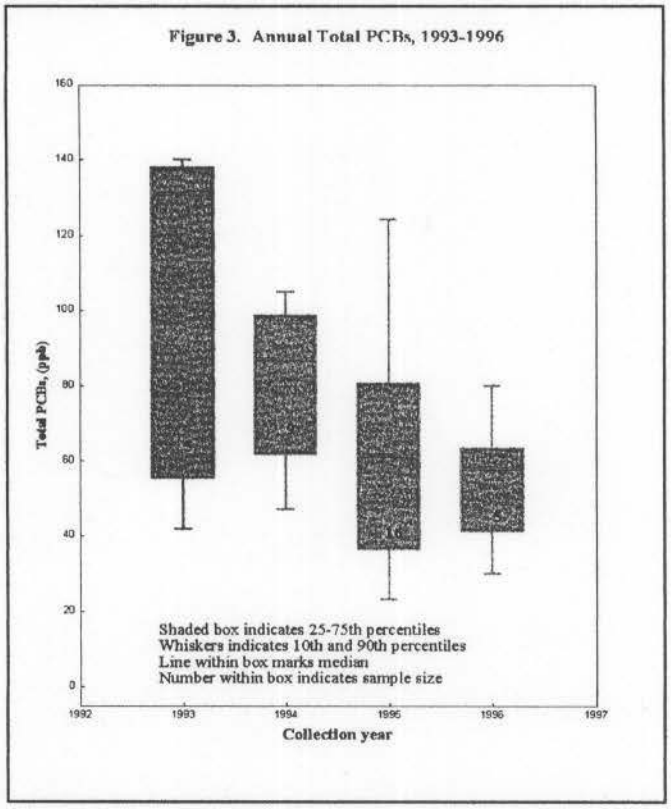
The maximum levels of other organochlorine pesticides detected were lindane (9.3 ppb), dieldrin (10.3 ppb), *B*-BHC (13.4 ppb), and *trans*-nonachlor (14.2 ppb). Generally, these values were less than those reported in the Great Lakes region (Bowerman et al 1991) and Oregon (Anthony et al 1993), and do not pose an apparent or immediate physiological risk.

B. Polychlorinated Biphenyls

In the Delaware Bay nestlings total PCB levels ranged from <MDL to 395 ppb, less than the suggested 500 ppb (Elliott and Norstrom 1998, Wiemeyer et al 1984) to cause significant population effects. Like DDE, PCBs are known to bioaccumulate in adipose tissue. The interactions, combined effects, and pharmokinetics of DDE and PCBs are not clearly understood. It is interesting to note that there was a strong correlation between DDE and total PCB levels in the Delaware Bay nestlings. This observation is consistent with the findings in Maine (USFWS 1994); however, it is unclear how this correlation relates to the well being of nestlings.

Total PCB levels detected in the Delaware Bay nestlings were less than those found in Maine (USFWS 1994), the Great Lakes region (Bowerman et al 1994), and parts of British Columbia (Gill 1998), but greater than levels found on the west coast of the United States (Anthony et al 1993, Frenzel and Anthony 1989), parts of British Columbia (Elliott and Norstrom 1998), and the Great Lakes interior (Bowerman et al 1994) (Table 5).

Figure 3. Annual Total PCBs, 1993-1996



An inter-year comparison of total PCB levels using a stem and whiskers diagram (Figure 3) demonstrates a decline in median total PCB levels from 1993 to 1996. It should be pointed out that all nest sites are not uniformly represented in each sampling year. Data provided from at least 3 additional sampling years would be necessary to conduct a robust trend analysis of total PCB levels.

C. Non-*ortho*-PCBs

With only one exception, the concentration gradient for non-*ortho*-PCBs in the Delaware Bay nestlings was PCB 77 > PCB 126 > PCB 81 > PCB 169; this gradient was the predominant pattern detected in British Columbia nestlings (Elliott and Norstrom 1998). A different pattern was reported from other areas of British Columbia (Gill 1998) where PCB 126 > PCB 77 > PCB 37 > PCB 169 > PCB 81. Generally, the concentration of the non-*ortho*-PCBs was along the same order of magnitude for all three studies.

The non-*ortho*-PCBs were the primary contributor to the calculated TCDD-eq value in the Delaware Bay nestlings; whereas the PCDDs and PCDFs were the primary contributors to the calculated TCDD-eq values in British Columbia (Gill 1988, Elliott and Norstrom 1998).

D. Dibenzo-p-dioxins (PCDD) and Dibenzofurans (PCDF)

Little information is available to compare nestling blood levels of PCDDs and PCDFs. Generally, PCDD and PCDF values were less than 1 pg/g (ppt) and occasionally less than the MDL established by the QC blank. Nevertheless, because of the extreme toxicity of dioxin compounds, trace levels of these compounds are important to consider.

The total TCDD-eq for any individual eaglet was less than 1.5 pg/g, except for 629-39852 Bear Swamp (2.8 pg/g), 629-39834-Cohansey River and 629-39863-Stow Creek (1.9 pg/g), and 629-39850-Bear Swamp (1.7 pg/g). The average contribution of the PCDDs and PCDFs to the total TCDD-eq was 0.83 pg/g (range = 0.34 - 2.8 pg/g), representing 5 - 22% of the total TCDD-eq (PCDD / PCDF TCDD-eq + non-*ortho*-PCB TCDD-eq). This is in contrast to the findings in British Columbia (Gill 1988, Elliott and Norstrom 1998) where the PCDDs and PCDFs were the primary contributor to the total TCDD-eq value. The average TCDD-eq value found in the Delaware Bay nestlings (5.5 pg/g) was typically less than those in the British Columbia studies. This is consistent with the assumptions of the TCDD-eq calculations, in that the non-*ortho*-PCBs carry less weight than PCDDs and PCDFs (Van den Berg et al 1998).

E. Elemental Contaminants

Overall, elemental contaminant concentrations are considered to be below levels of apparent or immediate physiological or behavioral impact. However, chronic and sublethal effects may still be manifestated by bioaccumulation, or through other metabolic pathways later in the eaglet's life.

Arsenic levels were consistently higher in the Belleplain nestlings than at any other nesting site. The reason for this anomaly is unclear, and because of the relatively small sample size of any given nest site used in this study, this observation should be interpreted with caution pending further investigation.

With regard to selenium, mallards surviving experimental oral overdosing of selenium had mean blood concentrations of 12,000 ppb (Heinz et al 1990). Considering the acidic to neutral nature of the soils in the lower Delaware River basin, and the observed nestling blood levels, less than 950 ppb, selenium does not represent an immediate ecological threat.

Another anomaly noted was elevated mercury levels in Union Lake nestlings. These levels were the highest detected over multiple years of any nest site, suggesting a local contaminant source. Mercury is a known neurotoxin, and it's pharmokinetics in the avian system are not clearly understood. Given the possibility of bioaccumulation of this element in addition to current blood levels (exceeding 1 ppm in some nestlings) further investigations of eagle behavior and blood mercury levels in the Union Lake area may be warranted.

Overall, mercury levels in the Delaware Bay nestlings (geometric mean = 140.6 ug/g) were similar to those found in Maine (USFWS, 1994) and Florida (Wood et al 1996), and less than those found in Oregon (Anthony et al 1993, Frenzel and Anthony 1989, Wiemeyer et al 1989) (Table 5).

All other elemental concentrations were determined by semi-quantitative scan. This comprehensive elemental analysis method is generally considered ±30 - 50% accurate and capable of detecting inordinate levels of elements when they occur. No disparate values or "hot spots" were detected by the scan. Data regarding normal eagle blood concentrations of most elements included in the scan are scarce or non-existent, making further interpretation speculative.

VI. CONCLUSIONS AND RECOMMENDATIONS

Data presented in this report clearly document that bald eagle nestlings inhabiting the lower Delaware Bay basin have been exposed to a variety of pesticides, and PCBs. Additionally, there is evidence warranting further investigation of arsenic and mercury levels at Belleplain and Union Lake respectively. Overall, the contaminants analyzed were below levels associated with apparent physiological or behavioral impacts; however, chronic and sublethal effects may still be manifestated by bioaccumulation, or through other metabolic pathways later in the eaglet's life. The following recommendations are provided:

- Continue to monitor all nest sites for pesticide metabolites and PCBs. At a minimum, an additional 3 to 6 years of sampling should be conducted to generate sufficient data to establish statistically sound trend analyses.

- Monitor residual arsenic concentrations at several trophic levels in the Belleplain region. Efforts to characterize the sources, transport pathways, and bioavailability of arsenic based compounds should be instituted.

- Monitor residual mercury concentrations at several trophic levels in the Union Lake region. Efforts to characterize the sources, transport pathways, and bioavailability of mercuric compounds should be instituted.

- Any available morbidund or expired eagle should be submitted to a wildlife pathologist to determine cause of death and have tissue samples properly collected for later contaminant analysis. Tissues should include at a minimum: hepatic, renal, and adipose sources. Chemical analyses should include a heavy meatal scan, a pesticide suite, total PCBs, and coplanar PCBs.

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VIII. APPENDICES

A. Polychlorinated Biphenyls in Bloods of Bald Eagles from the Lower Delaware River Drainage Area, New Jersey

B. Organochlorine Pesticides in Blood of Bald Eagles from the Lower Delaware River Drainage Area, New Jersey

C. Non-*ortho*-Chloro-Substituted Polychlorinated Biphenyls (PCBs) in Blood of Bald Eagles from the Lower Delaware River Drainage Area, New Jersey

D. 2,3,7,8-Substituted Dibenzo-p-dioxins and Dibenzofurans in Bloods of Bald Eagles from the Lower Delaware River Drainage Area, New Jersey

E. Determination of Elements in Blood Collected from Eagles in New Jersey and Delaware: 1993-1996

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Columbia Environmental Research Center
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October 30, 1998
Final Laboratory Report

Organic Contaminant Levels in Bloods of Bald Eagles from the Lower Delaware River Drainage Area of New Jersey

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Project History:

The US Fish and Wildlife Service's, New Jersey Field Office has monitored the threatened and endangered bald eagle in the lower Delaware River drainage since the 1970s. Several studies have linked organochlorine contaminant levels with reproductive impairment of osprey and peregrine falcons in New Jersey. A bald eagle restoration project was conducted in the 1980s and there are concerns that the recovery of this population could be affected due to higher levels of contaminant residues.

As bald eagles nested in this region, biologists tagged and collected whole blood samples from 5 - 9 week old bald eagle nestlings. Approximately 10 mL of whole blood was collected and transported from the field at 4°C. The 35 samples were heparinized and centrifuged within 24 hours of collection. Plasma and red blood cells were frozen separately at -20°C, and then were shipped frozen to CERC. The following contaminants were targeted for analysis as part of this research project: 2,3,7,8 substituted poly-chlorinated dibenzodioxins/furans; organochlorine pesticides; PCB congeners; non-*ortho*-PCBs.

Important note: The previous report of the Organochlorine Pesticides and PCB Congeners contained erroneously high detection limits. This report replaces the previous report on PCB Congeners and OC pesticides.

Summary of Methods for the Preparation of Eagle Blood Samples:

The plasma and red blood cells were recombined and homogenized before analysis. The sample was divided for mercury analysis and organic contaminant analysis. After sample size (volume and mass) was determined, the sample was dehydrated and method recovery standards, PCBs 030, 204. Surrogates, ^{13}C PCDD/PCDFs and ^{13}C-non-*ortho* PCBs, were added as described in the report sections that follow this summary.

Standard CERC operating procedures were used to analyze the eagle blood samples (1-4). Spiked samples were extracted with methylene chloride, with a small portion (~1 %) of the extract used to determine percent lipid. Extracts were then applied to a 20 g gravity-flow GPC column of SX-3 Biobeads (Biorad) and eluted with hexane/methylene chloride (80%/20%). The collected fractions were then applied to 5-g silica gel columns, with two fractions collected, PCB/pesticides (SG1) and pesticides (SG2). An HPLC porous graphitic carbon column was used to separate non-*ortho* PCBs (PGC2) and 2,3,7,8-PCDDs/PCDFs (PGC3) from the bulk/mono-*ortho* PCBs and pesticides (PGC1).

Gas chromatography (GC) with either electron capture (ECD) and high resolution mass spectrometry (GC/HRMS) was used for sample analysis. Specific final sample preparation steps are described in each fraction's report. Summary of Targeted Fractions:

PCBs and pesticides of fraction#1--	PGC1, analyzed by GC / ECD
Pesticides of fraction#2--	SG2, analyzed by GC / ECD
Non-*ortho* chlorinated PCBs--	PGC2, analyzed by GC / HR MS
2,3,7,8-PCDD/PCDFs--	PGC3 analyzed by GC / HR MS

The following quality control samples were analyzed with the 35 eagle blood samples:

3 procedural blanks, 3 procedural spikes,
3 matrix blanks, 3 matrix spikes (matrix of 6 grams chicken egg)
3 positive control tissue samples (5 grams of Saginaw Bay carp tissue)

Results for the targeted contaminants are reported in the following sections:

Polychlorinated Biphenyls in Bloods of Bald Eagles from the
Lower Delaware River Drainage Area New Jersey

Organochlorine Pesticides in Bloods of Bald Eagles from the
Lower Delaware River Drainage Area New Jersey

Non-*ortho*-chloro-substituted PCBs in Bloods of Bald Eagles from the
Lower Delaware River Drainage Area New Jersey

2,3,7,8-PCDDFs in Bloods of Bald Eagles from the
Lower Delaware River Drainage Area New Jersey

Appendix A

Polychlorinated Biphenyls in Bloods of Bald Eagles from the Lower Delaware River Drainage Area, New Jersey

Columbia Environmental Research Center Final Laboratory Report FY-98-30-07

Polychlorinated Biphenyls in Bloods of Bald Eagles from the Lower Delaware River Drainage Area New Jersey

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Analytical Method- Gas Chromatography/ Electron Capture Detection (GC/ECD):

Samples were extracted, cleaned, and fractionated as described text above. Purified sample fractions were analyzed by GC/ECD to measure PCBs in the PGC1 fraction. The GC/ECD analyses were performed as described in a CERC SOP (5). All GC/ECD analyses were performed using Hewlett-Packard 5890 Series II GCs with cool on-column capillary injection systems and Hewlett-Packard model 7673 autosamplers. For all analyses, a 5-m section of 0.53 mm id uncoated and deactivated (Restek Corp, Inc.) capillary retention gap was attached to the front of each analytical column by a "Press-Tight" (Restek Corp, Inc.) union.

PCB congener analysis:
Extracts were chromatographed on 60-m x 0.25-mm DB-5 (0.25μm 5% phenyl-, 95% methylsilicone, J&W Scientific) capillary columns. The two sets of samples were analyzed under the following conditions: The H_2-carrier was pressure regulated at 25 psi for set 1 and 24 psi for set 2. The temperature program for the Set 1 PCB analyses was as follows: initial temperature 60°C, immediately ramped to 140°C at 10°C/min, then ramped to 260°C at 1.5°C/min and held for 10 min, and finally ramped to 310°C at 10 C/min, and held for 2 min. The temperature program for the Set 2 PCB analyses was as follows: initial temperature 60°C, immediately ramped to 150 C at 15C/min, then ramped to 250 C at 1C/min and finally ramped to 320°C at 10°C/min, and held for 1 min. The temperature of the ECD was 330°C.

Capillary GC/ECD data were collected, archived in digital form, and processed using a PE-Nelson chromatography data system which includes the model 970 interface and version 4.1 of Turbochrom™ chromatography software running on a Pentium or 486 based microcomputer. Six levels of the OC pesticide standard (CERC# 162W) from 1 to 80 ng/mL, were used for pesticide calibration. Six levels of PCB standard, which are a combination of Aroclors 1242, 1248, 1254, 1260 in 1:1:1:1 w/w/w/w ratio (designated A1111), were used for PCB calibration, ranging from total PCB concentrations of 200 to 8000 ng/mL. An instrumental internal standard (IIS) method with aldrin or octachloronaphthalene (OCN) was used to calculate the concentrations of the targeted compounds. Results of the organochlorine pesticides are presented in Table 1 of this section, with final concentrations expressed as nanograms per gram of whole blood.

Quality control data, i.e. spikes, blanks, replicates, and controls, are presented in Table 2 and are discussed below. Recovery data for PCBs 030 and 204 are presented in Table 3.

Results and discussion

Method detection limits (MDLs) are presented in Table 2 in units of nanograms per gram of eagle blood. MDLs were determined by the method outlined by Keith *et al.* (6,7) which is based on procedure blank results. ***Important note:***

> *In the May 1998 report of the PCB results, MDLs for the PCBs were expressed in terms of nanograms per sample and were thus incorrectly listed in the tables. Procedure blank values are now in correct units, having been divided by the average sample mass in order to achieve units nanograms per gram of blood (ng/g) for the MDL values. Additionally, further review of the PCB chromatograms verified that labels on the procedure blank and matrix blank sample (both with date 072297) were switched, which led to application of erroneously high MDLs in the original report.*

MDLs for the various individual congeners range from 0.01 to 0.98 ng/g. The method detection limit for Total PCBs is 16 ng/g.

In addition to procedural and matrix blanks, matrix spikes were generated by spiking PCBs into 6 grams of clean chicken eggs (CERC numbers: MS 070997, MS 071597, MS 072297). Recoveries of the 1μg total PCB from these Matrix Spikes (MS) averaged 91%. Method precision was assessed by triplicate analysis of both the MS and positive control fish (CERC #6806, 5 grams, common carp from Saginaw Bay, MI). The positive control fish (PC) contain known amounts of environmentally incorporated PCBs and other contaminants. Method precision averaged 10% (CV) for the triplicates. The positive control fish result was compared with the CERC quality control chart for our positive control (8): total PCBs in the positive control were 5100 ng/g which is within 15% of the known value 5948 ng/g and within QC guidelines.

The spiked recovery compounds, PCBs 030 and 204, which elute in the PGC1 fraction, are presented in Table 3. PCB 030, a trichlorobiphenyl, is representative of more volatile early eluting PCBs (Cl_1 - Cl_3). PCB 204, an octachlorobiphenyl, is more representative of later

eluting PCBs (Cl_4 - Cl_{10}). Recoveries of PCBs in PGC1 averaged 45 ± 11% for PCB 030 and 69 ± 14% for PCB 204.

Measurable levels of PCB congeners were found all 35 blood samples. Concentrations of PCBs in the eagle blood samples are presented in Table 1 in units of ng/g of whole blood. Congener concentrations were summed to arrive at a total-PCB concentration for each blood sample. Analytical recoveries, based on PCBs l030 and l204 spiked into each sample, allow for accurate determination of PCB concentrations ***in*** the blood samples, i.e. the values reported are corrected for analytical recovery. Samples are designated by their CERC database number, field identification number and site description.

Concentrations of total-PCBs ranged from 23 ng/g to 395 ng/g. In sample 14976 (FWS# 62939858) the total PCB level was below our MDL reporting limit of 16 ng/g. Blood sample 14969 (FWS # 62939851) contained PCB levels three times higher than any other sample. Procedural blanks contained extremely low levels of PCBs, indicating no measurable cross contamination between samples and good method detection limits.

The chromatographic profile of the PCBs were generally similar in the various eagle blood samples. PCB patterns of the PCBs in the Positive Control Fish and the Matrix spikes are not similar to each other and were very different than the pattern seen in the eagle blood. Chromatograms of three of the eagle bloods are shown in Figures 1. We intend to analyze the patterns in greater detail using principal component analysis. The GC/ high resolution results for the non-ortho-PCB fraction are presented later in this report.

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Congener Specific PCB Results

Corrected MDL values

Table 1. NJ Eagle Blood (ng/g)

Corrected for recovery

Sample Name	FIELD ID	SAMPLE TYPE	TOTAL geq for Analysis	% LIPID	recovery corrected concentrations... 004,010 Amount (ng/g)	007,009 Amount (ng/g)	006 Amount (ng/g)	005,008 Amount (ng/g)	019 Amount (ng/g)	018 Amount (ng/g)	017,015 Amount (ng/g)	024,027 Amount (ng/g)
14952	62939833	Avian Blood	6.51	0.76	< 0.93	< 0.05	< 0.11	0.13	0.04	0.43	0.26	0.06
14953	62939834	Avian Blood	3.94	1.00	< 0.93	< 0.05	< 0.11	0.13	< 0.01	0.33	0.20	0.04
14954	62939835	Avian Blood	6.50	0.76	< 0.93	< 0.05	< 0.11	0.08	< 0.01	0.34	0.17	0.04
14955	62939836	Avian Blood	7.16	0.69	< 0.93	< 0.05	< 0.11	< 0.06	0.02	0.20	0.10	0.02
14956	62939838	Avian Blood	6.26	0.63	< 0.93	< 0.05	< 0.11	0.09	< 0.01	0.17	0.10	< 0.01
14957	62939839	Avian Blood	6.91	0.86	< 0.93	< 0.05	< 0.11	0.07	0.02	0.14	0.08	< 0.01
14958	62939840	Avian Blood	6.05	1.15	< 0.93	< 0.05	< 0.11	0.06	0.14	0.12	0.08	< 0.01
14959	62939841	Avian Blood	7.42	0.67	< 0.93	< 0.05	< 0.11	0.20	< 0.01	0.95	0.57	0.08
14960	62939842	Avian Blood	7.32	0.68	< 0.93	< 0.05	< 0.11	0.09	0.02	0.35	0.24	0.04
14961	62939843	Avian Blood	7.16	0.55	< 0.93	< 0.05	< 0.11	0.09	< 0.01	0.23	0.16	0.02
14962	62939844	Avian Blood	5.49	0.54	< 0.93	< 0.05	0.15	0.12	0.03	0.48	0.27	0.06
14963	62939845	Avian Blood	5.79	0.68	< 0.93	< 0.05	< 0.11	0.13	0.07	0.37	0.20	0.07
14964 *	62939846	Avian Blood	6.77	0.15	< 0.93	< 0.05	< 0.11	0.07	0.03	0.34	0.19	0.05
14965	62939847	Avian Blood	6.95	0.28	< 0.93	< 0.05	< 0.11	0.07	< 0.01	0.34	0.17	0.07
14966	62939848	Avian Blood	6.40	0.46	1.56	0.24	0.36	0.36	0.33	0.63	1.05	< 0.01
14967	62939849	Avian Blood	6.84	0.29	< 0.93	< 0.05	< 0.11	< 0.06	0.02	0.12	< 0.05	0.02
14968	62939850	Avian Blood	7.06	0.42	< 0.93	< 0.05	< 0.11	< 0.06	0.02	0.41	0.22	0.02
14969 *	62939851	Avian Blood	4.14	0.24	< 0.93	< 0.05	0.19	0.16	0.04	0.18	0.21	0.01
14970	62939852	Avian Blood	6.45	0.15	< 0.93	< 0.05	< 0.11	0.08	0.01	0.15	0.10	0.01
14971	62939853	Avian Blood	7.02	0.28	< 0.93	< 0.05	< 0.11	0.11	< 0.01	0.28	0.16	0.02
14972	62939854	Avian Blood	7.17	0.28	< 0.93	< 0.05	< 0.11	< 0.06	< 0.01	0.11	0.05	< 0.01
14973	62939855	Avian Blood	7.06	0.42	< 0.93	< 0.05	< 0.11	0.07	< 0.01	0.11	0.10	< 0.01
14974	62939856	Avian Blood	6.86	0.29	< 0.93	< 0.05	< 0.11	< 0.06	0.01	0.10	0.10	0.01
14975	62939857	Avian Blood	6.33	0.31	< 0.93	< 0.05	< 0.11	0.09	0.01	0.21	0.09	0.01
14976	62939858	Avian Blood	6.63	0.30	< 0.93	< 0.05	0.11	0.09	< 0.01	0.14	0.07	< 0.01
14977	62939859	Avian Blood	5.80	0.17	< 0.93	< 0.05	< 0.11	< 0.06	< 0.01	0.12	0.11	0.02
14978	62939860	Avian Blood	6.70	0.44	< 0.93	< 0.05	< 0.11	0.09	0.04	0.28	0.13	0.02
14979	62939861	Avian Blood	5.91	0.34	< 0.93	< 0.05	< 0.11	0.10	0.06	0.22	0.12	0.02
14980	62939862	Avian Blood	5.62	0.18	< 0.93	0.06	0.11	0.11	0.06	0.22	0.17	< 0.01
14981	62939863	Avian Blood	6.56	0.30	< 0.93	< 0.05	< 0.11	0.08	0.02	0.31	0.20	0.03
14982	62932120	Avian Blood	5.20	0.38	< 0.93	< 0.05	< 0.11	0.08	< 0.01	0.34	0.29	0.06
14983	62932122	Avian Blood	6.66	0.30	< 0.93	< 0.05	0.15	< 0.06	0.05	0.39	0.24	0.07
14984	62933938	Avian Blood	5.84	0.51	< 0.93	< 0.05	< 0.11	0.17	0.07	0.70	0.30	0.07
14985	62932125	Avian Blood	5.58	0.35	< 0.93	< 0.05	< 0.11	< 0.06	0.02	0.15	0.19	< 0.01
14986	62933934	Avian Blood	6.97	0.14	< 0.93	< 0.05	0.14	< 0.06	0.03	0.17	0.32	0.06
*GC replicate average.												

Sample Name	FIELD ID	SAMPLE TYPE	016,032 Amount (ng/g)	029 Amount (ng/g)	026 Amount (ng/g)	025 Amount (ng/g)	031 Amount (ng/g)	028 Amount (ng/g)	020,033 Amount (ng/g)	053 Amount (ng/g)	051 Amount (ng/g)	022 Amount (ng/g)
14952	62939833	Avian Blood	0.28	< 0.02	0.28	0.13	0.30	0.52	0.19	0.13	0.13	0.11
14953	62939834	Avian Blood	0.20	< 0.02	0.24	0.07	0.25	0.47	0.18	0.09	0.11	0.11
14954	62939835	Avian Blood	0.19	< 0.02	0.04	0.28	0.25	0.49	0.19	0.12	0.10	0.11
14955	62939836	Avian Blood	0.12	< 0.02	0.05	0.17	0.15	0.30	0.08	0.09	< 0.10	0.07
14956	62939838	Avian Blood	0.07	< 0.02	0.10	0.03	0.15	0.26	0.09	0.06	< 0.10	0.05
14957	62939839	Avian Blood	0.05	< 0.02	0.07	< 0.02	0.14	0.19	0.08	0.03	< 0.10	0.05
14958	62939840	Avian Blood	0.06	< 0.02	0.06	0.02	0.16	0.24	0.10	0.02	< 0.10	0.06
14959	62939841	Avian Blood	0.49	< 0.02	0.89	0.43	1.50	3.04	0.75	0.21	0.14	0.63
14960	62939842	Avian Blood	0.22	< 0.02	0.15	0.04	0.26	0.43	0.13	0.11	< 0.10	0.09
14961	62939843	Avian Blood	0.18	< 0.02	0.23	0.07	0.30	0.53	0.18	0.05	< 0.10	0.11
14962	62939844	Avian Blood	0.30	0.06	0.36	0.12	0.45	0.69	0.27	0.14	0.19	0.15
14963	62939845	Avian Blood	0.24	< 0.02	0.22	0.09	0.31	0.62	0.20	0.15	0.21	0.11
14964 *	62939846	Avian Blood	0.27	0.05	0.26	0.08	0.17	0.44	0.08	0.16	0.16	0.12
14965	62939847	Avian Blood	0.24	0.02	0.22	0.07	0.22	0.41	0.12	0.15	0.15	0.07
14966	62939848	Avian Blood	0.24	0.15	0.33	0.12	0.36	0.87	< 0.07	0.02	< 0.10	0.06
14967	62939849	Avian Blood	0.05	0.02	0.07	0.02	< 0.13	0.28	< 0.07	0.01	< 0.10	0.05
14968	62939850	Avian Blood	0.22	< 0.02	0.58	0.17	0.39	0.71	0.17	0.12	< 0.10	0.12
14969 *	62939851	Avian Blood	0.19	0.03	0.24	0.08	0.51	1.20	0.21	0.01	< 0.10	0.20
14970	62939852	Avian Blood	0.12	< 0.02	0.05	< 0.02	0.15	0.27	0.10	0.03	< 0.10	0.08
14971	62939853	Avian Blood	0.17	< 0.02	0.17	0.09	0.35	0.69	0.20	0.05	< 0.10	0.16
14972	62939854	Avian Blood	0.05	< 0.02	0.05	< 0.02	< 0.13	0.18	< 0.07	0.01	< 0.10	0.04
14973	62939855	Avian Blood	0.07	< 0.02	0.08	< 0.02	< 0.13	0.24	0.08	0.02	< 0.10	0.05
14974	62939856	Avian Blood	0.06	< 0.02	0.08	0.03	< 0.13	0.28	< 0.07	0.02	< 0.10	0.04
14975	62939857	Avian Blood	0.09	< 0.02	0.16	0.04	0.16	0.27	0.09	0.05	< 0.10	0.06
14976	62939858	Avian Blood	0.05	< 0.02	0.09	0.02	0.14	0.20	< 0.07	0.01	< 0.10	0.05
14977	62939859	Avian Blood	0.09	< 0.02	0.12	0.04	< 0.13	0.23	0.09	0.04	< 0.10	< 0.04
14978	62939860	Avian Blood	0.15	< 0.02	0.11	0.04	0.17	0.32	0.11	0.04	< 0.10	0.07
14979	62939861	Avian Blood	0.16	< 0.02	0.12	0.04	0.14	0.28	0.10	0.04	< 0.10	0.08
14980	62939862	Avian Blood	0.11	< 0.02	0.11	0.06	0.17	0.67	0.17	0.04	< 0.10	0.11
14981	62939863	Avian Blood	0.19	< 0.02	0.30	0.16	0.61	1.51	0.28	0.10	< 0.10	0.25
14982	62932120	Avian Blood	0.34	< 0.02	0.43	0.09	0.34	0.74	0.17	0.14	0.20	0.12
14983	62932122	Avian Blood	0.32	< 0.02	0.41	0.15	0.36	0.73	0.17	0.15	0.21	0.15
14984	62933938	Avian Blood	0.52	< 0.02	0.44	0.10	0.56	1.17	0.40	0.20	0.22	0.26
14985	62932125	Avian Blood	0.11	< 0.02	0.09	0.04	0.17	0.34	0.09	0.03	< 0.10	0.06
14986	62933934	Avian Blood	0.34	< 0.02	0.29	0.11	0.26	0.46	0.14	0.06	0.15	0.09

*GC replicate average.

Sample Name	FIELD ID	SAMPLE TYPE	045 Amount (ng/g)	046 Amount (ng/g)	052 Amount (ng/g)	043 Amount (ng/g)	049 Amount (ng/g)	047 Amount (ng/g)	048 Amount (ng/g)	044 Amount (ng/g)	042 Amount (ng/g)	041 Amount (ng/g)
14952	62939833	Avian Blood	0.08	0.03	1.84	0.05	1.55	1.06	0.18	1.30	0.58	0.53
14953	62939834	Avian Blood	0.04	< 0.01	1.78	0.03	1.48	0.99	0.19	1.16	0.54	0.46
14954	62939835	Avian Blood	0.04	< 0.01	1.72	0.03	1.38	0.98	0.15	1.11	0.55	0.55
14955	62939836	Avian Blood	0.04	0.02	1.59	0.04	1.30	0.99	0.15	1.10	0.53	0.49
14956	62939838	Avian Blood	0.01	< 0.01	0.91	0.01	0.81	0.50	0.08	0.52	0.23	< 0.26
14957	62939839	Avian Blood	0.01	< 0.01	0.51	0.03	0.45	0.29	0.06	0.37	0.14	< 0.26
14958	62939840	Avian Blood	0.02	< 0.01	0.60	0.03	0.61	0.44	0.06	0.37	0.21	< 0.26
14959	62939841	Avian Blood	0.11	0.05	3.38	0.14	3.64	2.48	0.51	2.46	1.82	1.30
14960	62939842	Avian Blood	0.09	0.04	1.60	0.04	1.53	0.88	0.16	1.13	0.53	0.53
14961	62939843	Avian Blood	0.04	0.02	1.33	0.04	1.11	0.82	0.14	1.00	0.47	0.43
14962	62939844	Avian Blood	0.07	0.02	2.14	0.05	1.58	1.21	0.21	1.74	0.70	0.88
14963	62939845	Avian Blood	0.06	0.02	1.93	0.06	1.53	1.19	0.19	1.27	0.60	0.66
14964 *	62939846	Avian Blood	0.11	0.04	2.27	0.03	2.02	1.64	0.21	1.56	0.78	0.73
14965	62939847	Avian Blood	0.07	0.02	1.61	0.04	1.33	1.02	0.15	1.15	0.52	0.61
14966	62939848	Avian Blood	0.16	0.02	0.60	0.04	0.52	0.67	0.09	0.42	0.29	0.27
14967	62939849	Avian Blood	0.01	< 0.01	0.42	0.01	0.40	0.39	0.07	0.27	0.13	< 0.26
14968	62939850	Avian Blood	0.09	0.03	2.25	0.09	2.25	1.55	0.26	1.31	1.04	0.68
14969 *	62939851	Avian Blood	0.06	< 0.01	1.69	0.04	2.77	2.67	0.18	0.63	1.20	< 0.26
14970	62939852	Avian Blood	0.03	0.01	0.67	0.03	0.49	0.49	0.03	0.48	0.19	< 0.26
14971	62939853	Avian Blood	0.04	0.01	0.94	0.02	0.81	0.56	0.11	0.71	0.40	< 0.26
14972	62939854	Avian Blood	0.01	< 0.01	0.58	< 0.01	0.41	0.28	< 0.03	0.42	0.14	< 0.26
14973	62939855	Avian Blood	0.01	< 0.01	0.61	< 0.01	0.59	0.44	0.05	0.34	0.20	< 0.26
14974	62939856	Avian Blood	0.01	< 0.01	0.62	0.02	0.58	0.49	0.03	0.34	0.20	< 0.26
14975	62939857	Avian Blood	0.01	< 0.01	0.82	0.01	0.66	0.40	0.08	0.46	0.25	< 0.26
14976	62939858	Avian Blood	< 0.01	< 0.01	0.54	< 0.01	0.39	0.23	< 0.03	0.31	< 0.13	< 0.26
14977	62939859	Avian Blood	0.01	< 0.01	0.60	0.01	0.51	0.38	< 0.03	0.37	0.18	< 0.26
14978	62939860	Avian Blood	0.04	0.01	0.89	0.03	0.64	0.43	0.07	0.63	0.23	< 0.26
14979	62939861	Avian Blood	0.03	0.01	0.90	0.01	0.82	0.51	< 0.03	0.62	0.20	< 0.26
14980	62939862	Avian Blood	< 0.01	< 0.01	1.20	< 0.01	1.12	0.62	0.08	0.66	0.25	0.29
14981	62939863	Avian Blood	0.02	0.01	1.80	< 0.01	1.64	1.17	0.24	1.13	0.79	0.57
14982	62932120	Avian Blood	0.05	0.01	2.98	0.12	2.52	1.72	0.43	1.88	0.90	0.79
14983	62932122	Avian Blood	0.05	0.02	2.79	0.06	2.24	1.62	0.26	1.54	0.85	0.94
14984	62933938	Avian Blood	0.18	0.08	2.94	0.05	2.40	2.17	0.15	1.99	0.89	0.93
14985	62932125	Avian Blood	0.01	< 0.01	0.76	0.03	0.75	0.57	0.04	0.43	0.26	< 0.26
14986	62933934	Avian Blood	0.02	< 0.01	1.32	0.04	1.11	1.02	0.13	0.77	0.42	0.36

*GC replicate average.

Sample Name	FIELD ID	SAMPLE TYPE	064 Amount (ng/g)	040 Amount (ng/g)	067 Amount (ng/g)	063 Amount (ng/g)	074 Amount (ng/g)	070,076 Amount (ng/g)	066 Amount (ng/g)	095 Amount (ng/g)	091 Amount (ng/g)	056,060 Amount (ng/g)
14952	62939833	Avian Blood	0.42	0.12	0.15	0.10	0.58	1.00	1.33	1.99	0.60	0.27
14953	62939834	Avian Blood	0.39	0.06	0.14	0.10	0.63	0.92	1.43	2.01	0.60	0.26
14954	62939835	Avian Blood	0.37	0.07	0.16	0.10	0.52	0.82	1.19	1.78	0.55	0.24
14955	62939836	Avian Blood	0.35	0.07	0.15	0.15	0.97	0.81	2.38	1.65	0.53	0.33
14956	62939838	Avian Blood	0.17	< 0.03	< 0.05	0.04	0.33	0.45	0.69	0.83	0.26	< 0.17
14957	62939839	Avian Blood	0.13	< 0.03	< 0.05	< 0.04	0.31	0.56	0.64	1.03	0.29	< 0.17
14958	62939840	Avian Blood	0.18	< 0.03	< 0.05	0.05	0.46	0.76	0.92	1.22	0.43	0.18
14959	62939841	Avian Blood	1.19	0.40	0.23	0.38	2.68	3.73	6.73	1.68	0.73	1.39
14960	62939842	Avian Blood	0.30	0.12	0.09	0.18	0.46	0.85	1.06	1.41	0.46	0.21
14961	62939843	Avian Blood	0.32	0.07	0.13	0.13	0.57	0.88	1.43	1.43	0.43	0.25
14962	62939844	Avian Blood	0.49	0.12	0.23	0.09	0.67	1.28	1.63	2.32	0.65	0.33
14963	62939845	Avian Blood	0.43	0.08	0.19	0.08	0.57	1.08	1.32	2.27	0.66	0.26
14964 *	62939846	Avian Blood	0.57	0.18	0.26	0.13	0.89	1.20	2.08	2.65	0.80	0.35
14965	62939847	Avian Blood	0.35	0.11	0.17	0.07	0.46	0.78	1.11	1.85	0.57	0.22
14966	62939848	Avian Blood	0.16	0.09	0.09	0.11	0.70	0.49	1.63	1.44	0.13	0.18
14967	62939849	Avian Blood	0.09	< 0.03	< 0.05	0.04	< 0.24	< 0.44	< 0.47	0.45	0.16	< 0.17
14968	62939850	Avian Blood	0.60	0.15	0.07	0.17	1.33	0.84	3.07	1.19	0.53	0.44
14969 *	62939851	Avian Blood	0.96	0.34	0.58	0.38	2.16	2.03	5.44	3.05	1.97	0.67
14970	62939852	Avian Blood	0.13	0.07	< 0.05	0.06	0.67	0.60	1.57	0.90	0.34	0.25
14971	62939853	Avian Blood	0.25	0.11	0.06	0.10	0.67	1.04	1.57	1.09	0.30	0.34
14972	62939854	Avian Blood	0.09	< 0.03	< 0.05	< 0.04	0.28	< 0.44	0.56	1.02	0.26	< 0.17
14973	62939855	Avian Blood	0.11	0.05	0.06	0.05	0.33	< 0.44	0.83	0.47	0.22	< 0.17
14974	62939856	Avian Blood	0.12	0.03	0.06	0.05	0.36	< 0.44	0.85	0.53	0.22	< 0.17
14975	62939857	Avian Blood	0.13	< 0.03	< 0.05	0.05	0.33	0.51	0.69	0.46	0.17	< 0.17
14976	62939858	Avian Blood	0.03	< 0.03	< 0.05	< 0.04	< 0.24	< 0.44	< 0.47	< 0.31	0.13	< 0.17
14977	62939859	Avian Blood	0.08	< 0.03	0.06	0.05	0.33	< 0.44	0.76	0.51	0.18	< 0.17
14978	62939860	Avian Blood	0.16	0.06	0.06	0.06	0.37	0.53	0.86	1.00	0.36	< 0.17
14979	62939861	Avian Blood	0.11	0.04	0.07	0.04	0.35	0.48	0.80	0.80	0.31	< 0.17
14980	62939862	Avian Blood	0.04	< 0.03	< 0.05	0.04	1.36	0.79	2.89	< 0.31	0.33	0.45
14981	62939863	Avian Blood	0.54	0.10	0.14	0.17	1.42	1.71	3.11	1.32	0.45	0.68
14982	62932120	Avian Blood	0.58	0.17	0.21	0.11	0.78	1.27	1.54	2.61	0.85	0.31
14983	62932122	Avian Blood	0.55	0.28	0.17	0.17	0.88	1.21	1.73	2.97	0.71	0.36
14984	62933938	Avian Blood	0.68	0.31	0.20	0.15	1.65	1.65	3.70	2.94	0.88	0.57
14985	62932125	Avian Blood	0.12	< 0.03	0.08	0.04	0.36	0.50	0.83	0.41	0.26	< 0.17
14986	62933934	Avian Blood	0.21	0.04	0.11	0.06	0.43	0.70	0.94	1.32	0.42	< 0.17

*GC replicate average.

Sample Name	FIELD ID	SAMPLE TYPE	092 Amount (ng/g)	084 Amount (ng/g)	101 Amount (ng/g)	099 Amount (ng/g)	119 Amount (ng/g)	083 Amount (ng/g)	097 Amount (ng/g)	087 Amount (ng/g)	136 Amount (ng/g)	110 Amount (ng/g)
14952	62939833	Avian Blood	0.83	0.56	3.47	2.69	0.25	0.23	1.03	1.40	0.55	2.58
14953	62939834	Avian Blood	0.92	0.43	3.79	2.83	0.26	0.23	1.08	1.48	0.52	2.68
14954	62939835	Avian Blood	0.74	0.37	3.19	2.36	0.24	0.21	0.95	1.16	0.52	2.34
14955	62939836	Avian Blood	0.88	0.42	3.40	4.06	0.33	0.26	0.97	1.37	0.48	2.42
14956	62939838	Avian Blood	0.39	0.18	1.81	1.35	0.11	0.11	0.51	0.70	0.21	1.13
14957	62939839	Avian Blood	0.49	0.23	2.62	1.82	0.12	0.15	0.74	1.14	0.32	1.92
14958	62939840	Avian Blood	0.69	0.31	3.73	2.80	0.17	0.23	1.02	1.59	0.47	2.64
14959	62939841	Avian Blood	0.96	0.55	4.21	3.44	0.28	0.35	1.62	1.90	0.32	3.35
14960	62939842	Avian Blood	0.60	0.55	2.84	1.94	0.14	0.19	0.88	1.25	0.37	2.06
14961	62939843	Avian Blood	0.61	0.36	2.54	2.17	0.20	0.18	0.79	1.08	0.39	1.94
14962	62939844	Avian Blood	0.84	0.56	3.58	2.60	0.26	0.26	1.12	1.44	0.51	2.74
14963	62939845	Avian Blood	0.91	0.47	4.02	2.68	0.26	0.26	1.25	1.55	0.60	2.95
14964 *	62939846	Avian Blood	1.17	0.82	4.91	3.89	0.40	0.32	1.49	1.87	0.84	3.61
14965	62939847	Avian Blood	0.74	0.54	3.18	2.29	0.24	0.20	0.96	1.18	0.52	2.35
14966	62939848	Avian Blood	0.16	0.27	1.93	2.20	0.14	2.46	0.49	0.67	0.34	1.17
14967	62939849	Avian Blood	0.24	0.12	1.15	0.97	0.07	< 0.08	0.34	< 0.40	0.12	< 0.69
14968	62939850	Avian Blood	0.66	0.41	2.78	3.17	0.20	0.22	0.90	1.21	0.27	1.59
14969 *	62939851	Avian Blood	3.24	0.83	13.23	13.81	2.03	0.80	2.92	4.27	1.34	8.15
14970	62939852	Avian Blood	0.49	0.31	2.18	2.79	0.17	0.16	0.69	1.01	0.31	1.79
14971	62939853	Avian Blood	0.53	0.30	2.40	1.77	0.12	0.16	0.81	1.11	0.31	1.99
14972	62939854	Avian Blood	0.47	0.21	2.16	1.57	0.10	0.10	0.67	0.97	0.24	1.65
14973	62939855	Avian Blood	0.38	0.12	1.63	1.40	0.13	0.09	0.44	0.58	0.13	0.99
14974	62939856	Avian Blood	0.36	0.12	1.60	1.41	0.12	0.10	0.44	0.58	0.13	1.00
14975	62939857	Avian Blood	0.31	0.14	1.44	0.96	0.07	0.08	0.43	0.60	0.10	0.93
14976	62939858	Avian Blood	0.25	< 0.11	1.21	0.75	0.06	< 0.08	0.31	0.49	< 0.09	< 0.69
14977	62939859	Avian Blood	0.28	0.13	1.33	1.22	0.08	< 0.08	0.40	0.51	0.17	0.96
14978	62939860	Avian Blood	0.54	0.33	2.40	1.86	0.14	0.16	0.69	0.93	0.29	1.97
14979	62939861	Avian Blood	0.51	0.23	2.25	1.77	0.13	0.15	0.59	0.85	0.21	1.23
14980	62939862	Avian Blood	0.54	0.17	2.65	1.94	0.17	0.12	0.66	0.95	0.17	1.49
14981	62939863	Avian Blood	0.67	0.25	2.77	2.59	0.20	0.19	0.90	1.17	0.37	2.01
14982	62932120	Avian Blood	1.22	0.53	5.33	3.98	0.37	0.33	1.59	1.99	1.11	3.93
14983	62932122	Avian Blood	1.29	0.57	5.41	4.17	0.41	0.35	1.56	1.99	0.82	3.89
14984	62933938	Avian Blood	1.26	0.98	4.65	5.11	0.37	0.34	1.53	2.18	0.77	3.83
14985	62932125	Avian Blood	0.36	0.17	1.63	1.37	0.12	0.10	0.46	0.62	0.21	1.05
14986	62933934	Avian Blood	0.57	0.30	2.40	1.74	0.17	0.17	0.74	0.96	0.42	1.79

*GC replicate average.

Corrected MDL values

Table 1. NJ Eagle Blood (ng/g)

Corrected for recovery

Sample Name	FIELD ID	SAMPLE TYPE	082 Amount (ng/g)	151 Amount (ng/g)	135,144,124 Amount (ng/g)	147 Amount (ng/g)	107 Amount (ng/g)	123,149 Amount (ng/g)	118 Amount (ng/g)	134 Amount (ng/g)	114 Amount (ng/g)	131,122 Amount (ng/g)
14952	62939833	Avian Blood	0.25	1.35	0.90	0.18	0.35	3.36	2.43	0.20	0.08	0.07
14953	62939834	Avian Blood	0.23	1.38	0.90	0.23	0.37	3.48	2.77	0.19	0.24	0.04
14954	62939835	Avian Blood	0.24	1.13	0.77	0.16	0.31	3.11	2.15	0.15	0.13	0.03
14955	62939836	Avian Blood	0.24	1.19	0.86	0.20	0.48	3.20	4.63	0.16	0.42	0.05
14956	62939838	Avian Blood	0.10	0.50	0.36	0.10	0.21	1.45	1.60	0.08	0.08	< 0.02
14957	62939839	Avian Blood	0.17	1.01	0.71	0.14	0.27	2.74	2.46	0.17	0.15	0.05
14958	62939840	Avian Blood	0.26	1.54	1.04	0.20	0.47	4.10	3.76	0.29	0.24	0.09
14959	62939841	Avian Blood	0.57	0.90	0.75	< 0.01	0.64	2.62	4.38	0.17	0.17	0.05
14960	62939842	Avian Blood	0.26	0.88	0.69	0.14	0.32	2.50	2.41	0.18	0.12	0.05
14961	62939843	Avian Blood	0.18	0.84	0.61	0.16	0.27	2.28	2.02	0.13	0.14	0.04
14962	62939844	Avian Blood	0.26	1.25	0.88	0.23	0.37	3.37	2.46	0.19	0.16	0.05
14963	62939845	Avian Blood	0.26	1.53	1.06	0.19	0.42	4.00	2.74	0.23	0.19	0.06
14964 *	62939846	Avian Blood	0.40	2.12	1.36	0.26	0.57	5.33	3.96	0.33	0.37	0.10
14965	62939847	Avian Blood	0.24	1.28	0.85	0.17	0.35	3.35	2.11	0.18	0.17	0.04
14966	62939848	Avian Blood	0.31	0.74	0.60	0.25	0.36	1.79	2.37	0.25	0.23	0.22
14967	62939849	Avian Blood	< 0.09	0.36	0.24	0.09	0.16	0.97	1.13	0.06	0.07	< 0.02
14968	62939850	Avian Blood	0.34	0.61	0.43	0.12	0.39	1.77	3.61	0.10	0.34	0.05
14969 *	62939851	Avian Blood	0.98	5.57	3.43	1.29	2.56	15.00	16.27	0.72	0.28	0.21
14970	62939852	Avian Blood	0.28	0.76	0.56	0.16	0.30	2.34	3.85	0.12	0.15	0.07
14971	62939853	Avian Blood	0.24	0.84	0.62	0.15	0.28	2.44	2.39	0.15	0.07	0.07
14972	62939854	Avian Blood	0.15	0.86	0.62	0.15	0.20	2.47	2.07	0.15	0.05	0.06
14973	62939855	Avian Blood	< 0.09	0.52	0.35	0.11	0.20	1.48	1.63	0.07	< 0.04	< 0.02
14974	62939856	Avian Blood	< 0.09	0.52	0.35	0.11	0.20	1.42	1.54	0.06	< 0.04	0.02
14975	62939857	Avian Blood	0.10	0.35	0.25	0.05	0.16	0.94	1.09	0.07	< 0.04	< 0.02
14976	62939858	Avian Blood	< 0.09	0.30	0.23	0.04	0.13	0.82	< 0.98	< 0.05	< 0.04	< 0.02
14977	62939859	Avian Blood	< 0.09	0.46	0.32	0.06	0.18	1.30	1.40	0.08	< 0.04	0.03
14978	62939860	Avian Blood	0.20	0.86	0.60	0.17	0.24	2.47	2.08	0.16	0.06	0.07
14979	62939861	Avian Blood	0.13	0.62	0.47	0.11	0.24	1.82	1.82	0.07	0.08	0.03
14980	62939862	Avian Blood	0.12	0.70	0.50	0.12	0.29	2.11	3.97	0.08	0.12	< 0.02
14981	62939863	Avian Blood	0.24	0.87	0.63	0.14	0.34	2.42	2.85	0.13	0.11	0.04
14982	62932120	Avian Blood	0.26	1.99	1.39	0.26	0.47	5.15	3.70	0.26	0.06	0.07
14983	62932122	Avian Blood	0.27	2.21	1.45	0.38	0.48	6.00	3.64	0.32	0.10	0.10
14984	62933938	Avian Blood	0.63	1.78	1.25	0.31	0.52	4.83	5.29	0.38	0.20	0.15
14985	62932125	Avian Blood	0.11	0.52	0.37	0.08	0.19	1.56	1.62	0.08	< 0.04	0.03
14986	62933934	Avian Blood	0.17	0.96	0.66	0.13	0.25	2.59	1.83	0.15	< 0.04	0.04

*GC replicate average.

Sample Name	FIELD ID	SAMPLE TYPE	146 Amount (ng/g)	153 Amount (ng/g)	132 Amount (ng/g)	105 Amount (ng/g)	141 Amount (ng/g)	179 Amount (ng/g)	137 Amount (ng/g)	176 Amount (ng/g)	130 Amount (ng/g)	138 Amount (ng/g)
14952	62939833	Avian Blood	1.55	4.40	2.31	0.90	0.85	0.52	0.27	0.17	0.38	5.37
14953	62939834	Avian Blood	1.74	5.11	1.96	1.19	0.89	0.46	0.30	0.19	0.42	5.95
14954	62939835	Avian Blood	1.25	3.37	2.09	< 0.63	0.71	0.40	0.22	0.53	< 0.10	4.72
14955	62939836	Avian Blood	2.34	6.50	1.48	2.42	0.86	0.40	0.49	0.26	0.60	8.73
14956	62939838	Avian Blood	0.79	2.34	0.68	0.70	0.36	0.19	0.14	0.08	0.18	2.71
14957	62939839	Avian Blood	1.30	4.27	1.53	1.12	0.77	0.33	0.33	0.09	0.40	5.81
14958	62939840	Avian Blood	1.99	6.59	2.38	1.65	1.16	0.57	0.52	0.21	0.58	8.83
14959	62939841	Avian Blood	1.30	3.60	1.39	2.71	0.66	0.37	0.28	< 0.05	0.40	5.01
14960	62939842	Avian Blood	0.99	2.89	1.74	1.27	0.65	0.39	0.19	0.12	0.30	3.97
14961	62939843	Avian Blood	1.00	2.83	1.29	0.93	0.56	0.29	0.20	0.07	0.30	3.83
14962	62939844	Avian Blood	1.32	3.53	2.04	1.07	0.79	0.46	0.26	0.16	0.37	4.83
14963	62939845	Avian Blood	1.45	4.02	2.76	1.06	1.02	0.66	0.30	0.15	0.47	5.59
14964 *	62939846	Avian Blood	2.43	6.44	3.07	1.81	1.42	0.92	0.47	0.31	0.68	8.93
14965	62939847	Avian Blood	1.31	3.57	2.24	0.78	0.81	0.54	0.22	0.15	0.39	4.82
14966	62939848	Avian Blood	1.26	3.34	1.14	1.08	0.49	0.51	0.33	0.22	0.42	3.87
14967	62939849	Avian Blood	0.60	1.76	0.31	< 0.63	< 0.21	0.13	< 0.09	< 0.05	0.15	2.05
14968	62939850	Avian Blood	1.47	4.07	0.61	2.05	0.46	0.22	0.32	0.10	0.43	5.56
14969 *	62939851	Avian Blood	10.82	30.11	6.02	8.82	3.97	1.32	1.84	0.68	2.86	37.54
14970	62939852	Avian Blood	1.68	5.26	1.44	2.65	0.63	0.30	0.50	0.09	0.54	7.40
14971	62939853	Avian Blood	0.99	3.34	1.19	2.06	0.65	0.33	0.27	0.07	0.38	4.87
14972	62939854	Avian Blood	1.02	3.46	1.55	1.33	0.68	0.34	0.28	0.10	0.35	4.84
14973	62939855	Avian Blood	0.80	2.22	0.63	1.43	0.34	0.17	0.13	< 0.05	0.24	2.99
14974	62939856	Avian Blood	0.79	2.21	0.66	1.32	0.34	0.18	0.14	< 0.05	0.23	3.01
14975	62939857	Avian Blood	0.44	1.16	0.51	0.79	0.25	0.12	0.12	< 0.05	0.16	1.82
14976	62939858	Avian Blood	0.35	0.99	0.39	< 0.63	0.21	0.10	< 0.09	< 0.05	0.13	1.48
14977	62939859	Avian Blood	0.66	1.94	0.50	1.36	0.28	0.19	0.11	< 0.05	0.18	2.66
14978	62939860	Avian Blood	1.06	3.27	1.31	1.64	0.59	0.40	0.23	0.10	0.34	4.53
14979	62939861	Avian Blood	0.90	2.67	0.85	1.72	0.42	0.17	0.15	0.05	0.25	3.43
14980	62939862	Avian Blood	0.95	3.10	0.83	2.56	0.45	0.21	0.17	< 0.05	0.25	3.97
14981	62939863	Avian Blood	1.24	3.57	1.35	2.12	0.65	0.28	0.26	0.10	0.37	4.78
14982	62932120	Avian Blood	2.11	5.99	2.57	2.80	1.24	0.89	0.38	0.14	0.66	7.80
14983	62932122	Avian Blood	2.39	6.66	3.00	1.99	1.38	0.98	0.43	0.27	0.67	8.67
14984	62933938	Avian Blood	2.24	7.41	2.71	3.56	1.20	0.68	0.61	0.17	0.80	9.52
14985	62932125	Avian Blood	0.81	2.64	0.62	1.20	0.36	0.23	0.12	0.06	0.22	3.00
14986	62933934	Avian Blood	0.93	2.70	1.53	0.93	0.60	0.45	0.19	0.08	0.34	3.93

*GC replicate average.

Corrected MDL values

Table 1. NJ Eagle Blood (ng/g)

Corrected for recovery

Sample Name	FIELD ID	SAMPLE TYPE	158 Amount (ng/g)	129 Amount (ng/g)	178 Amount (ng/g)	182,187 Amount (ng/g)	183 Amount (ng/g)	128 Amount (ng/g)	167 Amount (ng/g)	185 Amount (ng/g)	174 Amount (ng/g)	177 Amount (ng/g)
14952	62939833	Avian Blood	0.47	0.17	0.60	3.77	1.31	0.90	0.32	0.12	1.10	0.85
14953	62939834	Avian Blood	0.52	0.17	0.65	4.14	1.45	0.98	0.34	0.11	1.10	0.86
14954	62939835	Avian Blood	0.49	0.15	0.43	2.68	1.07	0.82	0.25	0.10	0.96	0.70
14955	62939836	Avian Blood	0.90	0.16	0.77	4.50	1.89	2.07	0.55	0.13	1.13	1.23
14956	62939838	Avian Blood	0.23	0.08	0.23	1.64	0.65	0.48	0.18	0.04	0.43	0.36
14957	62939839	Avian Blood	0.59	0.19	0.41	2.92	1.23	1.09	0.32	0.13	0.85	0.76
14958	62939840	Avian Blood	0.92	0.29	0.66	4.49	1.94	1.88	0.49	0.20	1.21	1.16
14959	62939841	Avian Blood	0.41	0.18	0.37	2.31	0.92	1.18	0.31	0.08	0.77	0.64
14960	62939842	Avian Blood	0.37	0.19	0.33	2.12	0.81	0.79	0.25	0.09	0.76	0.58
14961	62939843	Avian Blood	0.34	0.11	0.34	2.10	0.79	0.70	0.22	0.07	0.68	0.50
14962	62939844	Avian Blood	0.44	0.16	0.46	2.90	1.02	0.88	0.28	0.09	1.02	0.65
14963	62939845	Avian Blood	0.57	0.23	0.53	3.15	1.36	0.98	0.36	0.17	1.38	0.91
14964 *	62939846	Avian Blood	0.89	0.27	0.88	5.64	2.26	1.74	0.59	0.25	2.07	1.54
14965	62939847	Avian Blood	0.46	0.17	0.50	2.96	1.26	0.83	0.31	0.13	1.22	0.83
14966	62939848	Avian Blood	0.47	0.22	0.52	2.69	1.10	1.01	0.65	0.38	0.36	0.58
14967	62939849	Avian Blood	< 0.15	< 0.08	0.18	1.15	0.46	0.37	0.13	< 0.03	< 0.26	0.27
14968	62939850	Avian Blood	0.56	0.10	0.43	2.68	1.11	1.30	0.36	0.07	0.49	0.73
14969 *	62939851	Avian Blood	4.19	0.80	3.78	25.25	9.30	11.56	2.17	0.59	5.05	5.98
14970	62939852	Avian Blood	0.70	0.15	0.50	3.10	1.50	1.96	0.44	0.10	0.69	0.90
14971	62939853	Avian Blood	0.45	0.16	0.33	2.19	1.02	0.92	0.28	0.10	0.78	0.61
14972	62939854	Avian Blood	0.45	0.16	0.34	2.28	0.98	0.91	0.28	0.10	0.80	0.62
14973	62939855	Avian Blood	0.22	< 0.08	0.28	1.68	0.60	0.51	0.18	0.04	0.41	0.41
14974	62939856	Avian Blood	0.23	< 0.08	0.28	1.69	0.62	0.54	0.16	0.04	0.41	0.40
14975	62939857	Avian Blood	< 0.15	< 0.08	0.13	0.77	0.31	0.35	0.09	0.03	< 0.26	0.23
14976	62939858	Avian Blood	< 0.15	< 0.08	0.10	0.62	0.25	< 0.30	0.07	< 0.03	< 0.26	< 0.18
14977	62939859	Avian Blood	0.18	< 0.08	0.18	1.29	0.47	0.45	0.13	0.04	0.41	0.32
14978	62939860	Avian Blood	0.40	0.11	0.37	2.48	0.90	0.77	0.26	0.10	0.77	0.64
14979	62939861	Avian Blood	0.25	0.08	0.28	1.82	0.64	0.56	0.20	0.05	0.50	0.43
14980	62939862	Avian Blood	0.29	0.08	0.33	2.03	0.83	0.58	0.33	0.04	0.58	0.45
14981	62939863	Avian Blood	0.41	0.12	0.43	2.59	1.08	0.85	0.28	0.08	0.85	0.68
14982	62932120	Avian Blood	0.70	0.24	0.77	4.89	1.99	1.30	0.41	0.19	1.91	1.20
14983	62932122	Avian Blood	0.73	0.25	0.87	5.43	2.29	1.62	0.47	0.24	2.12	1.40
14984	62933938	Avian Blood	0.80	0.29	0.69	4.20	1.69	2.25	0.47	0.15	1.61	1.20
14985	62932125	Avian Blood	0.28	< 0.08	0.25	1.75	0.86	0.51	0.21	0.04	0.48	0.40
14986	62933934	Avian Blood	0.34	0.11	0.36	2.13	0.91	0.66	0.19	0.09	0.93	0.62
*GC replicate average.												

Sample Name	FIELD ID	SAMPLE TYPE	171,202 Amount (ng/g)	156 Amount (ng/g)	173 Amount (ng/g)	201 Amount (ng/g)	157 Amount (ng/g)	172 Amount (ng/g)	197 Amount (ng/g)	180 Amount (ng/g)	193 Amount (ng/g)	191 Amount (ng/g)
14952	62939833	Avian Blood	1.00	0.43	0.03	0.23	0.45	0.30	0.10	3.62	0.37	0.17
14953	62939834	Avian Blood	1.05	0.52	0.01	0.23	0.52	0.33	0.11	4.02	0.40	0.19
14954	62939835	Avian Blood	0.71	0.27	0.01	0.15	0.37	0.22	0.09	2.70	0.27	0.13
14955	62939836	Avian Blood	1.01	0.81	0.02	0.31	0.49	0.42	0.11	5.42	0.48	0.24
14956	62939838	Avian Blood	0.32	0.26	0.01	0.08	0.17	0.12	0.04	1.69	0.15	0.08
14957	62939839	Avian Blood	0.49	0.54	0.01	0.23	0.12	0.24	0.04	3.09	0.31	0.15
14958	62939840	Avian Blood	0.73	0.93	0.03	0.35	0.20	0.38	0.05	4.95	0.43	0.23
14959	62939841	Avian Blood	0.43	0.61	< 0.01	0.24	0.21	0.20	0.05	2.46	0.23	0.11
14960	62939842	Avian Blood	0.49	0.49	< 0.01	0.16	0.28	0.16	0.05	2.20	0.19	0.11
14961	62939843	Avian Blood	0.47	0.30	< 0.01	0.13	0.27	0.18	0.07	1.95	0.20	0.11
14962	62939844	Avian Blood	0.63	0.44	< 0.01	0.12	0.35	0.21	0.09	2.56	0.26	0.14
14963	62939845	Avian Blood	0.79	0.55	0.02	0.21	0.42	0.26	0.08	3.51	0.34	0.19
14964 *	62939846	Avian Blood	1.28	0.82	0.03	0.32	0.66	0.48	0.12	6.21	0.59	0.31
14965	62939847	Avian Blood	0.81	0.41	0.02	0.17	0.48	0.26	0.11	3.20	0.31	0.17
14966	62939848	Avian Blood	0.49	< 0.22	0.02	0.22	0.14	0.23	0.09	2.42	0.13	0.27
14967	62939849	Avian Blood	0.22	< 0.22	< 0.01	0.07	0.12	0.10	0.03	1.13	0.10	0.06
14968	62939850	Avian Blood	0.48	0.68	0.02	0.29	0.22	0.29	0.05	3.32	0.26	0.14
14969 *	62939851	Avian Blood	5.71	2.65	0.13	1.65	4.87	1.61	0.57	21.92	1.79	1.18
14970	62939852	Avian Blood	0.65	0.77	0.01	0.38	0.34	0.32	0.04	4.29	0.31	0.17
14971	62939853	Avian Blood	0.44	0.42	0.02	0.23	0.27	0.17	0.04	2.44	0.24	0.12
14972	62939854	Avian Blood	0.42	0.43	0.02	0.25	0.28	0.18	0.03	2.50	0.26	0.14
14973	62939855	Avian Blood	0.37	0.26	0.01	0.15	0.32	0.11	0.04	1.42	0.15	0.07
14974	62939856	Avian Blood	0.38	0.23	0.01	0.14	0.33	0.11	0.04	1.43	0.15	0.07
14975	62939857	Avian Blood	0.14	< 0.22	< 0.01	0.09	0.08	0.07	0.01	0.83	0.07	0.03
14976	62939858	Avian Blood	0.11	< 0.22	< 0.01	< 0.07	0.06	< 0.06	< 0.01	0.65	0.06	0.03
14977	62939859	Avian Blood	0.25	< 0.22	0.01	0.13	0.17	0.10	0.03	1.27	0.13	0.06
14978	62939860	Avian Blood	0.66	0.36	0.03	0.23	0.59	0.19	0.06	2.74	0.24	0.11
14979	62939861	Avian Blood	0.51	0.28	0.01	0.17	0.28	0.12	0.04	2.04	0.20	0.08
14980	62939862	Avian Blood	0.37	0.62	< 0.01	0.33	0.33	0.12	0.04	1.94	0.21	0.08
14981	62939863	Avian Blood	0.61	0.38	0.01	0.22	0.54	0.23	0.07	2.79	0.29	0.13
14982	62932120	Avian Blood	1.18	0.60	0.04	0.34	1.14	0.34	0.14	5.01	0.49	0.23
14983	62932122	Avian Blood	1.42	0.58	0.06	0.67	1.33	0.42	0.27	5.69	0.63	0.30
14984	62933938	Avian Blood	1.03	0.92	0.03	0.41	1.00	0.37	0.13	5.03	0.40	0.19
14985	62932125	Avian Blood	0.40	0.25	0.01	0.12	0.33	0.12	0.04	2.15	0.17	0.08
14986	62933934	Avian Blood	0.57	0.28	0.02	0.13	0.60	0.17	0.08	2.15	0.21	0.11

*GC replicate average.

Sample Name	FIELD ID	SAMPLE TYPE	200 Amount (ng/g)	170,190 Amount (ng/g)	198 Amount (ng/g)	199 Amount (ng/g)	196,203 Amount (ng/g)	189 Amount (ng/g)	208,195 Amount (ng/g)	207 Amount (ng/g)	194 Amount (ng/g)	205 Amount (ng/g)
14952	62939833	Avian Blood	0.08	1.43	0.03	2.89	1.86	0.10	2.63	1.21	1.13	0.10
14953	62939834	Avian Blood	0.07	1.53	0.04	3.00	2.09	0.62	2.55	1.45	1.16	0.11
14954	62939835	Avian Blood	0.07	1.07	0.03	1.44	1.23	0.07	1.26	0.70	0.62	0.07
14955	62939836	Avian Blood	0.09	2.18	0.04	2.20	1.89	0.24	1.72	0.93	1.12	0.11
14956	62939838	Avian Blood	< 0.05	0.58	0.03	0.83	0.70	0.07	0.72	0.44	0.47	0.06
14957	62939839	Avian Blood	< 0.05	1.32	0.03	0.94	0.96	0.31	0.31	0.10	0.56	0.06
14958	62939840	Avian Blood	0.08	2.12	0.03	1.56	1.60	0.35	0.50	0.15	0.98	0.11
14959	62939841	Avian Blood	0.06	1.04	< 0.02	0.96	0.81	0.20	0.69	0.32	0.55	0.09
14960	62939842	Avian Blood	0.07	0.86	< 0.02	1.02	0.85	0.09	0.85	0.41	0.58	0.07
14961	62939843	Avian Blood	0.05	0.79	< 0.02	1.00	0.82	0.07	0.84	0.52	0.41	0.05
14962	62939844	Avian Blood	0.07	1.05	0.05	1.35	1.14	0.09	1.09	0.72	0.56	0.09
14963	62939845	Avian Blood	0.11	1.45	< 0.02	1.76	1.51	0.09	1.78	0.91	0.87	0.09
14964 *	62939846	Avian Blood	0.18	2.49	0.04	2.82	2.36	0.26	2.32	1.12	1.40	0.17
14965	62939847	Avian Blood	0.11	1.29	< 0.02	1.77	1.53	0.09	1.77	1.02	0.79	0.11
14966	62939848	Avian Blood	0.05	0.94	< 0.02	0.87	0.78	0.25	0.67	0.38	1.57	1.07
14967	62939849	Avian Blood	< 0.05	0.40	< 0.02	0.43	0.34	0.04	0.31	0.15	0.25	0.03
14968	62939850	Avian Blood	< 0.05	1.40	< 0.02	1.06	0.97	0.09	0.68	0.32	0.70	0.07
14969 *	62939851	Avian Blood	0.28	8.87	0.61	8.77	7.45	0.35	4.86	1.58	4.50	0.60
14970	62939852	Avian Blood	< 0.05	1.62	0.04	0.96	0.95	0.09	0.39	0.10	0.70	0.08
14971	62939853	Avian Blood	< 0.05	0.94	0.02	0.67	0.67	0.05	0.33	0.10	0.45	0.06
14972	62939854	Avian Blood	0.06	0.93	0.03	0.68	0.69	0.06	0.32	0.08	0.46	0.06
14973	62939855	Avian Blood	< 0.05	0.52	0.02	0.60	0.48	< 0.04	0.46	0.19	0.30	0.04
14974	62939856	Avian Blood	< 0.05	0.54	0.02	0.66	0.52	< 0.04	0.50	0.21	0.31	0.03
14975	62939857	Avian Blood	< 0.05	< 0.36	< 0.02	0.28	0.24	< 0.04	0.12	0.05	0.16	0.02
14976	62939858	Avian Blood	< 0.05	< 0.36	< 0.02	0.21	0.18	< 0.04	0.08	0.03	0.11	0.01
14977	62939859	Avian Blood	< 0.05	0.54	< 0.02	0.43	0.36	< 0.04	0.27	0.09	0.23	0.03
14978	62939860	Avian Blood	0.06	0.89	0.04	1.00	0.89	0.06	0.84	0.34	0.56	0.07
14979	62939861	Avian Blood	< 0.05	0.63	0.03	0.70	0.54	< 0.04	0.47	0.17	0.34	0.04
14980	62939862	Avian Blood	< 0.05	0.95	0.04	0.79	0.62	0.04	0.58	0.25	0.37	< 0.01
14981	62939863	Avian Blood	0.06	1.03	0.07	1.47	1.10	0.06	1.14	0.47	0.60	0.06
14982	62932120	Avian Blood	0.14	1.81	0.20	2.82	2.24	0.09	2.89	1.13	1.21	0.11
14983	62932122	Avian Blood	0.07	2.08	0.25	3.20	2.64	0.10	3.20	1.28	1.52	0.15
14984	62933938	Avian Blood	0.10	1.80	0.11	2.12	1.78	0.09	1.83	0.83	0.96	0.09
14985	62932125	Avian Blood	< 0.05	0.72	0.03	0.80	0.73	0.06	0.65	0.28	0.50	0.04
14986	62933934	Avian Blood	0.06	0.87	0.04	1.08	0.93	< 0.04	0.94	0.47	0.51	0.06
*GC replicate average.												

Sample Name	FIELD ID	SAMPLE TYPE	206 Amount (ng/g)	209 Amount (ng/g)	t-PCBs Amount (ng/g)
14952	62939833	Avian Blood	< 0.49	8.46	92
14953	62939834	Avian Blood	< 0.49	8.88	97
14954	62939835	Avian Blood	< 0.49	3.94	71
14955	62939836	Avian Blood	< 0.49	4.85	103
14956	62939838	Avian Blood	< 0.49	2.92	40
14957	62939839	Avian Blood	< 0.49	0.33	58
14958	62939840	Avian Blood	< 0.49	0.47	87
14959	62939841	Avian Blood	< 0.49	2.11	106
14960	62939842	Avian Blood	< 0.49	2.64	63
14961	62939843	Avian Blood	< 0.49	2.97	58
14962	62939844	Avian Blood	0.58	3.86	82
14963	62939845	Avian Blood	< 0.49	5.70	91
14964 *	62939846	Avian Blood	0.52	5.67	128
14965	62939847	Avian Blood	< 0.49	5.23	79
14966	62939848	Avian Blood	< 0.49	2.11	65
14967	62939849	Avian Blood	0.89	1.15	23
14968	62939850	Avian Blood	< 0.49	2.03	76
14969 *	62939851	Avian Blood	9.45	5.79	395
14970	62939852	Avian Blood	0.63	0.32	70
14971	62939853	Avian Blood	0.58	0.44	58
14972	62939854	Avian Blood	0.55	0.40	49
14973	62939855	Avian Blood	1.03	1.09	36
14974	62939856	Avian Blood	1.11	1.21	37
14975	62939857	Avian Blood	< 0.49	0.20	24
14976	62939858	Avian Blood	< 0.49	0.14	< 16
14977	62939859	Avian Blood	0.65	0.56	30
14978	62939860	Avian Blood	1.91	2.10	58
14979	62939861	Avian Blood	1.07	1.22	45
14980	62939862	Avian Blood	1.57	1.65	58
14981	62939863	Avian Blood	2.88	3.32	80
14982	62932120	Avian Blood	6.55	7.14	131
14983	62932122	Avian Blood	6.93	7.38	140
14984	62933938	Avian Blood	4.25	4.75	137
14985	62932125	Avian Blood	1.48	1.63	42
14986	62933934	Avian Blood	2.42	2.59	60
*GC replicate average.					

Corrected 8/24/98 MB and PB 0722997 corrected

Table 2. New Jersey Eagle Blood QC Congener PCBs

Sample Name	Field ID	Sample Type	Total gram-equiv. Analyzed	% Lipid	004,010 (ng/g)	007,009 (ng/g)	006 (ng/g)	005,008 (ng/g)	019 (ng/g)	018 (ng/g)	017,015 (ng/g)	024,027 (ng/g)	016,032 (ng/g)	029 (ng/g)	026 (ng/g)	025 (ng/g)	031 (ng/g)	028 (ng/g)
14964 GCR1	62939846	Avian Blood	6.77	0.15	< 0.93	< 0.05	< 0.11	< 0.06	0.02	0.19	0.11	0.03	0.16	0.02	0.14	0.04	< 0.13	0.18
14964 GCR2	62939846	Avian Blood	6.77	0.15	< 0.93	< 0.05	< 0.11	< 0.06	0.02	0.18	0.10	0.03	0.14	0.05	0.15	0.05	0.13	0.26
14964 GCR3	62939846	Avian Blood	6.77	0.15	< 0.93	< 0.05	< 0.11	< 0.06	0.01	0.16	0.09	0.02	0.12	< 0.02	0.11	0.04	< 0.13	0.24
14964 GCR AVG					< 0.93	< 0.05	< 0.11	< 0.06	0.02	0.18	0.10	0.03	0.14	0.02	0.13	0.04	< 0.13	0.23
SD (n-1)									0.01	0.02	0.01	0.01	0.02	0.03	0.02	0.01		0.04
14969 GCR1	62939851	Avian Blood	4.14	0.24	< 0.93	< 0.05	0.11	0.09	0.04	0.10	0.11	0.01	0.11	0.02	0.15	0.05	0.29	0.66
14969 GCR2	62939851	Avian Blood	4.14	0.24	< 0.93	< 0.05	0.11	0.08	0.02	0.09	0.11	0.01	0.09	0.02	0.11	0.04	0.26	0.62
14969 GCR3	62939851	Avian Blood	4.14	0.24	< 0.93	< 0.05	< 0.11	0.07	< 0.01	0.08	0.10	< 0.01	0.09	< 0.02	0.10	0.03	0.22	0.55
14969 GCR AVG					< 0.93	< 0.05	< 0.11	0.08	0.02	0.09	0.11	0.01	0.10	< 0.02	0.12	0.04	0.26	0.61
SD (n-1)								0.01	0.02	0.01	0.01	0.01	0.01		0.03	0.01	0.04	0.06
MB 070997	Matrix Blank	Chicken Egg	5.88	10.80	< 0.93	< 0.05	< 0.11	0.10	0.07	0.13	0.07	0.01	0.07	< 0.02	< 0.02	< 0.02	< 0.13	0.13
MB 071597	Matrix Blank	Chicken Egg	5.89	10.30	< 0.93	0.11	0.15	< 0.06	0.01	0.28	0.13	< 0.01	0.20	< 0.02	0.21	0.07	0.13	0.33
MB 072297 *	Matrix Blank	Chicken Egg	5.89	10.30	< 0.93	0.12	0.13	0.26	0.02	0.10	< 0.05	0.02	0.05	< 0.02	0.23	0.30	0.15	0.14
MS 070997	Matrix Spike	Chicken Egg	5.94	10.80	0.3	0.2	0.4	1.2	0.0	2.3	1.3	0.1	1.0	0.1	0.6	0.3	1.5	2.0
MS 071597	Matrix Spike	Chicken Egg	5.96	10.50	0.3	0.2	0.4	1.2	0.0	2.3	1.3	0.1	1.0	0.1	0.6	0.3	1.5	2.0
MS 072297	Matrix Spike	Chicken Egg	5.96	10.50	0.6	0.3	0.4	1.8	0.2	3.3	1.6	0.2	1.8	0.1	0.5	0.3	1.7	2.4
Average			5.95	10.60	0.4	0.2	0.4	1.4	0.1	2.6	1.4	0.2	1.3	0.1	0.5	0.3	1.5	2.2
SD (n-1)			0.01	0.17	0.1	0.0	0.0	0.4	0.1	0.6	0.2	0.0	0.5	0.0	0.0	0.0	0.1	0.3
%RSD			0.2	1.6	30.7	12.7	6.2	27.4	135.0	21.7	11.9	16.6	36.6	0.0	6.4	2.1	8.2	11.8
PC 070997	Positive Control	Sag Bay Carp	4.94	14.80	0.4	0.3	1.7	1.9	0.3	33.4	15.9	2.7	18.5	0.3	89.4	16.2	27.1	48.9
PC 071597	Positive Control	Sag Bay Carp	4.97	14.70	0.1	0.3	1.9	2.2	0.2	39.2	18.3	3.0	21.1	0.1	77.6	17.5	30.1	58.4
PC 072297	Positive Control	Sag Bay Carp	4.95	14.80	0.4	0.5	1.8	1.5	0.4	35.8	18.1	2.8	19.5	0.3	79.7	18.1	31.7	57.0
Average			4.95	14.77	0.3	0.4	1.8	1.9	0.3	36.1	17.4	2.8	19.7	0.2	82.2	17.3	29.6	54.8
SD (n-1)			0.02	0.06	0.2	0.1	0.1	0.3	0.1	2.9	1.3	0.1	1.3	0.1	6.3	1.0	2.3	5.2
%RSD			0.3	0.4	48.9	28.1	4.6	18.3	20.3	8.1	7.5	4.8	6.7	40.4	7.7	5.5	7.9	9.4

Corrected 8/24/98 MB and PB 0722997 corrected

Table 2. New Jersey Eagle Blood QC Congener PCBs

Sample Name	Field ID	Sample Type	Total gram-equiv. Analyzed	% Lipid	004,010 (ng/g)	007,009 (ng/g)	006 (ng/g)	005,008 (ng/g)	019 (ng/g)	018 (ng/g)	017,015 (ng/g)	024,027 (ng/g)	016,032 (ng/g)	029 (ng/g)	026 (ng/g)	025 (ng/g)	031 (ng/g)	028 (ng/g)
PB 070997 (a)	Procedure Blank	20g Na2SO4	1	NA	3.06	0.16	0.31	0.21	0.00	0.25	0.03	0.00	0.14	0.02	0.00	0.06	0.50	0.00
mass corrected PB					*0.48*	*0.03*	*0.05*	*0.03*	*0.00*	*0.04*	*0.00*	*0.00*	*0.02*	*0.00*	*0.00*	*0.01*	*0.08*	*0.00*
PB 071597 (a)	Procedure Blank	20g Na2SO4	1	NA	0.67	0.00	0.01	0.07	0.00	0.09	0.05	0.00	0.04	0.08	0.00	0.00	0.17	0.13
mass corrected PB					*0.11*	*0.00*	*0.00*	*0.01*	*0.00*	*0.01*	*0.01*	*0.00*	*0.01*	*0.01*	*0.00*	*0.00*	*0.03*	*0.02*
PB 072297 (a) *	Procedure Blank	20g Na2SO4	1	NA	0.18	0.00	0.29	0.18	0.00	0.29	0.18	0.00	0.12	0.00	0.06	0.06	0.18	0.35
corrected 8/24/98					*0.03*	*0.00*	*0.05*	*0.03*	*0.00*	*0.05*	*0.03*	*0.00*	*0.02*	*0.00*	*0.01*	*0.01*	*0.03*	*0.06*
PB Average					0.20	0.01	0.03	0.02	0.00	0.03	0.01	0.00	0.02	0.01	0.00	0.01	0.04	0.03
SD (n-1)					0.24	0.01	0.03	0.01	0.00	0.02	0.01	0.00	0.01	0.01	0.01	0.01	0.03	0.03
MDL = PB Avg + 3(PB SD)	*(Average sample mass)*		*(6.37 g)*		*0.93*	*0.05*	*0.11*	*0.06*	*0.01*	*0.08*	*0.05*	*0.01*	*0.04*	*0.02*	*0.02*	*0.02*	*0.13*	*0.11*
(a) Amount in ng																		
* PB and MB 072297 were switched in previous report.																		

Table 2. New Jersey Eagle Blood QC Congener PCBs

Sample Name	Field ID	Sample Type	020,033 (ng/g)	053 (ng/g)	051 (ng/g)	022 (ng/g)	045 (ng/g)	046 (ng/g)	052 (ng/g)	043 (ng/g)	049 (ng/g)	047 (ng/g)	048 (ng/g)	044 (ng/g)	042 (ng/g)	041 (ng/g)	064 (ng/g)	040 (ng/g)	067 (ng/g)
14964 GCR1	62939846	Avian Blood	< 0.07	0.09	< 0.10	0.09	0.05	0.02	1.32	0.01	1.17	0.93	0.15	0.91	0.46	0.42	0.33	0.10	0.15
14964 GCR2	62939846	Avian Blood	0.07	0.09	0.13	0.05	0.06	0.02	1.21	0.02	1.07	0.86	0.11	0.83	0.41	0.39	0.30	0.10	0.14
14964 GCR3	62939846	Avian Blood	< 0.07	0.08	0.12	0.04	0.06	0.02	1.08	0.02	0.96	0.81	0.07	0.74	0.37	0.35	0.27	0.08	0.12
14964 GCR AVG			< 0.07	0.09	0.08	0.06	0.06	0.02	1.20	0.02	1.07	0.87	0.11	0.83	0.41	0.39	0.30	0.09	0.14
SD (n-1)				0.01	0.07	0.03	0.01	0.00	0.12	0.01	0.11	0.06	0.04	0.09	0.05	0.04	0.03	0.01	0.02
14969 GCR1	62939851	Avian Blood	0.11	0.01	0.05	0.11	0.06	< 0.01	1.50	0.03	2.45	2.35	0.13	0.56	1.07	< 0.26	0.86	0.30	0.47
14969 GCR2	62939851	Avian Blood	0.11	0.01	0.05	0.10	0.05	0.01	1.37	0.04	2.22	2.13	0.17	0.51	0.97	< 0.26	0.78	0.29	0.49
14969 GCR3	62939851	Avian Blood	0.10	0.01	0.04	0.09	0.04	0.01	1.24	0.02	2.05	1.99	0.13	0.46	0.87	< 0.26	0.70	0.24	0.44
14969 GCR AVG			0.11	0.01	0.05	0.10	0.05	0.01	1.37	0.03	2.24	2.16	0.14	0.51	0.97	< 0.26	0.78	0.28	0.47
SD (n-1)			0.01	0.00	0.01	0.01	0.01	0.01	0.13	0.01	0.20	0.18	0.02	0.05	0.10		0.08	0.03	0.03
MB 070997	Matrix Blank	Chicken Egg	0.08	0.01	< 0.10	0.04	0.03	< 0.01	0.25	< 0.01	< 0.20	0.12	0.04	< 0.20	< 0.13	< 0.26	0.06	< 0.03	< 0.05
MB 071597	Matrix Blank	Chicken Egg	0.17	0.14	0.14	0.07	0.16	0.32	0.84	0.16	0.60	0.65	0.15	0.80	0.32	0.28	0.14	0.16	< 0.05
MB 072297 *	Matrix Blank	Chicken Egg	< 0.07	0.05	< 0.10	< 0.04	< 0.01	0.14	0.15	0.06	0.23	0.08	< 0.03	< 0.20	< 0.13	< 0.26	< 0.02	0.23	< 0.05
MS 070997	Matrix Spike	Chicken Egg	1.5	0.4	0.2	0.8	0.3	0.2	3.4	0.1	2.2	1.0	0.9	1.9	1.3	1.0	0.9	0.3	0.1
MS 071597	Matrix Spike	Chicken Egg	1.5	0.4	0.2	0.8	0.3	0.2	3.4	0.1	2.2	1.0	0.9	1.9	1.3	1.0	0.9	0.3	0.1
MS 072297	Matrix Spike	Chicken Egg	2.0	0.5	0.3	1.1	0.5	0.2	4.1	0.1	2.4	1.0	1.2	2.6	1.5	1.1	1.2	0.5	0.1
Average			1.7	0.4	0.3	0.9	0.3	0.2	3.6	0.1	2.2	1.0	1.0	2.1	1.4	1.0	1.0	0.4	0.1
SD (n-1)			0.3	0.1	0.0	0.2	0.1	0.0	0.4	0.0	0.1	0.0	0.2	0.4	0.1	0.1	0.1	0.1	0.0
%RSD			15.4	15.4	15.3	17.2	38.2	10.5	11.2	22.5	6.4	0.8	15.9	19.4	10.8	7.1	14.6	26.4	27.1
PC 070997	Positive Control	Sag Bay Carp	7.4	15.4	9.0	7.2	8.6	2.9	284.8	9.9	341.6	212.3	30.1	149.3	139.1	97.2	71.9	19.9	4.1
PC 071597	Positive Control	Sag Bay Carp	8.0	18.6	9.8	8.1	7.1	2.2	296.1	10.8	325.7	201.8	34.7	162.4	148.7	94.7	76.8	17.8	4.4
PC 072297	Positive Control	Sag Bay Carp	8.3	17.7	12.2	9.2	8.8	2.4	299.4	12.3	326.7	202.5	34.3	155.4	147.1	101.7	78.6	15.9	4.8
Average			7.9	17.2	10.4	8.2	8.1	2.5	293.4	11.0	331.3	205.5	33.1	155.7	145.0	97.9	75.8	17.9	4.5
SD (n-1)			0.5	1.6	1.7	1.0	0.9	0.4	7.7	1.2	8.9	5.9	2.5	6.6	5.2	3.6	3.5	2.0	0.4
%RSD			5.8	9.6	16.0	11.9	11.4	15.9	2.6	10.9	2.7	2.9	7.7	4.2	3.6	3.6	4.6	11.2	7.9

Corrected 8/24/98 MB and PB 0722997 corrected

Table 2. New Jersey Eagle Blood QC Congener PCBs

Sample Name	Field ID	Sample Type	020,033	053	051	022	045	046	052	043	049	047	048	044	042	041	064	040	067
			(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)
PB 070997 (a)	Procedure Blank	20g Na2SO4	0.04	0.01	0.33	0.00	0.04	0.00	1.12	0.00	0.71	0.16	0.04	0.70	0.44	0.84	0.01	0.09	0.00
mass corrected PB			*0.01*	*0.00*	*0.05*	*0.00*	*0.01*	*0.00*	*0.18*	*0.00*	*0.11*	*0.03*	*0.01*	*0.11*	*0.07*	*0.13*	*0.00*	*0.01*	*0.00*
PB 071597 (a)	Procedure Blank	20g Na2SO4	0.09	0.01	0.03	0.06	0.00	0.00	0.30	0.00	0.14	0.31	0.02	0.14	0.04	0.05	0.05	0.00	0.14
mass corrected PB			*0.01*	*0.00*	*0.00*	*0.01*	*0.00*	*0.00*	*0.05*	*0.00*	*0.02*	*0.05*	*0.00*	*0.02*	*0.01*	*0.01*	*0.01*	*0.00*	*0.02*
PB 072297 (a) *	Procedure Blank	20g Na2SO4	0.24	0.00	0.00	0.12	0.00	0.00	0.65	0.00	0.29	0.29	0.12	0.35	0.12	0.12	0.00	0.00	0.00
corrected 8/24/98			*0.04*	*0.00*	*0.00*	*0.02*	*0.00*	*0.00*	*0.10*	*0.00*	*0.05*	*0.05*	*0.02*	*0.06*	*0.02*	*0.02*	*0.00*	*0.00*	*0.00*
PB Average			0.02	0.00	0.02	0.01	0.00	0.00	0.11	0.00	0.06	0.04	0.01	0.06	0.03	0.05	0.00	0.00	0.01
SD (n-1)			0.02	0.00	0.03	0.01	0.00	0.00	0.06	0.00	0.05	0.01	0.01	0.04	0.03	0.07	0.00	0.01	0.01
MDL = PB Avg + 3(PB SD)	*(Average sample mass)*		*0.07*	*0.01*	*0.10*	*0.04*	*0.01*	*0.01*	*0.30*	*0.01*	*0.20*	*0.08*	*0.03*	*0.20*	*0.13*	*0.26*	*0.02*	*0.03*	*0.05*
(a) Amount in ng																			
* PB and MB 072297 were switched in previous report.																			

Table 2. New Jersey Eagle Blood QC Congener PCBs

Sample Name	Field ID	Sample Type	063	074	070,076	066	095	091	056,060	092	084	101	099	119	083	097	087	136	110
			(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)
14964 GCR1	62939846	Avian Blood	0.07	0.52	0.67	< 0.47	1.42	0.42	0.20	0.68	0.48	2.87	2.29	0.24	0.19	0.86	1.09	0.48	2.10
14964 GCR2	62939846	Avian Blood	0.07	0.48	0.65	< 0.47	1.32	0.45	0.19	0.62	0.43	2.61	2.06	0.20	0.17	0.79	0.99	0.46	1.92
14964 GCR3	62939846	Avian Blood	0.06	0.42	0.58	< 0.47	1.18	0.40	0.17	0.56	0.39	2.31	1.82	0.19	0.15	0.71	0.89	0.40	1.71
14964 GCR AVG			0.07	0.47	0.63	< 0.47	1.31	0.42	0.19	0.62	0.43	2.60	2.06	0.21	0.17	0.79	0.99	0.45	1.91
SD (n-1)			0.01	0.05	0.05		0.12	0.03	0.02	0.06	0.05	0.28	0.24	0.03	0.02	0.08	0.10	0.04	0.20
14969 GCR1	62939851	Avian Blood	0.33	1.88	1.71	0.20	2.44	1.78	0.59	2.84	0.74	11.67	12.02	1.73	0.73	2.58	3.74	1.11	7.19
14969 GCR2	62939851	Avian Blood	0.30	1.75	1.67	0.19	2.27	1.58	0.54	2.58	0.68	10.66	11.18	1.62	0.65	2.35	3.41	0.98	6.43
14969 GCR3	62939851	Avian Blood	0.28	1.60	1.54	0.17	2.04	1.43	0.50	2.44	0.60	9.77	10.30	1.57	0.56	2.15	3.20	1.17	6.15
14969 GCR AVG			0.30	1.74	1.64	0.19	2.25	1.60	0.54	2.62	0.67	10.70	11.17	1.64	0.65	2.36	3.45	1.09	6.59
SD (n-1)			0.03	0.14	0.09	0.02	0.20	0.18	0.05	0.20	0.07	0.95	0.86	0.08	0.09	0.22	0.27	0.10	0.54
MB 070997	Matrix Blank	Chicken Egg	< 0.04	0.37	< 0.44	0.90	< 0.31	0.08	< 0.17	0.14	0.14	< 0.76	1.21	0.05	< 0.08	< 0.27	< 0.40	< 0.09	< 0.69
MB 071597	Matrix Blank	Chicken Egg	0.75	2.46	1.24	3.60	< 0.31	0.33	0.65	0.78	0.33	1.80	5.49	0.44	2.52	0.40	0.78	0.26	0.89
MB 072297 *	Matrix Blank	Chicken Egg	0.20	0.30	< 0.44	0.92	< 0.31	0.15	< 0.17	0.25	0.05	< 0.76	< 0.46	< 0.03	0.55	< 0.27	< 0.40	< 0.09	< 0.69
MS 070997	Matrix Spike	Chicken Egg	0.2	1.4	2.5	2.5	2.6	0.5	0.9	0.6	2.3	4.0	1.8	0.1	0.3	1.2	1.9	0.9	2.7
MS 071597	Matrix Spike	Chicken Egg	0.2	1.4	2.5	2.8	2.6	0.5	0.9	0.6	2.3	4.0	1.8	0.1	0.3	1.2	1.9	0.9	2.7
MS 072297	Matrix Spike	Chicken Egg	0.1	1.3	2.9	2.6	3.3	0.6	1.0	0.8	4.5	4.4	1.7	0.1	0.2	1.3	2.0	1.0	3.0
Average			0.2	1.4	2.7	2.6	2.8	0.6	0.9	0.7	3.0	4.1	1.7	0.1	0.2	1.3	1.9	0.9	2.8
SD (n-1)			0.0	0.0	0.2	0.2	0.4	0.1	0.1	0.1	1.2	0.2	0.1	0.0	0.0	0.0	0.1	0.0	0.2
%RSD			20.4	2.6	8.9	6.0	14.8	9.4	9.5	11.9	40.9	5.2	2.9	9.0	3.1	2.8	4.0	5.2	6.6
PC 070997	Positive Control	Sag Bay Carp	26.3	161.9	66.4	341.6	87.8	64.8	45.8	62.7	37.8	277.5	254.9	16.3	30.4	132.1	134.3	16.9	177.9
PC 071597	Positive Control	Sag Bay Carp	24.2	151.7	73.4	324.2	107.9	61.1	47.1	58.6	38.7	269.0	236.1	14.5	27.9	125.4	131.1	17.8	181.2
PC 072297	Positive Control	Sag Bay Carp	26.5	160.3	78.2	331.1	112.1	58.0	49.0	57.9	37.3	287.4	249.2	16.2	32.1	133.9	140.5	18.2	194.7
Average			25.7	158.0	72.7	332.3	102.6	61.3	47.3	59.7	37.9	278.0	246.7	15.7	30.1	130.5	135.3	17.6	184.6
SD (n-1)			1.3	5.5	5.9	8.8	13.0	3.4	1.6	2.6	0.7	9.2	9.6	1.0	2.2	4.5	4.8	0.7	8.9
%RSD			5.0	3.5	8.1	2.6	12.7	5.6	3.4	4.4	1.9	3.3	3.9	6.4	7.1	3.4	3.5	3.7	4.8

Corrected 8/24/98 MB and PB 0722997 corrected

Table 2. New Jersey Eagle Blood QC Congener PCBs

Sample Name	Field ID	Sample Type	063	074	070,076	066	095	091	056,060	092	084	101	099	119	083	097	087	136	110
			(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)
PB 070997 (a)	Procedure Blank	20g Na2SO4	0.13	0.84	1.57	1.67	1.00	0.32	0.58	0.41	0.42	2.80	1.68	0.08	0.27	0.97	1.45	0.33	2.44
mass corrected PB			*0.02*	*0.13*	*0.25*	*0.26*	*0.16*	*0.05*	*0.09*	*0.06*	*0.07*	*0.44*	*0.26*	*0.01*	*0.04*	*0.15*	*0.23*	*0.05*	*0.38*
PB 071597 (a)	Procedure Blank	20g Na2SO4	0.00	0.14	0.28	0.30	0.35	0.16	0.09	0.11	0.14	0.71	0.43	0.01	0.03	0.21	0.30	0.11	0.46
mass corrected PB			*0.00*	*0.02*	*0.04*	*0.05*	*0.05*	*0.03*	*0.01*	*0.02*	*0.02*	*0.11*	*0.07*	*0.00*	*0.00*	*0.03*	*0.05*	*0.02*	*0.07*
PB 072297 (a) *	Procedure Blank	20g Na2SO4	0.00	0.29	0.59	0.59	0.00	0.18	0.12	0.24	0.24	1.35	0.71	0.00	0.12	0.41	0.71	0.18	1.06
corrected 8/24/98			*0.00*	*0.05*	*0.09*	*0.09*	*0.00*	*0.03*	*0.02*	*0.04*	*0.04*	*0.21*	*0.11*	*0.00*	*0.02*	*0.06*	*0.11*	*0.03*	*0.17*
PB Average			0.01	0.07	0.13	0.13	0.07	0.03	0.04	0.04	0.04	0.25	0.15	0.00	0.02	0.08	0.13	0.03	0.21
SD (n-1)			0.01	0.06	0.11	0.11	0.08	0.01	0.04	0.02	0.02	0.17	0.10	0.01	0.02	0.06	0.09	0.02	0.16
MDL = PB Avg + 3(PB SD)	*(Average sample mass)*		*0.04*	*0.24*	*0.44*	*0.47*	*0.31*	*0.08*	*0.17*	*0.11*	*0.11*	*0.76*	*0.46*	*0.03*	*0.08*	*0.27*	*0.40*	*0.09*	*0.69*

(a) Amount in ng

* PB and MB 072297 were switched in previous report.

Table 2. New Jersey Eagle Blood QC Congener PCBs

Sample Name	Field ID	Sample Type	082	151	135,144,124	147	107	123,149	118	134	114	131,122	146	153	132	105	141	179
			(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)
14964 GCR1	62939846	Avian Blood	0.23	1.24	0.80	0.15	0.33	3.12	2.28	0.19	0.23	0.06	1.43	3.78	1.89	0.98	0.82	0.54
14964 GCR2	62939846	Avian Blood	0.21	1.13	0.72	0.14	0.30	2.85	2.11	0.18	0.19	0.05	1.30	3.45	1.60	0.98	0.75	0.49
14964 GCR3	62939846	Avian Blood	0.19	1.00	0.64	0.13	0.27	2.49	1.90	0.16	0.17	0.05	1.13	3.00	1.39	0.92	0.68	0.43
14964 GCR AVG			0.21	1.12	0.72	0.14	0.30	2.82	2.10	0.18	0.20	0.05	1.29	3.41	1.63	0.96	0.75	0.49
SD (n-1)			0.02	0.12	0.08	0.01	0.03	0.32	0.19	0.02	0.03	0.01	0.15	0.39	0.25	0.03	0.07	0.06
14969 GCR1	62939851	Avian Blood	0.85	4.93	3.04	1.14	2.24	13.41	13.84	0.63	0.25	0.20	9.42	26.27	3.69	8.96	3.46	1.16
14969 GCR2	62939851	Avian Blood	0.79	4.49	2.77	1.06	2.11	12.04	13.20	0.59	0.22	0.18	8.70	24.25	4.69	7.16	3.20	1.07
14969 GCR3	62939851	Avian Blood	0.74	4.09	2.52	0.94	1.87	10.94	12.44	0.53	0.22	0.13	8.14	22.54	6.23	5.29	2.96	0.98
14969 GCR AVG			0.79	4.50	2.78	1.05	2.07	12.13	13.16	0.58	0.23	0.17	8.75	24.35	4.87	7.14	3.21	1.07
SD (n-1)			0.06	0.42	0.26	0.10	0.19	1.24	0.70	0.05	0.02	0.04	0.64	1.87	1.28	1.84	0.25	0.09
MB 070997	Matrix Blank	Chicken Egg	< 0.09	< 0.15	< 0.16	0.03	0.13	< 0.60	1.72	< 0.05	0.22	0.10	0.61	1.78	0.22	0.94	< 0.21	< 0.08
MB 071597	Matrix Blank	Chicken Egg	0.46	0.46	0.34	0.31	0.45	1.04	8.25	0.18	1.29	< 0.02	3.51	9.86	0.17	5.74	0.38	0.60
MB 072297 *	Matrix Blank	Chicken Egg	< 0.09	< 0.15	< 0.16	< 0.02	< 0.10	< 0.60	1.34	0.08	0.04	< 0.02	0.04	0.16	< 0.25	< 0.63	< 0.21	0.28
MS 070997	Matrix Spike	Chicken Egg	0.4	1.5	1.1	0.1	0.2	3.7	2.4	0.4	0.1	0.9	0.8	2.5	3.2	1.1	1.2	0.9
MS 071597	Matrix Spike	Chicken Egg	0.4	1.5	1.1	0.1	0.2	3.7	2.4	0.4	0.1	0.9	0.8	2.5	3.2	1.1	1.2	0.9
MS 072297	Matrix Spike	Chicken Egg	0.5	1.5	1.1	0.1	0.2	3.9	2.2	0.4	0.1	0.1	0.6	2.3	2.8	1.9	1.2	0.9
Average			0.4	1.5	1.1	0.1	0.2	3.8	2.4	0.4	0.1	0.6	0.7	2.5	3.1	1.3	1.2	0.9
SD (n-1)			0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.5	0.1	0.1	0.3	0.4	0.0	0.0
%RSD			7.9	2.2	2.6	7.8	10.2	3.3	5.5	4.5	18.2	76.0	8.6	4.7	9.1	32.8	0.8	0.7
PC 070997	Positive Control	Sag Bay Carp	41.1	29.2	22.5	6.6	35.8	84.2	234.2	8.1	11.3	3.1	35.6	85.3	33.2	105.3	22.2	11.2
PC 071597	Positive Control	Sag Bay Carp	40.4	31.7	23.9	6.7	30.0	89.2	215.4	8.8	11.2	4.4	35.1	88.3	59.5	163.5	23.6	12.3
PC 072297	Positive Control	Sag Bay Carp	41.5	34.0	25.7	6.4	32.5	98.2	230.5	9.4	12.4	4.6	38.3	96.0	44.7	201.2	25.6	13.6
Average			41.0	31.6	24.0	6.6	32.8	90.5	226.7	8.8	11.6	4.0	36.3	89.9	45.8	156.7	23.8	12.4
SD (n-1)			0.5	2.4	1.6	0.1	2.9	7.1	10.0	0.7	0.6	0.8	1.7	5.5	13.1	48.3	1.7	1.2
%RSD			1.3	7.6	6.8	1.7	8.9	7.8	4.4	7.6	5.5	19.7	4.7	6.1	28.7	30.9	7.2	9.8

Table 2. New Jersey Eagle Blood QC Congener PCBs

Sample Name	Field ID	Sample Type	082	151	135,144,124	147	107	123,149	118	134	114	131,122	146	153	132	105	141	179
			(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)
PB 070997 (a)	Procedure Blank	20g Na2SO4	0.33	0.59	0.62	0.07	0.34	2.24	3.47	0.18	0.12	0.06	0.78	2.79	0.00	2.18	0.78	0.31
mass corrected PB			*0.05*	*0.09*	*0.10*	*0.01*	*0.05*	*0.35*	*0.54*	*0.03*	*0.02*	*0.01*	*0.12*	*0.44*	*0.00*	*0.34*	*0.12*	*0.05*
PB 071597 (a)	Procedure Blank	20g Na2SO4	0.09	0.23	0.21	0.00	0.07	0.71	0.72	0.06	0.03	0.01	0.26	0.93	0.00	0.30	0.26	0.16
mass corrected PB			*0.01*	*0.04*	*0.03*	*0.00*	*0.01*	*0.11*	*0.11*	*0.01*	*0.00*	*0.00*	*0.04*	*0.15*	*0.00*	*0.05*	*0.04*	*0.03*
PB 072297 (a) *	Procedure Blank	20g Na2SO4	0.12	0.24	0.24	0.00	0.06	0.88	1.06	0.06	0.00	0.00	0.18	0.71	0.77	0.71	0.24	0.12
corrected 8/24/98			*0.02*	*0.04*	*0.04*	*0.00*	*0.01*	*0.14*	*0.17*	*0.01*	*0.00*	*0.00*	*0.03*	*0.11*	*0.12*	*0.11*	*0.04*	*0.02*
PB Average			0.03	0.06	0.06	0.00	0.02	0.20	0.27	0.02	0.01	0.00	0.06	0.23	0.04	0.17	0.07	0.03
SD (n-1)			0.02	0.03	0.04	0.01	0.02	0.13	0.24	0.01	0.01	0.01	0.05	0.18	0.07	0.16	0.05	0.02
MDL = PB Avg + 3(PB SD)	*(Average sample mass)*		*0.09*	*0.15*	*0.16*	*0.02*	*0.10*	*0.60*	*0.98*	*0.05*	*0.04*	*0.02*	*0.22*	*0.77*	*0.25*	*0.63*	*0.21*	*0.08*
(a) Amount in ng																		
* PB and MB 072297 were switched in previous report.																		

Table 2. New Jersey Eagle Blood QC Congener PCBs

Sample Name	Field ID	Sample Type	137	176	130	138	158	129	178	182,187	183	128	167	185	174	177	171,202	156	173
			(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)
14964 GCR1	62939846	Avian Blood	0.28	0.19	0.39	5.21	0.52	0.16	0.51	3.30	1.32	1.04	0.34	0.14	1.21	0.90	0.76	0.46	0.02
14964 GCR2	62939846	Avian Blood	0.25	0.16	0.37	4.76	0.47	0.14	0.47	3.00	1.20	0.92	0.32	0.13	1.11	0.82	0.68	0.44	0.01
14964 GCR3	62939846	Avian Blood	0.22	0.15	0.32	4.20	0.43	0.13	0.42	2.65	1.06	0.80	0.28	0.12	0.96	0.73	0.60	0.40	0.01
14964 GCR AVG			0.25	0.17	0.36	4.72	0.47	0.14	0.47	2.98	1.19	0.92	0.31	0.13	1.09	0.82	0.68	0.43	0.01
SD (n-1)			0.03	0.02	0.04	0.51	0.05	0.02	0.05	0.33	0.13	0.12	0.03	0.01	0.13	0.09	0.08	0.03	0.01
14969 GCR1	62939851	Avian Blood	1.59	0.57	2.52	32.41	3.58	0.69	3.34	22.13	8.11	9.97	1.91	0.51	4.40	5.22	4.72	2.63	0.10
14969 GCR2	62939851	Avian Blood	1.49	0.68	2.22	30.22	3.37	0.65	3.04	20.15	7.46	9.34	1.67	0.47	4.06	4.83	4.75	1.95	0.08
14969 GCR3	62939851	Avian Blood	1.38	0.40	2.21	28.46	3.21	0.59	2.80	18.99	6.99	8.74	1.69	0.44	3.79	4.46	4.39	1.84	0.14
14969 GCR AVG			1.49	0.55	2.32	30.36	3.39	0.64	3.06	20.42	7.52	9.35	1.76	0.47	4.08	4.84	4.62	2.14	0.11
SD (n-1)			0.11	0.14	0.18	1.98	0.19	0.05	0.27	1.59	0.56	0.62	0.13	0.04	0.31	0.38	0.20	0.43	0.03
MB 070997	Matrix Blank	Chicken Egg	0.15	0.06	0.18	2.41	0.28	< 0.08	0.17	0.98	0.44	0.59	0.15	< 0.03	< 0.26	0.31	0.15	0.35	0.01
MB 071597	Matrix Blank	Chicken Egg	0.95	0.22	0.97	13.36	1.05	< 0.08	0.90	5.53	3.09	4.86	1.19	0.14	0.36	1.64	0.87	1.92	0.10
MB 072297 *	Matrix Blank	Chicken Egg	< 0.09	< 0.05	< 0.10	< 1.30	< 0.15	< 0.08	< 0.06	< 0.47	< 0.22	< 0.30	0.16	< 0.03	< 0.26	< 0.18	< 0.07	0.42	0.06
MS 070997	Matrix Spike	Chicken Egg	0.2	0.3	0.3	4.3	0.5	0.3	0.3	1.9	1.0	0.8	0.2	0.2	1.4	0.9	0.4	0.5	0.1
MS 071597	Matrix Spike	Chicken Egg	0.2	0.3	0.3	4.3	0.5	0.3	0.3	1.9	1.0	0.8	0.2	0.2	1.4	0.9	0.4	0.5	0.1
MS 072297	Matrix Spike	Chicken Egg	0.3	0.3	0.3	4.1	0.5	0.3	0.3	1.7	0.9	0.7	0.2	0.2	1.4	0.9	0.4	0.5	0.1
Average			0.2	0.3	0.3	4.2	0.5	0.3	0.3	1.8	1.0	0.8	0.2	0.2	1.4	0.9	0.4	0.5	0.1
SD (n-1)			0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%RSD			3.9	2.5	4.8	2.8	3.2	3.0	5.4	6.9	3.6	7.4	11.5	7.3	0.4	2.6	1.3	4.8	3.5
PC 070997	Positive Control	Sag Bay Carp	14.4	4.1	16.6	146.1	14.1	9.6	8.3	62.1	22.2	43.6	12.9	3.2	18.2	19.6	8.0	19.6	4.0
PC 071597	Positive Control	Sag Bay Carp	13.3	3.3	17.1	150.8	14.5	9.7	8.9	62.6	23.3	44.2	11.5	3.3	20.3	20.5	9.0	18.3	2.9
PC 072297	Positive Control	Sag Bay Carp	14.3	3.7	18.5	165.1	15.1	10.6	9.7	69.8	25.5	48.0	11.8	3.6	22.3	22.9	10.1	20.9	3.9
Average			14.0	3.7	17.4	154.0	14.6	10.0	9.0	64.9	23.7	45.3	12.1	3.3	20.2	21.0	9.0	19.6	3.6
SD (n-1)			0.6	0.4	1.0	9.9	0.5	0.6	0.7	4.3	1.7	2.4	0.7	0.2	2.0	1.7	1.0	1.3	0.6
%RSD			4.4	11.5	5.6	6.4	3.5	5.6	7.6	6.6	7.2	5.3	5.9	6.6	10.1	8.2	11.6	6.7	16.7

Table 2. New Jersey Eagle Blood QC Congener PCBs

Sample Name	Field ID	Sample Type	137	176	130	138	158	129	178	182,187	183	128	167	185	174	177	171,202	156	173
			(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)
PB 070997 (a)	Procedure Blank	20g Na2SO4	0.31	0.15	0.35	4.81	0.52	0.27	0.21	1.67	0.74	1.05	0.20	0.09	0.94	0.64	0.30	0.76	0.02
mass corrected PB			*0.05*	*0.02*	*0.05*	*0.76*	*0.08*	*0.04*	*0.03*	*0.26*	*0.12*	*0.16*	*0.03*	*0.01*	*0.15*	*0.10*	*0.05*	*0.12*	*0.00*
PB 071597 (a)	Procedure Blank	20g Na2SO4	0.10	0.04	0.17	1.42	0.15	0.07	0.09	0.94	0.45	0.28	0.07	0.04	0.52	0.30	0.18	0.18	0.01
mass corrected PB			*0.02*	*0.01*	*0.03*	*0.22*	*0.02*	*0.01*	*0.01*	*0.15*	*0.07*	*0.04*	*0.01*	*0.01*	*0.08*	*0.05*	*0.03*	*0.03*	*0.00*
PB 072297 (a) *	Procedure Blank	20g Na2SO4	0.06	0.00	0.06	1.65	0.12	0.06	0.06	0.35	0.12	0.24	0.06	0.00	0.24	0.12	0.12	0.18	0.00
corrected 8/24/98			*0.01*	*0.00*	*0.01*	*0.26*	*0.02*	*0.01*	*0.01*	*0.06*	*0.02*	*0.04*	*0.01*	*0.00*	*0.04*	*0.02*	*0.02*	*0.03*	*0.00*
PB Average			0.02	0.01	0.03	0.41	0.04	0.02	0.02	0.16	0.07	0.08	0.02	0.01	0.09	0.06	0.03	0.06	0.00
SD (n-1)			0.02	0.01	0.02	0.30	0.04	0.02	0.01	0.10	0.05	0.07	0.01	0.01	0.06	0.04	0.01	0.05	0.00
MDL = PB Avg + 3(PB SD)	*(Average sample mass)*		*0.09*	*0.05*	*0.10*	*1.30*	*0.15*	*0.08*	*0.06*	*0.47*	*0.22*	*0.30*	*0.05*	*0.03*	*0.26*	*0.18*	*0.07*	*0.22*	*0.01*

(a) Amount in ng

* PB and MB 072297 were switched in previous report.

Table 2. New Jersey Eagle Blood QC Congener PCBs

Sample Name	Field ID	Sample Type	201	157	172	197	180	193	191	200	170,190	198	199	196,203	189	208,195	207	194
			(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)
14964 GCR1	62939846	Avian Blood	0.16	0.41	0.28	0.07	3.58	0.34	0.18	0.10	1.43	0.02	1.64	1.33	0.09	1.35	0.66	0.80
14964 GCR2	62939846	Avian Blood	0.18	0.33	0.25	0.06	3.31	0.31	0.16	0.10	1.32	0.02	1.51	1.27	0.18	1.24	0.60	0.74
14964 GCR3	62939846	Avian Blood	0.17	0.31	0.23	0.06	2.97	0.28	0.15	0.09	1.20	0.02	1.33	1.14	0.15	1.10	0.52	0.68
14964 GCR AVG			0.17	0.35	0.25	0.06	3.29	0.31	0.16	0.10	1.32	0.02	1.49	1.25	0.14	1.23	0.59	0.74
SD (n-1)			0.01	0.05	0.03	0.01	0.31	0.03	0.02	0.01	0.12	0.00	0.16	0.10	0.05	0.13	0.07	0.06
14969 GCR1	62939851	Avian Blood	1.51	4.27	1.41	0.51	18.63	1.55	1.02	0.25	7.59	0.57	7.56	6.42	0.31	4.19	1.36	3.82
14969 GCR2	62939851	Avian Blood	1.38	4.01	1.29	0.46	17.66	1.44	0.95	0.23	7.13	0.47	7.06	6.01	0.29	3.93	1.28	3.63
14969 GCR3	62939851	Avian Blood	1.12	3.53	1.20	0.42	16.90	1.35	0.89	0.21	6.80	0.45	6.65	5.64	0.26	3.68	1.20	3.46
14969 GCR AVG			1.34	3.94	1.30	0.46	17.73	1.45	0.95	0.23	7.17	0.50	7.09	6.02	0.29	3.93	1.28	3.64
SD (n-1)			0.20	0.38	0.11	0.05	0.87	0.10	0.07	0.02	0.40	0.06	0.46	0.39	0.03	0.26	0.08	0.18
MB 070997	Matrix Blank	Chicken Egg	0.11	0.04	0.13	0.01	1.49	0.09	0.05	< 0.05	0.64	< 0.02	0.33	0.31	0.05	0.12	0.03	0.27
MB 071597	Matrix Blank	Chicken Egg	2.07	0.44	0.81	0.48	7.98	0.67	0.41	< 0.05	3.33	0.15	2.01	1.81	0.17	0.78	0.11	1.55
MB 072297 *	Matrix Blank	Chicken Egg	0.39	0.03	< 0.06	0.08	< 0.64	< 0.04	< 0.02	< 0.05	< 0.36	< 0.02	< 0.12	< 0.12	< 0.04	0.39	< 0.01	< 0.09
MS 070997	Matrix Spike	Chicken Egg	0.2	0.1	0.2	0.0	2.7	0.2	0.2	0.2	1.4	0.0	0.6	0.7	0.1	0.3	0.0	0.6
MS 071597	Matrix Spike	Chicken Egg	0.2	0.1	0.2	0.0	2.7	0.2	0.2	0.2	1.4	0.0	0.6	0.7	0.1	0.3	0.0	0.6
MS 072297	Matrix Spike	Chicken Egg	0.2	0.2	0.2	0.0	2.5	0.1	0.1	0.1	1.2	0.0	0.5	0.6	0.1	0.2	0.0	0.5
Average			0.2	0.1	0.2	0.0	2.7	0.2	0.1	0.1	1.3	0.0	0.6	0.6	0.1	0.3	0.0	0.5
SD (n-1)			0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.2	0.0	0.1	0.1	0.0	0.0	0.0	0.0
%RSD			1.1	53.0	10.2	26.6	4.7	20.1	16.5	26.3	11.6	34.6	8.6	8.4	44.2	9.0	23.9	8.0
PC 070997	Positive Control	Sag Bay Carp	20.5	2.6	6.1	0.6	63.1	4.5	3.3	2.9	29.5	0.7	19.5	16.9	2.6	9.2	2.8	14.2
PC 071597	Positive Control	Sag Bay Carp	22.8	5.3	6.1	0.7	66.8	4.9	2.9	2.8	30.2	1.7	19.6	17.3	1.5	9.0	2.3	14.6
PC 072297	Positive Control	Sag Bay Carp	22.8	5.3	6.8	0.9	69.4	5.4	3.4	2.7	32.9	2.0	22.4	19.7	1.7	10.2	2.5	16.3
Average			22.0	4.4	6.3	0.7	66.4	4.9	3.2	2.8	30.9	1.5	20.5	17.9	1.9	9.5	2.5	15.0
SD (n-1)			1.3	1.6	0.4	0.1	3.2	0.5	0.3	0.1	1.8	0.7	1.6	1.5	0.6	0.6	0.2	1.1
%RSD			5.9	36.1	5.8	19.5	4.7	9.4	8.7	2.7	5.8	46.6	8.0	8.4	29.4	6.8	9.3	7.5

Table 2. New Jersey Eagle Blood QC Congener PCBs

Sample Name	Field ID	Sample Type	201	157	172	197	180	193	191	200	170,190	198	199	196,203	189	208,195	207	194
			(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)
PB 070997 (a)	Procedure Blank	20g Na2SO4	0.23	0.05	0.18	0.00	2.37	0.12	0.09	0.05	1.14	0.01	0.47	0.43	0.10	0.17	0.00	0.30
mass corrected PB			*0.04*	*0.01*	*0.03*	*0.00*	*0.37*	*0.02*	*0.01*	*0.01*	*0.18*	*0.00*	*0.07*	*0.07*	*0.02*	*0.03*	*0.00*	*0.05*
PB 071597 (a)	Procedure Blank	20g Na2SO4	0.03	0.04	0.10	0.01	1.22	0.06	0.05	0.04	0.61	0.05	0.29	0.32	0.16	0.13	0.03	0.29
mass corrected PB			*0.00*	*0.01*	*0.02*	*0.00*	*0.19*	*0.01*	*0.01*	*0.01*	*0.10*	*0.01*	*0.05*	*0.05*	*0.03*	*0.02*	*0.00*	*0.05*
PB 072297 (a) *	Procedure Blank	20g Na2SO4	0.00	0.00	0.00	0.00	0.59	0.00	0.06	0.18	0.00	0.00	0.18	0.12	0.06	0.06	0.00	0.12
corrected 8/24/98			*0.00*	*0.00*	*0.00*	*0.00*	*0.09*	*0.00*	*0.01*	*0.03*	*0.00*	*0.00*	*0.03*	*0.02*	*0.01*	*0.01*	*0.00*	*0.02*
PB Average			0.01	0.00	0.01	0.00	0.22	0.01	0.01	0.01	0.09	0.00	0.05	0.05	0.02	0.02	0.00	0.04
SD (n-1)			0.02	0.00	0.01	0.00	0.14	0.01	0.00	0.01	0.09	0.00	0.02	0.02	0.01	0.01	0.00	0.02
MDL = PB Avg + 3(PB SD)	*(Average sample mass)*		*0.07*	*0.02*	*0.06*	*0.01*	*0.64*	*0.04*	*0.02*	*0.05*	*0.36*	*0.02*	*0.12*	*0.12*	*0.04*	*0.05*	*0.01*	*0.09*

(a) Amount in ng

* PB and MB 072297 were switched in previous report.

Table 2. New Jersey Eagle Blood QC Congener PCBs

Sample Name	Field ID	Sample Type	205	206	209	Total PCBs	
			(ng/g)	(ng/g)	(ng/g)	(ng/g)	
14964 GCR1	62939846	Avian Blood	0.10	< 0.49	3.18	72.21	
14964 GCR2	62939846	Avian Blood	0.09	< 0.49	2.99	66.74	
14964 GCR3	62939846	Avian Blood	0.08	< 0.49	2.83	59.26	
14964 GCR AVG			0.09	< 0.49	3.00	66.07	
SD (n-1)			0.01		0.18	6.50	
14969 GCR1	62939851	Avian Blood	0.51	7.91	4.86	337.46	
14969 GCR2	62939851	Avian Blood	0.49	7.64	4.69	312.93	
14969 GCR3	62939851	Avian Blood	0.46	7.37	4.50	292.55	
14969 GCR AVG			0.49	7.64	4.68	314.31	
SD (n-1)			0.03	0.27	0.18	22.49	
MB 070997	Matrix Blank	Chicken Egg	0.02	< 0.49	0.07	19.84	
MB 071597	Matrix Blank	Chicken Egg	0.33	0.78	0.24	123.75	
MB 072297 *	Matrix Blank	Chicken Egg	0.39	< 0.49	0.09	8.84	
							% Recovery
MS 070997	Matrix Spike	Chicken Egg	0.0	0.1	0.1	104.6	*89.0*
MS 071597	Matrix Spike	Chicken Egg	0.0	0.1	0.1	104.6	*89.3*
MS 072297	Matrix Spike	Chicken Egg	0.0	0.2	0.0	111.8	*95.5*
Average			0.0	0.1	0.1	107	*91*
SD (n-1)			0.0	0.0	0.0	4	*4*
%RSD			14.4	32.6	18.8	3.9	
PC 070997	Positive Control	Sag Bay Carp	4.2	2.1	10.6	5074	
PC 071597	Positive Control	Sag Bay Carp	3.7	9.1	9.9	5121	PC
PC 072297	Positive Control	Sag Bay Carp	4.3	10.1	11.3	5328	% Recovery
Average			4.0	7.1	10.6	5174	*87.7*
SD (n-1)			0.3	4.3	0.7	135	
%RSD			7.3	61.3	6.8	2.6	

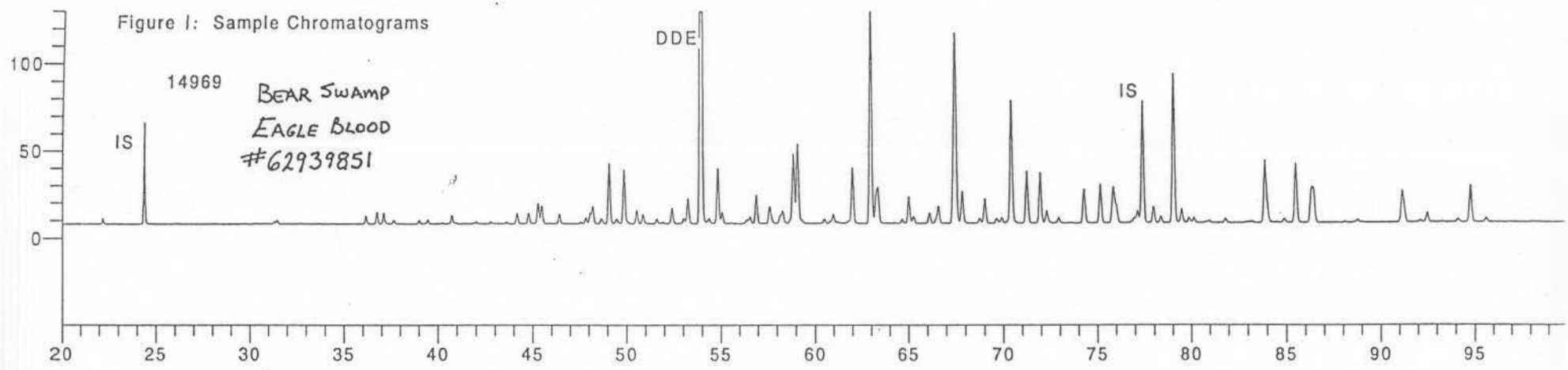
Table 2. New Jersey Eagle Blood QC Congener PCBs

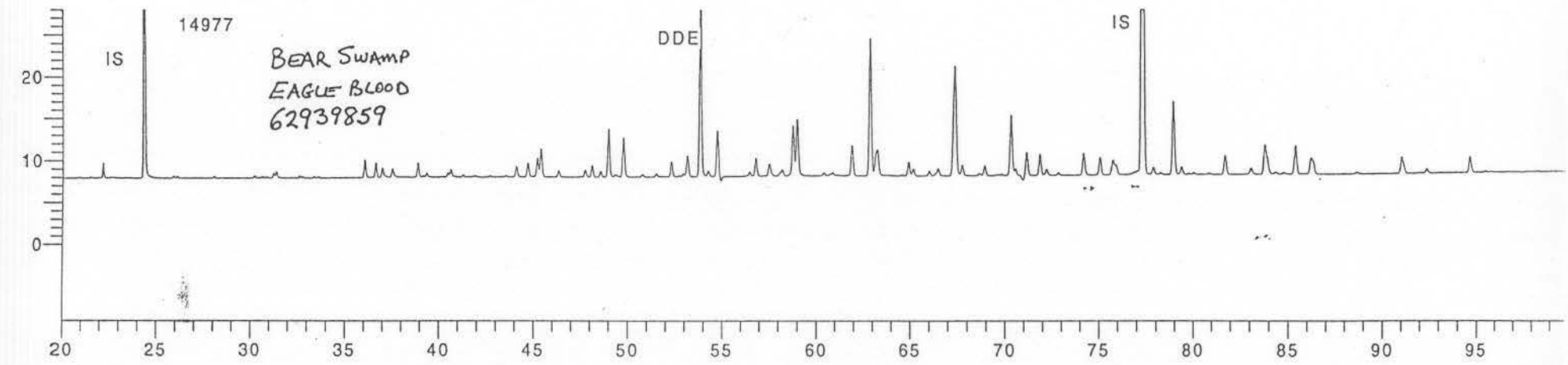
Sample Name	Field ID	Sample Type	205 (ng/g)	206 (ng/g)	209 (ng/g)	Total PCBs (ng/g)	
PB 070997 (a)	Procedure Blank	20g Na2SO4	0.00	0.98	0.20	57.77	
mass corrected PB			*0.00*	*0.15*	*0.03*	*9.58*	
PB 071597 (a)	Procedure Blank	20g Na2SO4	0.02	1.51	0.18	20.71	
mass corrected PB			*0.00*	*0.2*	*0.0*	*3.25*	
PB 072297 (a) *	Procedure Blank	20g Na2SO4	0.00	0.00	0.18	21.27	
corrected 8/24/98			*0.00*	*0.00*	*0.03*	*3.34*	
PB Average			0.00	0.13	0.03	5.39	
SD (n-1)			0.00	0.12	0.00	3.63	*AVG MDL=*
MDL = PB Avg + 3(PB SD)	*(Average sample mass)*		*0.01*	*0.49*	*0.04*	*16.27*	*0.18*
(a) Amount in ng							
* PB and MB 072297 were switched in previous report.							

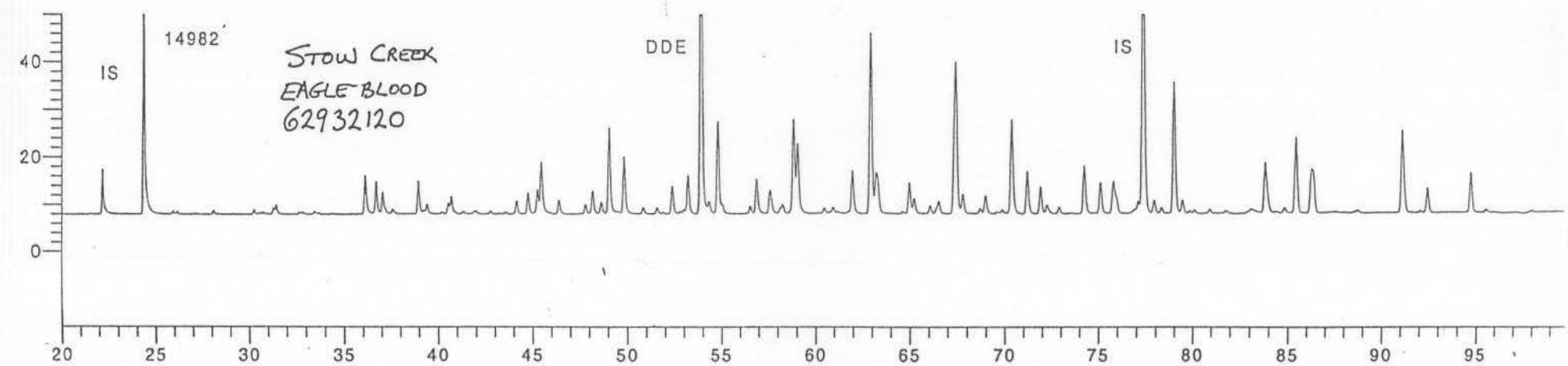
Table 3. NJ Eagle Blood, PCB Spike Recovery

Sample Name	Field ID	Sample Type	Total G-equiv Analyzed	% Lipid	Congener 030 (ng/g)+	Congener 030 % Recovery	Congener 204 (ng/g)+	Congener 204 % Recovery
14952	62939833	Eagle Blood	6.51	0.76	6.5	47	8.4	60
14953	62939834	Eagle Blood	3.94	1.00	12.7	55	16.1	70
14954	62939835	Eagle Blood	6.50	0.76	6.6	47	9.5	67
14955	62939836	Eagle Blood	7.16	0.69	7.5	59	7.0	55
14956	62939838	Eagle Blood	6.26	0.63	8.5	59	10.6	73
14957	62939839	Eagle Blood	6.91	0.86	7.8	59	10.3	78
14958	62939840	Eagle Blood	6.05	1.15	7.4	50	9.9	65
14959	62939841	Eagle Blood	7.42	0.67	6.0	49	8.0	65
14960	62939842	Eagle Blood	7.32	0.68	5.7	46	7.1	57
14961	62939843	Eagle Blood	7.16	0.55	5.5	43	7.1	56
14962	62939844	Eagle Blood	5.49	0.54	5.5	33	7.1	43
14963	62939845	Eagle Blood	5.79	0.68	7.1	45	8.3	53
14964*	62939846	Eagle Blood	6.77	0.15	6.9	51	7.1	53
14965	62939847	Eagle Blood	6.95	0.28	5.4	41	7.1	54
14966	62939848	Eagle Blood	6.40	0.46	4.7	33	7.9	55
14967	62939849	Eagle Blood	6.84	0.29	5.7	43	9.0	67
14968	62939850	Eagle Blood	7.06	0.42	5.3	41	7.6	59
14969*	62939851	Eagle Blood	4.14	0.24	11.2	51	17.8	81
14970	62939852	Eagle Blood	6.45	0.15	10.4	74	12.6	89
14971	62939853	Eagle Blood	7.02	0.28	8.2	63	10.7	83
14972	62939854	Eagle Blood	7.17	0.28	9.3	73	11.3	89
14973	62939855	Eagle Blood	7.06	0.42	7.9	61	10.9	85
14974	62939856	Eagle Blood	6.86	0.29	9.6	72	12.5	94
14975	62939857	Eagle Blood	6.33	0.31	9.7	67	12.5	87
14976	62939858	Eagle Blood	6.63	0.30	6.1	44	9.7	71
14977	62939859	Eagle Blood	5.80	0.17	8.9	57	12.3	78
14978	62939860	Eagle Blood	6.70	0.44	7.3	54	9.5	70
14979	62939861	Eagle Blood	5.91	0.34	7.7	50	11.5	75
14980	62939862	Eagle Blood	5.62	0.18	2.9	18	3.9	24
14981	62939863	Eagle Blood	6.56	0.30	8.9	64	11.6	84
14982	62932120	Eagle Blood	5.20	0.38	11.3	65	14.8	84
14983	62932122	Eagle Blood	6.66	0.30	8.0	59	11.0	81
14984	62933938	Eagle Blood	5.84	0.51	8.9	57	12.2	78
14985	62932125	Eagle Blood	5.58	0.35	8.6	53	11.8	72
14986	62933934	Eagle Blood	6.97	0.14	4.5	35	6.9	53
MB 070997	6.01 g	Chicken Egg	5.88	10.80	8.3	54	10.8	69
MB 071597	6.01 g	Chicken Egg	5.89	10.30	7.8	51	12.8	83
MB 072297	6.01 g	Chicken Egg	5.89	10.30	9.2	60	13.2	85
MS 070997*		Chicken Egg	5.94	10.80	9.1	60	10.5	68
MS 071597		Chicken Egg	5.96	10.50	7.9	52	10.8	71
MS 072297*		Chicken Egg	5.96	10.50	10.1	66	12.4	81
PC 070997*	5.0g 6806	Sag Bay Car	4.94	14.80	15.5	84	18.1	98
PC 071597*	5.0g 6806	Sag Bay Car	4.97	14.70	13.6	74	22.2	121
PC 072297	5.0g 6806	Sag Bay Car	4.95	14.80	12.8	70	25.3	137
PB 070997*		20g Na2SO4	1	na	34.8	38	69.9	77
PB 071597		20g Na2SO4	1	na	14.8	16	55.3	61
PB 072297*		20g Na2SO4	1	na	30.7	34	56.1	62
+Sum of SG1 and SG2 concentrations.				Average Recovery		53		73
*GC replicate average				SD (n=46)		14		19
MS = matrix spike; MB = matrix blank				Median		53		71
PC = positive control; PB = procedure blank				Low		16		24
				High		84		137

Figure I: Sample Chromatograms







Appendix B

Organochlorine Pesticides in Blood of Bald Eagles from the Lower Delaware River Drainage Area, New Jersey

Organochlorine Pesticides in Bloods of Bald Eagles from the Lower Delaware River Drainage Area New Jersey

Reported and reviewed by:

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Reviewed and Approved By:

Carl E. Orazio
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Analytical Method- Gas Chromatography/ Electron Capture Detection (GC/ECD):

Samples were extracted, cleaned, and fractionated as described first section of this report and referenced below (1-5). Purified sample fractions were analyzed by GC/ECD to measure organochlorine pesticides (OCs) in the PGC1 and SG2 fractions.

Organochlorine pesticide analysis:
A 30-m × 0.25 mm id OV-17 (0.25 μm thick bonded 50% phenyl-, 50% methyl-silicone film, Quadrex Corp.) and a 30-m x 0.25 mm id DB-35 (0.25 μm thick bonded x film, J&W Scientific) were used for the SG2 fractions. The H_2-carrier was pressure regulated at 14 psi for the OV-17 column. Temperature program: 90°C, immediately ramped to 165°C at 15°C/min, then ramped to 280°C at 3.5°C/min and held for 5 min, and finally ramped to 310°C at 5°C/min, and held for 3 min. The ECD was maintained at 330 °C.

SG1 organochlorine pesticide analysis:
Sample extracts were chromatographed on 60-m x 0.25-mm DB-5 (0.25 μm 5% phenyl-, 95% methylsilicone, J&W Scientific) capillary columns. Samples were analyzed as two sets on two different gas chromatographs. The H_2-carrier was pressure regulated at 25 psi for set 1 and 24 psi for set 2. The temperature program for the Set 1 PCB analyses was as follows: initial

temperature 60 °C, immediately ramped to 140 °C at 10°C/min, then ramped to 260°C at 1.5 °C/min and held for 10 min, and finally ramped to 310 °C at 10°C/min, and held for 2 min. The temperature program for the Set 2 PCB analyses was as follows: initial temperature 60 °C, immediately ramped to 150°C at 15 °C/min, then ramped to 250 °C at 1°C/min and finally ramped to 320 °C at 10°C/min, and held for 1 min. The ECD was maintained at 330 °C.

Capillary GC/ECD data were collected, archived in digital form, and processed using a PE-Nelson chromatography data system which includes the model 970 interface and version 4.1 of Turbochrom™ chromatography software running on a Pentium or 486 based microcomputer. Six levels of the OC pesticides standard, (CERC# 165W), from 1 to 80 ng/mL, were used for pesticide calibration. An instrumental internal standard (IIS) method with aldrin was used to calculate the concentrations of the targeted compounds. Results of the organochlorine pesticides are presented in Table 1 with final concentrations expressed as nanograms per gram of whole blood. Quality control data--spikes, blanks, replicates, controls--are presented in Table 2 and are discussed below. Recovery data for spiked PCBs 030 and 204 are presented in Table 3.

Results and Discussion

Method detection limits (MDLs) are presented in Table 2 in units of nanograms per gram of eagle blood. MDLs were determined by the method outlined by Keith *et al.* (6,7) which is based on procedure blank results. ***Important note:***

> *In the May 1998 report of the Organochlorine Pesticide results, MDLs were expressed in terms of nanograms per sample and were thus incorrectly listed in the tables. Procedure blank values are now in correct units, having been divided by the average sample mass in order to achieve units nanograms per gram of blood (ng/g) for the MDL values.*

The MDLs for the OC pesticides ranged from 0.1 ng/g to 2.6 ng/g. Method quantitation limits (MQLs=average PB + 10 std dev) were also calculated and presented in Table 2 (7,8). Matrix blanks (MB) consisting of 6g chicken egg, contained OC pesticides near the MDL values.

In addition to procedural and matrix blanks, matrix spikes were generated by spiking 80 ng per OC pesticide into 6 grams of clean chicken egg matrix (CERC numbers: MS 070997, MS 071597, MS 072297). Of the 24 targeted pesticides, 17 had average recoveries in the range of 85-115%; 4 had recoveries within 60-75%, and three had apparent recoveries of 129% (pp-DDT), 141% (dacthal) and 154% (methoxychlor). The elevated values were due to underlying PCB interference of these three peaks on the chromatogram. This is of no consequence to the Eagle Blood values, since levels of PCBs in the bloods are too low to respond as OC pesticide background.

Reproducibility was assessed by analysis of triplicate MS and positive control fish (CERC # 6806--common carp from Saginaw Bay, MI) samples. Method precision averaged 19±15% for the positive control and 1±1% for the matrix spike triplicate samples. The positive control fish

analyzed with this set was compared with the CERC quality control chart for this control environmental sample (9). The higher recoveries seen for the three pesticides in the matrix spikes were also observed the positive control samples.

The results for organochlorine pesticides are in Table 1 as concentrations (ng/g) in whole blood or tissue. Samples in Table 1 are designated by their CERC database number and are cross-referenced to their field identification number and site description. Concentrations of pesticides that were below detection limits and method quantitation limits (Table 2) are shown as < MDL or < MQL for that compound in Table 1.

In the eagle bloods, p,p'-DDE was the predominant organochlorine contaminant, ranging from <2.6 to 141 ng/g of blood. Chlordane related contaminants and dieldrin were also in found in the bloods. In most cases hexachlorobenzene (HCB), pentachloroanisole (PCA), lindane, β-BHC, δ-BHC and o,p-DDE were present as well. As shown in Table 1, all other targeted pesticides were at or below limits of detection. Samples are designated by their CERC database number, field identification number and site description. Pesticide levels are expressed in units of ng/g of whole blood. Recoveries of the pesticides, as indicated by the spike samples were generally 90-100% for the pesticides found in the eagle bloods, and therefore the analytical results indicate levels in the eagle blood.

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(7) Keith, L.H.; Crummet, W; Deegan, J., Jr; Libby, R.A.; Taylor, J.K.; and Wentler, G. 1983. "Principles of environmental analysis." Anal. Chem. 55: 2210-2218.

(8) Keith, L.H. 1991. Environmental Sampling and Analysis. Lewis Publishers.

(9) unpublished tracking data for positive control fish sample.

Organochlorine Pesticides Results

Table 1. New Jersey Eagle Blood samples, organochlorine analysis (ng/g)

Sample Identification	Field Identification	Sample Type	Site	Total gram-equivalents Analyzed	% Lipid	HCB	PCA	A BHC	Lindane	Heptachlor	B BHC	D BHC	Dacthal (a)
14952	62939833	Eagle Blood	Cohansey River	6.51	0.76	0.8	0.9	0.5	3.8	0.5	0.8	0.2	< 1.1
14953	62939834	Eagle Blood	Cohansey River	3.94	1.00	0.5	0.4	0.2	4.1	0.6	0.4	0.3	< 1.1
14954	62939835	Eagle Blood	Stow Creek	6.50	0.76	0.6	0.5	0.6	1.6	< 0.4	< 0.4	0.1	< 1.1
14955	62939836	Eagle Blood	Stow Creek	7.16	0.69	0.3	0.2	0.2	0.8	< 0.4	< 0.4	0.1	< 1.1
14956	62939838	Eagle Blood	Bear Swamp	6.26	0.63	0.6	0.7	0.4	4.8	< 0.4	< 0.4	0.4	< 1.1
14957	62939839	Eagle Blood	Union Lake	6.91	0.86	0.7	1.0	0.3	5.5	0.4	0.5	0.3	< 1.1
14958	62939840	Eagle Blood	Union Lake	6.05	1.15	1.2	0.6	0.5	2.1	0.5	0.6	1.7	< 1.1
14959	62939841	Eagle Blood	Belleplain	7.42	0.67	0.3	0.4	0.3	3.9	0.5	< 0.4	0.5	< 1.1
14960	62939842	Eagle Blood	Belleplain	7.32	0.68	0.3	0.3	0.3	3.6	0.5	< 0.4	0.7	< 1.1
14961	62939843	Eagle Blood	Cohansey River	7.16	0.55	< 0.3	0.7	< 0.2	3.3	< 0.4	13.4	0.4	< 1.1
14962	62939844	Eagle Blood	Cohansey River	5.49	0.54	0.4	0.4	0.2	1.5	< 0.4	< 0.4	0.2	1.5
14963	62939845	Eagle Blood	Stow Creek	5.79	0.68	0.9	1.5	0.3	7.8	0.8	0.6	1.1	< 1.1
14964*	62939846	Eagle Blood	Stow Creek	6.77	0.15	0.5	0.9	< 0.2	4.2	0.4	4.7	0.6	< 1.1
14965	62939847	Eagle Blood	Stow Creek	6.95	0.28	0.4	0.5	0.2	5.2	0.5	1.3	0.6	< 1.1
14966	62939848	Eagle Blood	Belleplain	6.40	0.46	0.5	0.2	0.4	9.3	1.2	0.6	2.6	3.0
14967	62939849	Eagle Blood	Belleplain	6.84	0.29	0.6	4.9	0.5	6.0	0.8	3.3	0.7	3.8
14968	62939850	Eagle Blood	Bear Swamp	7.06	0.42	0.4	1.2	0.3	7.2	0.7	1.2	0.3	< 1.1
14969	62939851	Eagle Blood	Bear Swamp	4.14	0.24	0.6	0.3	0.2	1.2	< 0.4	< 0.4	0.1	< 1.1
14970	62939852	Eagle Blood	Union Lake	6.45	0.15	0.4	0.3	0.2	3.6	< 0.4	< 0.4	0.2	< 1.1
14971	62939853	Eagle Blood	Union Lake	7.02	0.28	0.4	0.3	0.3	4.8	< 0.4	< 0.4	0.3	< 1.1
14972	62939854	Eagle Blood	Union Lake	7.17	0.28	0.6	4.0	0.8	3.2	1.0	4.0	0.4	< 1.1
14973	62939855	Eagle Blood	Maurice River	7.06	0.42	0.4	0.5	0.5	3.4	0.4	< 0.4	0.2	< 1.1
14974	62939856	Eagle Blood	Maurice River	6.86	0.29	0.3	0.5	0.2	4.5	< 0.5	< 0.4	0.2	< 1.1
14975	62939857	Eagle Blood	Round Valley	6.33	0.31	0.5	0.2	< 0.2	1.9	< 0.4	0.4	< 0.1	< 1.1
14976	62939858	Eagle Blood	Round Valley	6.63	0.30	0.7	0.3	0.4	2.0	< 0.4	0.4	0.3	1.5
14977	62939859	Eagle Blood	Bear Swamp	5.80	0.17	< 0.3	0.3	< 0.2	1.9	< 0.4	0.8	0.3	< 1.1
14978	62939860	Eagle Blood	Union Lake	6.70	0.44	0.4	0.5	0.3	4.6	< 0.4	< 0.4	0.7	< 1.1
14979	62939861	Eagle Blood	Maurice River	5.91	0.34	< 0.3	0.2	0.2	1.3	< 0.4	< 0.4	0.4	< 1.1
14980	62939862	Eagle Blood	Maurice River	5.62	0.18	< 0.3	0.1	0.2	0.8	< 0.4	< 0.4	0.2	1.2
14981	62939863	Eagle Blood	Stow Creek	6.56	0.30	< 0.3	0.2	< 0.2	2.7	< 0.4	< 0.4	< 0.1	< 1.1
14982	62932120	Eagle Blood	Stow Creek	5.20	0.38	1.5	0.5	0.2	5.0	0.4	0.5	0.4	< 1.1
14983	62932122	Eagle Blood	Stow Creek	6.66	0.30	1.0	0.6	0.4	6.3	0.6	0.4	1.2	< 1.1
14984	62933938	Eagle Blood	Appaquinimink Ck.	5.84	0.51	0.4	0.3	< 0.2	3.3	< 0.4	< 0.4	0.8	< 1.1
14985	62932125	Eagle Blood	Bear Swamp	5.58	0.35	< 0.3	0.2	0.2	3.2	< 0.4	< 0.4	0.2	< 1.1
14986	62933934	Eagle Blood	Murder Kill	6.97	0.14	< 0.3	0.2	< 0.2	1.5	< 0.4	< 0.4	0.2	< 1.1

Note: Values are Sum of SG1 and SG2 where appropriate.

(a) Has probable interference MQL filter used.

*GC Replicate Injection Average

Table 1. New Jersey Eagle Blood samples, organochlorine analysis (ng/g)

Sample Identification	Field Identification	Sample Type	Site	Oxychlordane	Heptachlor Epoxide	*Trans-* Chlordane	*Trans-* Nonachlor	*Cis-* Chlordane	o,p'-DDE	p,p'-DDE	Dieldrin	o,p'-DDD	Endrin
14952	62939833	Eagle Blood	Cohansey River	0.3	0.6	< 1.9	1.9	2.8	1.7	18.9	2.4	0.6	< 2.2
14953	62939834	Eagle Blood	Cohansey River	0.1	0.6	< 1.9	2.0	2.6	1.8	23.3	1.9	0.6	< 2.2
14954	62939835	Eagle Blood	Stow Creek	0.1	< 0.5	< 1.9	1.3	1.8	0.5	12.8	1.2	0.7	< 2.2
14955	62939836	Eagle Blood	Stow Creek	0.2	< 0.5	< 1.9	1.2	1.5	0.5	23.8	1.2	< 0.5	< 2.2
14956	62939838	Eagle Blood	Bear Swamp	0.2	< 0.5	< 1.9	0.9	0.9	1.1	10.0	1.6	< 0.5	< 2.2
14957	62939839	Eagle Blood	Union Lake	0.3	< 0.5	< 1.9	2.1	1.7	1.8	20.0	1.3	< 0.5	< 2.2
14958	62939840	Eagle Blood	Union Lake	1.4	1.3	< 1.9	3.8	2.7	0.7	30.1	1.9	0.6	< 2.2
14959	62939841	Eagle Blood	Belleplain	0.2	< 0.5	< 1.9	1.1	1.1	1.6	12.5	0.8	< 0.5	< 2.2
14960	62939842	Eagle Blood	Belleplain	0.1	< 0.5	< 1.9	0.4	0.7	1.0	6.6	0.8	1.3	< 2.2
14961	62939843	Eagle Blood	Cohansey River	0.2	< 0.5	< 1.9	1.1	1.8	1.0	13.1	1.2	< 0.5	< 2.2
14962	62939844	Eagle Blood	Cohansey River	0.1	< 0.5	< 1.9	1.1	1.9	0.7	13.1	1.2	< 0.5	< 2.2
14963	62939845	Eagle Blood	Stow Creek	0.2	0.6	< 1.9	1.9	2.5	2.3	15.4	1.2	< 0.5	< 2.2
14964*	62939846	Eagle Blood	Stow Creek	0.2	< 0.5	< 1.9	1.4	2.1	1.3	26.1	1.2	< 0.5	< 2.2
14965	62939847	Eagle Blood	Stow Creek	0.3	0.6	< 1.9	1.5	2.0	1.7	12.7	1.2	< 0.5	< 2.2
14966	62939848	Eagle Blood	Belleplain	0.9	0.6	< 1.9	0.7	0.6	3.4	10.4	1.3	0.5	< 2.2
14967	62939849	Eagle Blood	Belleplain	0.4	< 0.5	< 1.9	0.8	0.4	0.7	6.2	0.6	< 0.5	< 2.2
14968	62939850	Eagle Blood	Bear Swamp	0.1	< 0.5	< 1.9	0.8	0.6	0.5	15.4	1.0	< 0.5	< 2.2
14969	62939851	Eagle Blood	Bear Swamp	1.8	1.2	< 1.9	14.2	7.7	6.6	141.0	10.3	< 0.5	< 2.2
14970	62939852	Eagle Blood	Union Lake	0.2	< 0.5	< 1.9	1.3	0.6	< 0.3	25.0	1.3	< 0.5	< 2.2
14971	62939853	Eagle Blood	Union Lake	0.2	< 0.5	< 1.9	1.3	1.0	< 0.3	12.5	1.2	< 0.5	< 2.2
14972	62939854	Eagle Blood	Union Lake	0.2	< 0.5	< 1.9	1.4	1.2	5.0	14.2	1.5	< 0.5	< 2.2
14973	62939855	Eagle Blood	Maurice River	0.2	< 0.5	< 1.9	0.9	0.7	< 0.3	5.9	0.6	< 0.5	< 2.2
14974	62939856	Eagle Blood	Maurice River	0.1	< 0.5	< 1.9	1.0	0.8	< 0.3	6.6	0.6	< 0.5	< 2.2
14975	62939857	Eagle Blood	Round Valley	0.1	< 0.5	< 1.9	1.0	0.5	0.5	3.6	0.4	< 0.5	< 2.2
14976	62939858	Eagle Blood	Round Valley	0.2	0.6	< 1.9	1.0	1.6	1.1	2.8	0.7	4.9	< 2.2
14977	62939859	Eagle Blood	Bear Swamp	0.1	< 0.5	< 1.9	0.6	0.6	< 0.3	5.2	0.8	< 0.5	< 2.2
14978	62939860	Eagle Blood	Union Lake	0.2	< 0.5	< 1.9	1.4	1.0	< 0.3	11.4	1.5	< 0.5	< 2.2
14979	62939861	Eagle Blood	Maurice River	< 0.1	< 0.5	< 1.9	0.5	< 0.3	0.4	5.0	0.4	< 0.5	< 2.2
14980	62939862	Eagle Blood	Maurice River	< 0.1	< 0.5	< 1.9	0.3	< 0.3	< 2.6	0.2	< 0.5	< 2.2
14981	62939863	Eagle Blood	Stow Creek	< 0.1	< 0.5	< 1.9	1.3	1.4	0.5	19.7	1.0	< 0.5	< 2.2
14982	62932120	Eagle Blood	Stow Creek	0.2	0.7	< 1.9	2.3	3.4	0.8	31.7	1.7	0.7	< 2.2
14983	62932122	Eagle Blood	Stow Creek	0.4	0.9	< 1.9	2.8	3.6	0.8	35.7	1.5	0.7	< 2.2
14984	62933938	Eagle Blood	Appaquinimink Ck.	< 0.1	< 0.5	< 1.9	1.3	1.4	< 0.3	36.4	1.8	< 0.5	< 2.2
14985	62932125	Eagle Blood	Bear Swamp	0.2	< 0.5	< 1.9	1.0	1.1	< 0.3	9.7	1.1	< 0.5	< 2.2
14986	62933934	Eagle Blood	Murder Kill	0.1	< 0.5	< 1.9	0.9	1.2	< 0.3	11.7	0.4	< 0.5	< 2.2

Note: Values are Sum of SG1 and SG2 where appropriate.

(a) Has probable interference MQL filter used.

*GC Replicate Injection Average

Table 1. New Jersey Eagle Blood samples, organochlorine analysis (ng/g)

Sample Identification	Field Identification	Sample Type	Site	*Cis*-Nonachlor	o,p'-DDT	p,p'-DDD	p,p'-DDT (a)	Mirex	Methoxychlor (a)
14952	62939833	Eagle Blood	Cohansey River	1.0	< 0.4	7.5	< 4.1	< 0.9	< 1.2
14953	62939834	Eagle Blood	Cohansey River	1.1	< 0.4	6.7	< 4.1	< 0.9	< 1.2
14954	62939835	Eagle Blood	Stow Creek	0.6	< 0.4	4.3	< 4.1	< 0.9	< 1.2
14955	62939836	Eagle Blood	Stow Creek	0.6	< 0.4	3.9	< 4.1	< 0.9	< 1.2
14956	62939838	Eagle Blood	Bear Swamp	0.4	< 0.4	< 2.6	< 4.1	< 0.9	< 1.2
14957	62939839	Eagle Blood	Union Lake	0.8	< 0.4	4.5	< 4.1	< 0.9	< 1.2
14958	62939840	Eagle Blood	Union Lake	1.2	< 0.4	8.1	< 4.1	< 0.9	< 1.2
14959	62939841	Eagle Blood	Belleplain	0.6	< 0.4	2.6	< 4.1	< 0.9	< 1.2
14960	62939842	Eagle Blood	Belleplain	0.5	< 0.4	< 2.6	< 4.1	< 0.9	< 1.2
14961	62939843	Eagle Blood	Cohansey River	0.6	< 0.4	4.4	< 4.1	< 0.9	< 1.2
14962	62939844	Eagle Blood	Cohansey River	0.7	< 0.4	5.0	< 4.1	< 0.9	< 1.2
14963	62939845	Eagle Blood	Stow Creek	0.8	< 0.4	6.8	< 4.1	< 0.9	< 1.2
14964*	62939846	Eagle Blood	Stow Creek	0.7	< 0.4	5.4	< 4.1	< 0.9	< 1.2
14965	62939847	Eagle Blood	Stow Creek	0.7	< 0.4	6.1	< 4.1	< 0.9	< 1.2
14966	62939848	Eagle Blood	Belleplain	0.4	< 0.4	2.6	< 4.1	< 0.9	< 1.2
14967	62939849	Eagle Blood	Belleplain	0.3	< 0.4	< 2.6	< 4.1	< 0.9	< 1.2
14968	62939850	Eagle Blood	Bear Swamp	0.3	< 0.4	< 2.6	< 4.1	< 0.9	< 1.2
14969	62939851	Eagle Blood	Bear Swamp	5.6	0.4	30.4	< 4.1	< 0.9	< 1.2
14970	62939852	Eagle Blood	Union Lake	0.5	< 0.4	2.9	< 4.1	< 0.9	< 1.2
14971	62939853	Eagle Blood	Union Lake	0.5	< 0.4	3.0	< 4.1	< 0.9	< 1.2
14972	62939854	Eagle Blood	Union Lake	0.7	< 0.4	3.4	< 4.1	< 0.9	< 1.2
14973	62939855	Eagle Blood	Maurice River	0.4	< 0.4	< 2.6	< 4.1	< 0.9	< 1.2
14974	62939856	Eagle Blood	Maurice River	0.4	< 0.4	< 2.6	< 4.1	< 0.9	< 1.2
14975	62939857	Eagle Blood	Round Valley	0.4	< 0.4	< 2.6	< 4.1	< 0.9	< 1.2
14976	62939858	Eagle Blood	Round Valley	0.4	< 0.4	< 2.6	< 4.1	< 0.9	1.6
14977	62939859	Eagle Blood	Bear Swamp	< 0.3	< 0.4	< 2.6	< 4.1	< 0.9	< 1.2
14978	62939860	Eagle Blood	Union Lake	0.6	< 0.4	3.1	< 4.1	< 0.9	< 1.2
14979	62939861	Eagle Blood	Maurice River	< 0.3	< 0.4	< 2.6	< 4.1	< 0.9	< 1.2
14980	62939862	Eagle Blood	Maurice River	< 0.3	< 0.4	< 2.6	< 4.1	< 0.9	< 1.2
14981	62939863	Eagle Blood	Stow Creek	0.6	< 0.4	3.7	< 4.1	< 0.9	< 1.2
14982	62932120	Eagle Blood	Stow Creek	1.0	0.5	12.3	< 4.1	< 0.9	< 1.2
14983	62932122	Eagle Blood	Stow Creek	1.1	0.4	14.1	< 4.1	< 0.9	< 1.2
14984	62933938	Eagle Blood	Appaquinimink Ck.	0.7	< 0.4	7.1	< 4.1	< 0.9	< 1.2
14985	62932125	Eagle Blood	Bear Swamp	0.4	< 0.4	2.8	< 4.1	< 0.9	< 1.2
14986	62933934	Eagle Blood	Murder Kill	0.4	< 0.4	3.1	< 4.1	< 0.9	< 1.2

Note: Values are Sum of SG1 and SG2 where appropriate.

(a) Has probable interference MQL filter used.

*GC Replicate Injection Average

Table 2. New Jersey Eagle Blood QAQC Samples, organochlorine analysis (ng/g)

Sample Identification	Field Identification	Sample Type	Total gram-equivalents Analyzed	% Lipid	HCB	PCA	A BHC	Lindane	Heptachlor	B BHC	D BHC	Dacthal (b)	Oxychlordane	Heptachlor Epoxide	*Trans-* Chlordane	*Trans-* Nonachlor
PC 070997	Positive Control	Sag Bay Carp	4.94	14.80	6.3	4.8	8.0	13.2	< 0.4	4.6	21.3	4.9	3.1	1.9	8.0	23.1
PC 071597(a)	Positive Control	Sag Bay Carp	4.97	14.70	8.7	5.0	4.0	9.3	< 0.4	4.8	16.8	7.2	1.6	2.4	7.1	22.2
PC 072297	Positive Control	Sag Bay Carp	4.95	14.80	8.2	4.7	7.7	5.9	< 0.4	4.5	22.1	6.7	3.2	2.0	6.4	20.1
Average			5.0	14.8	7.7	4.8	6.6	9.5	< 0.4	4.6	20.1	6.3	2.6	2.1	7.2	21.8
SD(n-1)			0.0	0.1	1.3	0.1	2.2	3.7		0.2	2.9	1.2	0.9	0.3	0.8	1.5
% RSD			*0*	*0*	*16*	*3*	*34*	*39*		*3*	*14*	*19*	*34*	*13*	*11*	*7*
MS 070997(a)	Matrix Spike	Chicken Egg	5.94	10.80	8.1	14.4	11.7	13.2	9.3	12.7	10.4	20.7	12.9	14.5	14.6	13.8
% Recovery					60	107	87	98	69	94	77	154	96	108	108	102
MS 071597	Matrix Spike	Chicken Egg	5.96	10.50	7.0	14.1	10.8	12.2	8.8	13.3	9.2	19.2	12.1	13.3	14.0	14.1
% Recovery					52	105	80	91	66	99	69	143	90	99	104	105
MS 072297(a)	Matrix Spike	Chicken Egg	5.96	10.50	8.7	13.3	11.4	17.9	9.3	12.4	10.6	16.8	12.6	13.3	12.9	12.1
% Recovery					65	99	85	134	69	92	79	125	94	99	96	90
Average			6.0	10.6	59	104	84	108	68	95	75	141	93	102	103	99
SD(n-1)			0.0	0.2	0.9	0.6	0.5	3.1	0.3	0.5	0.8	1.9	0.4	0.7	0.8	1.1
% RSD			*0.2*	*1.6*	*1.5*	*0.6*	*0.5*	*2.8*	*0.4*	*0.5*	*1.0*	*1.4*	*0.4*	*0.7*	*0.8*	*1.1*
MB 070997	Matrix Blank	Chicken Egg	5.88	10.80	1.7	0.1	0.1	0.2	0.2	0.0	1.1	0.5	0.0	0.2	0.5	0.2
MB 071597	Matrix Blank	Chicken Egg	5.89	10.30	2.1	0.2	0.2	1.7	0.2	0.6	0.1	0.1	0.0	0.1	0.3	0.4
MB 072297	Matrix Blank	Chicken Egg	5.89	10.30	1.2	0.2	0.2	0.7	0.3	0.4	0.2	1.0	0.0	0.1	0.2	0.1
Average					1.7	0.2	0.2	0.9	0.2	0.3	0.5	0.5	0.0	0.1	0.3	0.2
SD(n-1)					0.5	0.1	0.1	0.8	0.1	0.3	0.6	0.5	0.0	0.1	0.2	0.2
PB 070997(a)	Procedure Blank	20g Na2SO4	6.37	----	0.6	0.2	0.6	0.3	1.6	1.4	0.3	1.8	0.0	1.6	6.0	0.9
					0.09	0.04	0.09	0.05	0.25	0.21	0.05	0.28	0.00	0.25	0.94	0.14
PB 071597	Procedure Blank	20g Na2SO4	6.37	----	0.2	0.2	0.4	0.1	0.4	0.3	0.0	0.6	0.2	0.1	0.1	0.1
					0.03	0.03	0.06	0.02	0.06	0.05	0.00	0.09	0.03	0.02	0.02	0.02
PB 072297	Procedure Blank	20g Na2SO4	6.37	----	1.0	0.5	0.7	0.9	1.0	1.0	0.1	1.0	0.0	0.4	1.3	0.0
					0.16	0.08	0.11	0.14	0.16	0.16	0.02	0.16	0.00	0.06	0.20	0.00
PB Average					0.1	0.0	0.1	0.1	0.2	0.1	0.0	0.2	0.0	0.1	0.4	0.1
SD(n-1)					0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.0	0.1	0.5	0.1
MDL=PB AVG+3(PB SD)					*0.3*	*0.1*	*0.2*	*0.3*	*0.4*	*0.4*	*0.1*	*0.5*	*0.1*	*0.5*	*1.9*	*0.3*
MQL = PB AVG + 10(PB SD)					*0.7*	*0.3*	*0.3*	*0.7*	*1.1*	*1.0*	*0.3*	*1.1*	*0.2*	*1.4*	*5.3*	*0.8*

Note: Values are Sum of SG1, SG2 when appropriate.

(a) GC replicate injection average.

(b) Recovery indicates presence of possible PCB interference.

Table 2. New Jersey Eagle Blood QAQC Samples, organochlorine analysis (ng/g)

Sample Identification	Field Identification	Sample Type	*Cis*-Chlordane	o,p'-DDE	p,p'-DDE	Dieldrin	o,p'-DDD	Endrin	*Cis*-Nonachlor	o,p'-DDT	p,p'-DDD	p,p'-DDT(b)	Mirex	Methoxychlor (b)
PC 070997	Positive Control	Sag Bay Carp	29.7	4.9	385.7	13.9	50.0	11.4	8.8	< 0.4	189.7	21.2	1.9	6.1
PC 071597(a)	Positive Control	Sag Bay Carp	30.0	5.5	403.9	11.5	56.5	9.8	9.2	< 0.4	196.7	24.5	2.6	32.2
PC 072297	Positive Control	Sag Bay Carp	24.1	4.2	439.1	7.3	41.9	10.9	7.7	< 0.4	164.3	21.4	2.8	35.1
Average			27.9	4.9	409.6	10.9	49.5	10.7	8.6		183.6	22.4	2.4	24.5
SD(n-1)			3.3	0.7	27.1	3.3	7.3	0.8	0.8		17.0	1.9	0.5	16.0
% RSD			*12*	*14*	*7*	*31*	*15*	*8*	*9*		*9*	*8*	*19*	*65*
MS 070997(a)	Matrix Spike	Chicken Egg	14.9	11.0	13.3	14.1	15.3	16.2	14.6	15.0	14.2	19.0	8.2	21.8
% Recovery			111	82	99	105	114	120	108	111	105	141	61	162
MS 071597	Matrix Spike	Chicken Egg	14.1	12.4	11.6	13.1	13.7	15.3	14.1	16.8	13.8	18.9	8.7	22.4
% Recovery			105	92	86	98	102	114	105	125	103	141	65	167
MS 072297(a)	Matrix Spike	Chicken Egg	13.3	12.4	10.8	12.6	13.1	14.5	12.8	12.7	13.4	14.2	10.4	18.0
% Recovery			99	92	80	94	97	108	95	95	100	106	77	134
Average			105	89	89	99	104	114	103	110	103	129	68	154
SD(n-1)			0.8	0.8	1.3	0.7	1.2	0.8	0.9	2.1	0.4	2.7	1.2	2.4
% RSD			*0.7*	*0.9*	*1.4*	*0.8*	*1.1*	*0.7*	*0.9*	*1.9*	*0.4*	*2.1*	*1.7*	*1.5*
MB 070997	Matrix Blank	Chicken Egg	0.0	0.2	12.3	0.3	0.3	0.2	0.1	0.2	0.5	0.7	0.1	2.1
MB 071597	Matrix Blank	Chicken Egg	0.0	0.0	55.7	0.2	0.1	0.3	0.1	0.5	0.3	1.6	1.2	0.0
MB 072297	Matrix Blank	Chicken Egg	0.0	0.0	0.2	0.3	0.1	0.6	0.1	0.2	0.5	0.4	0.1	0.0
Average			0.0	0.1	22.7	0.3	0.2	0.4	0.1	0.3	0.4	0.9	0.0	0.7
SD(n-1)			0.0	0.1	29.2	0.1	0.1	0.2	0.0	0.2	0.1	0.6	0.6	1.2
PB 070997(a)	Procedure Blank	20g Na2SO4	1.0	1.0	8.6	0.2	1.7	7.4	1.0	1.4	6.8	6.0	2.8	ND
			0.15	0.16	1.35	0.03	0.27	1.16	0.16	0.22	1.06	0.95	0.44	0.00
PB 071597	Procedure Blank	20g Na2SO4	0.2	0.2	1.4	0.0	0.3	0.7	0.1	0.4	0.0	** 2.0**	0.0	0.0
			0.03	0.03	0.22	0.00	0.05	0.11	0.02	0.06	0.00	0.31	0.00	0.00
PB 072297	Procedure Blank	20g Na2SO4	0.3	0.0	6.4	0.3	0.5	4.6	0.1	1.2	7.2	2.2	0.2	1.3
			0.05	0.00	1.00	0.05	0.08	0.72	0.02	0.19	1.13	0.35	0.03	0.20
PB Average			0.1	0.1	0.9	0.0	0.1	0.7	0.1	0.2	0.7	0.5	0.2	0.1
SD(n-1)			0.1	0.1	0.6	0.0	0.1	0.5	0.1	0.1	0.6	0.4	0.2	0.1
MDL=PB AVG+3(PB SD)			***0.3***	***0.3***	***2.6***	***0.1***	***0.5***	***2.2***	***0.3***	***0.4***	***2.6***	***1.6***	***0.9***	***0.4***
MQL = PB AVG + 10(PB SD)			***0.7***	***0.9***	***6.7***	***0.3***	***1.4***	***5.9***	***0.9***	***1.0***	***7.1***	***4.1***	***2.6***	***1.2***
Note: Values are Sum of SG1, SG2 when appropriate.														
(a) GC replicate injection average.														
(b) Recovery indicates presence of possible PCB interference.														

Appendix C

Non-*ortho*-Chloro-Substituted Polychlorinated Biphenyls (PCBs) in Blood of Bald Eagles from the Lower Delaware River Drainage Area, New Jersey

Non-*ortho*-Chloro-Substituted Polychlorinated Biphenyls (PCBs) in Bloods of Bald Eagles from the Lower Delaware River Drainage Area New Jersey

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Analytical Method: Determination of Non-*ortho*-chloro-substituted PCB Congeners by Capillary Gas Chromatography and High Resolution Mass Spectrometry (GC/HRMS)

Samples were extracted, cleaned, and fractionated as described first section of this report and referenced below (1,2) The non-*ortho*-PCB fractions from PGC were transferred to conical autosampler vials and evaporated to less than 50 µL with nitrogen. A total of 5 ng of internal standard was added to each vial by using 50 µL of ^{13}C-labeled 2,2',4,5,5'-PeCB (PCB #101, ECRC 90W-3E) at 100 pg/µL nonane. The final volume of all of the sample fractions was about 50 µL.

Analytes in PGC fraction 1 were determined by capillary GC/ECD for congener-specific PCB analysis. Non-*ortho*-PCBs in PGC fraction 2 were determined by GC/HRMS, monitoring two sequential mass windows of selected ions during the chromatographic separation (3,4). PCDFs and PCDDs in PGC fraction 3 were determined by GC/HRMS.

Capillary Gas Chromatography and Mass Spectrometry

Instrumentation: GC/HRMS analysis was performed with a HP 5890A capillary gas chromatograph interfaced to a VG 70-250S high resolution mass spectrometer. An HP 7673 autosampler was used to introduce 2 µL of the enriched extract from a conical vial onto a 2.5 m x 530 µm deactivated fused silica retention gap via a cool on-column injection technique. A 50 m x 200 µm x 0.11 µm Ultra-1 capillary column (Hewlett-Packard's equivalent to DB-1) was used to resolve most non-*ortho*-PCBs from interferences. The GC oven was held at 120°C for 1 min, programmed to 240°C at 2.2°C/min, then ramped to 310°C at 5°C/min, and a final hold of 5 mins. Helium carrier gas was maintained at 48 psig with an initial linear velocity of 25 cm/s. The analytical column was put into the MS interface, heated at 310°C. All column-to-column connections were made using fused silica press-tight connectors.

General Detection Procedure: The VG GC/HRMS system was tuned to 10,000 R.P. and calibrated using perfluorodecalin, and mass windows were established for two groups of non-*ortho*-PCBs. Group 1 from 23-48:00 min included ions for Cl_4-biphenyls 77 and 81 and Cl_5-biphenyl 126; Group 2 from 48:05-65 min included ions for Cl_6-biphenyl 169. Within each mass window, two most abundant ions were measured for positive identification and quantitation of each analyte. The ion responses were quantitated and averaged, unless interferences occurred. Within each mass window, additional ions monitored the responses of higher chlorinated, potential interfering PCB congeners, Cl_{4-8} naphthalenes (PCNs), Cl_{3-5} terphenyls (PCTs), Br_5- and Cl_6-diphenyl ethers, and Cl_4-PCDF (to ensure no breakthrough of PCDFs).

Quantitation of Analytes: The amount of each analyte detected was inherently corrected for losses through the whole analysis (extraction, isolation of analytes, and instrumental analysis). A calibration curve describing the response of each native congener to that of a isotope-labeled congener was used directly in the calculations and its range of values was determined in the calibration procedure. Concentrations of the native PCB congeners in standards ranged from 0.25 to 2,500 pg/µL. Each calibration curve was specifically matched to the range of analyte responses in the sample set.

QUALITY CONTROL

Chromatographic and Mass Spectral Resolution: PGC separates non-*ortho*-PCBs from other PCB congeners with nearly 99.9% efficiency. However, even this 0.1% carryover of major PCB congeners can interfere with gas chromatographic/mass spectral analysis: fragment ions are not fully resolved by high resolution MS and thus override the lower level non-*o*-PCBs. Therefore, a 50-m Ultra 1 column is used (instead of a DB-5 column) to chromatographically resolve most non-*o*-PCBs from major PCBs: non-*o*-Cl_4-PCB 81 elutes about 9 sec earlier than Cl_5-PCB 87, non-*o*-Cl_4-PCB 77 elutes about 10 sec later than Cl_6-PCB 136 and 10 sec earlier than Cl_5-PCB congener 110, and non-*o*-Cl_6-PCB 169 elutes when no other PCBs nearly co-elute. For continuing QC checks on chromatography, molecular ion responses of these major PCB congeners are measured to ensure that their fragment ion responses do not contribute an interference $\geq$10% to the responses of the respective non-*ortho*-PCB. Column performance is verified by analyzing standards of individual congeners, labeled congeners, and congeners from Aroclor spiked mixtures.

Unfortunately, non-*o*-Cl_5-PCB 126 is only minimally resolved from Cl_6-PCB 129. PCB 129's molecular ion response is monitored to assure that its fragment ion response (3.5% abundance) does not contribute an interference ≥10% to the response of PCB 126. PCB 129's molecular ion response must not exceed three times that of PCB 126.

Adequate mass resolution is verified while monitoring ions for Cl_{4-8} PCNs throughout the sample set. The Cl_{5-7} PCNs ions monitored differ by about 0.1 Da from the ^{13}C-Cl_{4-6} PCB procedural internal standards, assuring a continual check on mass resolution. For each mass window, lock-mass and lock-mass-check ions were used to maintain and verify the accuracy of mass measurement.

Criteria for Confirmation: For the positive identification and quantitation of each congener, the following criteria were established and met in this study:

(1) Peak areas for the selected ion responses must be greater than three times background noise.

(2) Native ion peaks must occur at retention times from -1 to +3 sec that for the corresponding ^{13}C-labeled ion peaks, that elute about 1 sec earlier.

(3) The ion ratio for the two principal ion responses must be within the acceptable range (generally ±15%). These ion ratios were determined experimentally for the system during calibrations, compared with the theoretical values, and were tracked. For ion responses very near the noise levels, or analytes with interferences, the final confirmation is left to the judgment of the analyst.

QC Samples: Nine quality control samples were prepared and analyzed: three procedural blanks, three chicken egg (matrix) blanks, three chicken egg (matrix) spikes, and three replicates of a positive control carp sample (6806, Saginaw Bay, Michigan). Approximately 6-g aliquants of the samples were homogenized with three times their weight of anhydrous sodium sulfate [SOPC 5.144]. The chicken egg extract was fortified with 5 µg of a 1:1:1:1 mixture of Aroclors 1242:1248:1254:1260 using 50 µL of the ECRC Standard 162W-10 after homogenization. Each sample aliquant was spiked with 5 ng of ^{13}C-labeled non-*o*-PCBs (77, 81, 126, and 169) using 50 µL of ECRC Standard 191W-1.

Method efficiency by calculating percent recovery of ^{13}C-surrogates: To account for variations in GC/HRMS analysis, a known amount of internal standard was spiked into the final extract and used to calculate the amounts of the surrogates recovered in the final extract. The efficiency of the extraction and cleanup procedure was measured by comparing the quantity of the surrogates detected in the *final* isolated extract (at GC/HRMS analysis) with the quantity spiked into the sample.

RESULTS AND DISCUSSION

Brief Summary: Samples were analyzed together with other biota samples and a calibration set of seven standards with data file names N36PCB and N36BPCB. Table 1 lists sample concentrations of non-*o*-PCBs and Table 2 lists percent recoveries of the surrogates for quality assurance.

Non-ortho-PCBs in the eagle bloods: Concentrations of the four selected non-*o*-PCBs in Table 1 are expressed as pg/g (picograms/ gram of eagle blood). The detection limit for each non-*o*-PCB is about 2 pg/g. **Concentrations in the samples were usually detectable but were typically very low and often were less than method detection limits determined from the QC blank samples.** Therefore, one should be cautious about interpreting values near the background levels. PCB 77 was generally ≤100 pg/g except for samples 14959 (309 pg/g, Belleplain), 14963 and 14981 (150 and 128 pg/g, Stow Creek), and 14969 (177 pg/g, Bear Swamp). PCB 126 did not exceed 60 pg/g in any eagle blood samples, PCB 81 was less than 20 pg/g, and PCB 169 was less than 10 pg/g. It is interesting to note that the ratio of PCB 77 to PCB 126 varies among the samples, from nearly 2:1 (as in numerous bloods) to 14:1 (as in sample 14959,62939841-Belleplain). In addition to investigating the PCB congener patterns we intend to interpret the non-ortho data in greater detail.

Quality Control Results: In the procedure **blanks**, amounts of native non-*o*-PCBs are expressed as total mass (pg) divided by 6 to simulate background sample concentrations (Table 1). Values in the **procedure blanks** and **chicken egg blanks** are nearly the same as the lowest concentrations in the eagle blood samples. Two exceptions are the elevated concentrations of PCB 126 in two of three chicken egg blanks, caused by low yet measurable cross-contamination from a sample of another set later found to contain a very high PCB 126 concentration. In the **spiked chicken egg** samples, concentrations are generally within 25% of the PCB concentrations in the mixed Aroclor standard.

Average non-*o*-PCB concentrations for the **positive control** Saginaw Bay carp 6806 samples were within 25% of the target values from 46 to 51 previous analyses as shown below:

CONCENTRATIONS (pg/g) in POSITIVE CONTROL SAGINAW BAY CARP

Non-*ortho*-PCB	IUPAC #	Concentration Range (pg/g) from Previous 46 or 51 Analyses	(%RSD)	This Study (N=3)	%RSD
3,4,4',5-TeCB	81	243 to 640	(23)	253	3
3,3',4,4'-TeCB	77	2,195 to 4,500	(15)	2,292	5
3,3',4,4',5-PeCB	126	903 to 1,600	(15)	1,240	32
3,3',4,4',5,5'-HxCB	169	44 to 120	(17)	47	6

For the 47 sample analyses of this study, surrogate **recoveries** of ^{13}C-PCB 77, 126, and 169 are listed in Table 2. Almost all were within the QC range (25-125%), except for three samples. Even so, quantitation of the native non-*o*-PCBs are not significantly affected because of the self-correcting technique using ^{13}C-surrogates. Sample 14980 had low

recoveries < 25%, but sufficient for quantitation. Samples 14966 and 14968 had unusually high recoveries measured for ^{13}C-PCB 169 due to excessive blowdown and proportionally high loss of the more volatile instrumental standard in the final vial. **Ion ratios** of the primary ions for all detected analytes in both samples and calibration standards generally varied within the QC range (±15%) of theoretical, except where noted by NQ (not quantifiable).

Detection of Other Compounds: Non-*o*-PCB amounts were not interfered by the presence of low levels of polychlorinated naphthalenes (PCNs), which have ions of the same nominal mass but different accurate masses from the ^{13}C-labeled PCBs. PCNs were predominantly Cl_{4-5}, which ranged from about 10 to 50 pg/g. PolychlorinatedTerphenyls (PCTs) were < 20 pg/g.

References

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Non-*ortho*-PCBs Results

Table 1. Non-*o*-Chloro-Substituted PCBs (pg/g) in Blood Samples from Bald Eagles in New Jersey

May 11, 1998 GC/MS Sets: N36PCB and N36BPCB
Dates: 4/13/98 and 4/15/98

				Non-*o*-Polychlorinated Biphenyls			
				Tetra:		Penta:	Hexa:
NFCR Number:	Frakes' Number:	Sample Description:	GC/MS Run No.	3,4,4',5-TCB (81)	3,3',4,4'-TCB (77)	3,3',4,4',5-PeCB (126)	3,3',4,4',5,5'-HxCB (169)
14952	629-39833	Eagle Blood, 6.58 g, Cohansey River	36B-10	8	40	15	5
14953	629-39834	Eagle Blood, 3.98 g, Cohansey River	36B-11	12 NQ	64	21	6
14954	629-39835	Eagle Blood, 6.57 g, Stow Creek	36B-12	8 NQ	41	14 NQ	3 NQ
14955	629-39836	Eagle Blood, 7.23 g, Stow Creek	36B-14	8	35	23	5
14956	629-39838	Eagle Blood, 6.32 g, Bear Swamp	36B-15	6 NQ	27	13	3
14957	629-39839	Eagle Blood, 6.98 g, Union Lake	36B-16	7	31	15	3 NQ
14958	629-39840	Eagle Blood, 6.11 g, Union Lake	36B-17	8	42	20	4
14959	629-39841	Eagle Blood, 7.49 g, Belleplain	36B-19	14	309	22	3
14960	629-39842	Eagle Blood, 7.39 g, Belleplain	36B-20	7 NQ	46	13	3
14961	629-39843	Eagle Blood, 7.23 g, Cohansey River	36B-21	7	38	12	3 NQ
14962	629-39844	Eagle Blood, 5.55 g, Cohansey River	36B-22	9 NQ	49	17	4 NQ
14963	629-39845	Eagle Blood, 5.85 g, Stow Creek	36B-24	18	150	36	4
14964	629-39846	Eagle Blood, 6.84 g, Stow Creek	36B-25	8	38	18	4
14965	629-39847	Eagle Blood, 7.02 g, Stow Creek	36B-26	7 NQ	36	13	3
14966	629-39848	Eagle Blood, 6.46 g, Belleplain	36B-27	7 NQ	38	14	3 NQ
14967	629-39849	Eagle Blood, 6.91 g, Belleplain	36B-29	7 NQ	21	11 NQ	3 NQ
14968	629-39850	Eagle Blood, 7.13 g, Bear Swamp	36B-30	10 NQ	41	27	5

Table 1. Non-*o*-Chloro-Substituted PCBs (pg/g) in Blood Samples from Bald Eagles in New Jersey

May 11, 1998 GC/MS Sets: N36PCB and N36BPCB
Dates: 4/13/98 and 4/15/98

				Non-*o*-Polychlorinated Biphenyls			
				Tetra:		Penta:	Hexa:
NFCR Number:	Frakes' Number:	Sample Description:	GC/MS Run No.	3,4,4',5-TCB (81)	3,3',4,4'-TCB (77)	3,3',4,4',5-PeCB (126)	3,3',4,4',5,5'-HxCB (169)
14969	629-39851	Eagle Blood, 4.18 g, Bear Swamp	36B-31	16	177	59	9
14970	629-39852	Eagle Blood, 6.52 g, Union Lake	36B-32	8	35	23	4 NQ
14971	629-39853	Eagle Blood, 7.0 g, Union Lake	36B-34	8	62	14	3 NQ
14972	629-39854	Eagle Blood, 7.24 g, Union Lake	36B-35	6	20	12	3
14973	629-39855	Eagle Blood, 7.13 g, Maurice River	36B-36	6 NQ	23	13 NQ	4
14974	629-39856	Eagle Blood, 6.93 g, Maurice River	36B-40	7 NQ	29	13 NQ	3 NQ
14975	629-39857	Eagle Blood, 6.39 g, Round Valley	36B-41	7	28	14	3 NQ
14976	629-39858	Eagle Blood, 6.70 g, Round Valley	36B-42	7 NQ	26	12	3 NQ
14977	629-39859	Eagle Blood, 5.86 g, Bear Swamp	36B-44	8 NQ	36	17	3 NQ
14978	629-39860	Eagle Blood, 6.77 g, Union Lake	36B-45	6	33	15	3 NQ
14979	629-39861	Eagle Blood, 5.97 g, Maurice River	36B-46	7	25	13	4
14980	629-39862	Eagle Blood, 5.68 g, Maurice River	36B-47	3 ND	81	29	8 NQ
14981	629-39863	Eagle Blood, 6.63 g, Stow Creek	36B-49	11	128	19	3
14982	629-32120	Eagle Blood, 5.25 g, Stow Creek	36B-50	9 NQ	45	17	4
14983	629-32122	Eagle Blood, 6.73 g, Stow Creek	36B-51	8	47	18 NQ	4

Table 1. Non-*o*-Chloro-Substituted PCBs (pg/g) in Blood Samples from Bald Eagles in New Jersey

May 11, 1998 GC/MS Sets: N36PCB and N36BPCB
Dates: 4/13/98 and 4/15/98

NFCR Number:	Frakes' Number:	Sample Description:	GC/MS Run No.	Non-*o*-Polychlorinated Biphenyls			
				Tetra:		Penta:	Hexa:
				3,4,4',5-TCB (81)	3,3',4,4'-TCB (77)	3,3',4,4',5-PeCB (126)	3,3',4,4',5,5'-HxCB (169)
14984	629-33938	Eagle Blood, 5.90 g, Appaquinimink Creek	36B-52	13	77	31	7
14985	629-32125	Eagle Blood, 5.64 g, Bear Swamp	36B-54	7 NQ	30 NQ	16	3 ND
14986	629-33934	Eagle Blood, 7.04 g, Murder Kill	36B-55	7	40	17	3 ND
		Quality Assurance Samples					
Proc. Blank 1		Procedure Blank, 7/9/97, Total mass (pg)/6	36-20	3 NQ	51	17	4 NQ
Proc. Blank 2		Procedure Blank, 7/15/97,Total mass (pg)/6	36-21	3 NQ	11	4	3 ND
Proc. Blank 3		Procedure Blank,7/22/97,Total mass (pg)/6	36-22	5 NQ	29	15	5
Chicken Egg blk 1		Chicken egg (matrix) blank 7/9/97 6.01 g	36-24	5	31	81	5
Chicken Egg blk 2		Chicken egg (matrix) blank 7/15/97 6.0 g	36-25	12	57	55	10
Chicken Egg blk 3		Chicken egg (matrix) blank 7/22/97 6 g	36B-1	2 NQ	11	4 NQ	3 ND
Chicken Egg spk 1		Chicken egg (matrix) spike 7/9/97 6.0 g with 1 ug Aroclor mixtures 1242:1248:1254:1260	36B-2	12	212	17	3 NQ
Chicken Egg spk 2		Chicken egg (matrix) spike 7/15/97 6.02 g with 1 ug Aroclor mixtures 1242:1248:1254:1260	36B-4	12	207	16	4 NQ
Chicken Egg spk 3		Chicken egg (matrix) spike 7/22/97 6.02 g with 1 ug Aroclor mixtures 1242:1248:1254:1260	36B-5	12	190	11	3 ND
Positive Control 1		Positive Control Saginaw Carp 7/9/97, 4.99 g	36B-6	264	2,460	1,007	51
Positive Control 2		Positive Control Saginaw Carp 7/15/97, 5.02 g	36B-7	243	2,211	917	46

Table 1. Non-*o*-Chloro-Substituted PCBs (pg/g) in Blood Samples from Bald Eagles in New Jersey

May 11, 1998

GC/MS Sets: N36PCB and N36BPCB
Dates: 4/13/98 and 4/15/98

NFCR Number:	Frakes' Number:	Sample Description:	GC/MS Run No.	Non-*o*-Polychlorinated Biphenyls			
				Tetra:		Penta:	Hexa:
				3,4,4',5-TCB (81)	3,3',4,4'-TCB (77)	3,3',4,4',5-PeCB (126)	3,3',4,4',5,5'-HxCB (169)
Positive Control 3		Positive Control Saginaw Carp 7/22/97, 5.0 g	36B-9	253	2,206	1,795	44

a Total Mass (pg) of Analyte in Entire Blank Sample; Compare with chicken egg blank conc. by dividing by 6g

NQ Not Quantitated at Specified Concentration due to Incomplete Ion Cluster or Inaccurate Ion Ratio
ND Not Detected at Specified Detection Limit

Table 2. Percent Recoveries of ^{13}C-Non-*o*-Chloro-Substituted PCBs in Blood Samples from Bald Eagles in New Jersey

May 11, 1998 GC/MS Sets: N36PCB and N36BPCB
Dates: 4/13/98 and 4/15/98

NFCR Number:	Submitter Number:	Sample Description:	GC/MS Run No.	^{13}C-Non-*o*-Polychlorinated Biphenyls			
				Tetra:		Penta:	Hexa:
				3,4,4',5-TCB (^{13}C-PCB #81)	3,3',4,4'-TCB (^{13}C-PCB #77)	3,3',4,4',5-PeCB (^{13}C-PCB #126)	3,3',4,4',5,5'-HxCB (^{13}C-PCB #169)
14952	629-39833	Eagle Blood, 6.58 g, Cohansey River	36B-10	67	59	74	75
14953	629-39834	Eagle Blood, 3.98 g, Cohansey River	36B-11	90	72	79	77
14954	629-39835	Eagle Blood, 6.57 g, Stow Creek	36B-12	73	60	72	77
14955	629-39836	Eagle Blood, 7.23 g, Stow Creek	36B-14	80	63	67	63
14956	629-39838	Eagle Blood, 6.32 g, Bear Swamp	36B-15	54	48	65	70
14957	629-39839	Eagle Blood, 6.98 g, Union Lake	36B-16	68	58	76	84
14958	629-39840	Eagle Blood, 6.11 g, Union Lake	36B-17	87	68	71	65
14959	629-39841	Eagle Blood, 7.49 g, Belleplain	36B-19	86	69	71	70
14960	629-39842	Eagle Blood, 7.39 g, Belleplain	36B-20	83	65	61	63
14961	629-39843	Eagle Blood, 7.23 g, Cohansey River	36B-21	76	62	69	72
14962	629-39844	Eagle Blood, 5.55 g, Cohansey River	36B-22	57	45	44	43
14963	629-39845	Eagle Blood, 5.85 g, Stow Creek	36B-24	101	79	78	74
14964	629-39846	Eagle Blood, 6.84 g, Stow Creek	36B-25	97	77	79	73
14965	629-39847	Eagle Blood, 7.02 g, Stow Creek	36B-26	97	78	70	67
14966	629-39848	Eagle Blood, 6.46 g, Belleplain	36B-27	103	86	124	160
14967	629-39849	Eagle Blood, 6.91 g, Belleplain	36B-29	84	67	68	88
14968	629-39850	Eagle Blood, 7.13 g, Bear Swamp	36B-30	72	60	89	174

Table 2. Percent Recoveries of ^{13}C-Non-*o*-Chloro-Substituted PCBs in Blood Samples from Bald Eagles in New Jersey

May 11, 1998 GC/MS Sets: N36PCB and N36BPCB
Dates: 4/13/98 and 4/15/98

NFCR Number:	Submitter Number:	Sample Description:	GC/MS Run No.	^{13}C-Non-*o*-Polychlorinated Biphenyls: Tetra: 3,4,4',5-TCB (^{13}C-PCB #81)	Tetra: 3,3',4,4'-TCB (^{13}C-PCB #77)	Penta: 3,3',4,4',5-PeCB (^{13}C-PCB #126)	Hexa: 3,3',4,4',5,5'-HxCB (^{13}C-PCB #169)
14969	629-39851	Eagle Blood, 4.18 g, Bear Swamp	36B-31	85	68	70	68
14970	629-39852	Eagle Blood, 6.52 g, Union Lake	36B-32	91	73	68	70
14971	629-39853	Eagle Blood, 7.0 g, Union Lake	36B-34	84	66	62	62
14972	629-39854	Eagle Blood, 7.24 g, Union Lake	36B-35	93	73	73	76
14973	629-39855	Eagle Blood, 7.13 g, Maurice River	36B-36	87	68	66	72
14974	629-39856	Eagle Blood, 6.93 g, Maurice River	36B-40	92	74	78	87
14975	629-39857	Eagle Blood, 6.39 g, Round Valley	36B-41	87	71	70	73
14976	629-39858	Eagle Blood, 6.70 g, Round Valley	36B-42	79	63	60	66
14977	629-39859	Eagle Blood, 5.86 g, Bear Swamp	36B-44	77	61	60	65
14978	629-39860	Eagle Blood, 6.77 g, Union Lake	36B-45	68	56	52	56
14979	629-39861	Eagle Blood, 5.97 g, Maurice River	36B-46	80	65	61	67
14980	629-39862	Eagle Blood, 5.68 g, Maurice River	36B-47	17	13	16	17
14981	629-39863	Eagle Blood, 6.63 g, Stow Creek	36B-49	98	76	70	95
14982	629-32120	Eagle Blood, 5.25 g, Stow Creek	36B-50	77	62	59	71
14983	629-32122	Eagle Blood, 6.73 g, Stow Creek	36B-51	76	60	54	66

Table 2. Percent Recoveries of ^{13}C-Non-*o*-Chloro-Substituted PCBs in Blood Samples from Bald Eagles in New Jersey

May 11, 1998 GC/MS Sets: N36PCB and N36BPCB
Dates: 4/13/98 and 4/15/98

NFCR Number:	Submitter Number:	Sample Description:	GC/MS Run No.	^{13}C-Non-*o*-Polychlorinated Biphenyls: Tetra: 3,4,4',5-TCB (^{13}C-PCB #81)	Tetra: 3,3',4,4'-TCB (^{13}C-PCB #77)	Penta: 3,3',4,4',5-PeCB (^{13}C-PCB #126)	Hexa: 3,3',4,4',5,5'-HxCB (^{13}C-PCB #169)
14984	629-33938	Eagle Blood, 5.90 g, Appaquinimink Creek	36B-52	71	59	57	68
14985	629-32125	Eagle Blood, 5.64 g, Bear Swamp	36B-54	62	52	55	68
14986	629-33934	Eagle Blood, 7.04 g, Murder Kill	36B-55	42	34	31	34
		Quality Assurance Samples					
Proc. Blank 1		Procedure Blank, 7/9/97	36-20	91	70	79	83
Proc. Blank 2		Procedure Blank, 7/15/97	36-21	73	62	71	72
Proc. Blank 3		Procedure Blank,7/22/97	36-22	87	70	71	71
Chicken Egg blk 1		Chicken egg (matrix) blank 7/9/97 6.01 g	36-24	84	64	69	72
Chicken Egg blk 2		Chicken egg (matrix) blank 7/15/97 6.0 g	36-25	88	70	70	75
Chicken Egg blk 3		Chicken egg (matrix) blank 7/22/97 6 g	36B-1	88	70	71	66
Chicken Egg spk		Chicken egg (matrix) spike 7/9/97 6.0 g	36B-2	97	72	82	82
Chicken Egg spk 2		Chicken egg (matrix) spike 7/15/97 6.02 g	36B-4	94	74	81	75
Chicken Egg spk 3		Chicken egg (matrix) spike 7/22/97 6.02 g	36B-5	89	70	70	69
Positive Control 1		Positive Control Saginaw Carp 7/9/97, 4.99 g	36B-6	90	66	72	69
Positive Control 2		Positive Control Saginaw Carp 7/15/97, 5.02 g	36B-7	77	62	65	65
Positive Control 3		Positive Control Saginaw Carp 7/22/97, 5.0 g	36B-9	61	55	74	75

Appendix D

2,3,7,8-Substituted Dibenzo-p-dioxins and Dibenzofurans in Bloods of Bald Eagles from the Lower Delaware River Drainage Area, New Jersey

2,3,7,8-Substituted Dibenzo-p-dioxins and Dibenzofurans in Bloods of Bald Eagles from the Lower Delaware River Drainage Area New Jersey

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Analytical Method: Determination of 2,3,7,8-Substituted Dibenzo-p-dioxins- Capillary Gas Chromatography and High Resolution Mass Spectrometry (GC/HRMS)
Samples were extracted, cleaned, and fractionated as described first section of this report and referenced below (1-3). 2,3,7,8-PCDDs and PCDFs in fraction 3 from PGC were transferred to conical autosampler vials and evaporated to less than 50 µL with nitrogen. A total of 1 ng of internal standard was added to each vial by using 10 µL of ^{13}C-labeled 1,2,3,4-PCDD, prior to transfering the PCDDs/PCDFs (fraction 3). The final extract was concentrated to a volume of ~25 µL under a stream of nitrogen.

PCDFs and PCDDs were determined by Gas Chromatography/High Resolution Mass Spectrometry (GC/HRMS) by monitoring five sequential mass windows of selected ions during the chromatographic separation according to SOP C5.183 (4).

DETERMINATION OF 2,3,7,8-SUBSTITUTED PCDFs AND PCDDs by GC/HRMS

Capillary Gas Chromatography/High Resolution Mass Spectrometry

Instrumentation GC/HRMS analysis was performed using a HP 5890A capillary gas chromatograph interfaced to a VG 70-250S high resolution mass spectrometer. An HP 7673 autosampler was used to introduce 2 of 25 µL of the enriched extract from a conical vial through a spiral uniliner onto a 5 m x 320 µm deactivated fused silica retention gap via a heated (285°C) direct inlet. The analytes of interest were separated on a 50 m x 200 µm x 0.11 µm Ultra-2 (Hewlett Packard) capillary column with an initial hold of 1 min at 120°C followed by a ramp to 200°C at 20°C/min, another ramp to 300°C at 2.3°C/min, and a final hold of 5 mins. The He carrier gas was maintained at 44 psig with an initial linear velocity of 25 cm/s. All column-to-column connections were made using fused silica press-tight connectors.

General Detection Procedure The VG GC/HRMS system was tuned to 10,000 R.P. and calibrated using perfluorotetradecahydrophenanthrene, and mass windows were established for five ion groups to measure Cl_{4-8} PCDFs and PCDDs. These windows were monitored sequentially during the temperature program.

Within each mass window, two most abundant ions were measured for positive identification and quantitation of each analyte. The ion responses were quantitated and averaged, unless interferences occurred. Within each mass window, additional ions monitored any responses from Cl_{5-9}-PCDEs, Cl_{5-7}-terphenyls, Cl_{6-7}-PCNs, Cl_{3-8} dibenzothiophenes, and Cl_{3-8} phenanthrene/anthracenes.

QUALITY CONTROL

QC Samples: Nine quality control samples were prepared and analyzed: three procedural blanks, three chicken egg (matrix) blanks, three chicken egg (matrix) spikes, and three replicates of a positive control carp sample (6806, Saginaw Bay, Michigan). Approximately 6-g aliquants of the samples were homogenized with three times their weight of anhydrous sodium sulfate [SOPC 5.144]. The chicken egg extract was fortified with 250 pg of PCDFs/PCDDs (1250 pg OCDD/OCDF). For isotope dilution MS analysis, each sample was spiked with 600 pg of ^{13}C-labeled PCDFs and PCDDs using 15 µL of our Standard 174W-3 and then column extracted with dichloromethane.

Chromatographic and Mass Spectral Resolution Window switching times were established using a window-defining PCDF/PCDD standard mixture and the data acquisition windows set. Chromatographic columns were selected and temperature programmed on the basis that they must resolve 2,3,7,8-TCDD from 1,2,3,7/1,2,3,8-TCDD (and from 1,2,3,4-TCDD) by a resolution factor of at least 0.5. Column performance was verified by analyzing standards of individual components, and observing the chromatographic resolution of the TCDDs, HxCDDs, and HxCDFs. Similarly, relative retention times for all other congeners of interest were evaluated with respect to labeled analogs. It should be noted that isomer-specific confirmation of all analytes cannot be attained on a DB-5 or Ultra-2 column; the greatest concern is co-elution of one or more TCDFs with 2,3,7,8-TCDF, and one or more PeCDFs with 2,3,4,7,8-PeCDF. A lesser concern is the potential co-elution of 1,2,3,6,8,9-HxCDD with 2,3,4,6,7,8-

HxCDD.

Adequate mass resolution was verified while monitoring ions for Cl_{6-7} PCNs vs. ion responses of ^{13}C-TCDDs and of native TCDD vs. ^{13}C-TCDF throughout the sample set. The latter two ions, both at nominal m/z 320, differ by 0.04 Da, requiring a Resolving Power of at least 8000 for complete resolution thereby assuring a continual check on mass resolution. For each mass window, lock-mass and lock-mass-check ions were used to maintain and verify the accuracy of mass measurement.

Criteria for Confirmation: For the positive identification and quantitation of a particular congener, the following additional criteria had to be met:

(1) The peak areas for the selected ion responses must be greater than three times the background noise (S/N > 3);

(2a) For congeners with isotopically-labeled analogs, the ion peaks for the native must occur at retention times from -1 to +3 sec that for the corresponding ^{13}C-labeled ion peaks, which elute about 1 sec earlier than the native ion peaks;

(2b) For OCDF without an isotopically-labeled analog, ion responses in sample analyses must occur at RRTs from -0.2 to 0.5% of ^{13}C-labelled OCDD, analogous to the window above;

(3) For the two principal ion responses, the ion ratio must be within the acceptable range (generally ±15%). These ion ratios were determined experimentally for the system during calibrations, compared with the theoretical values, and were tracked for quality assurance.

For ion responses very near the noise levels, or analytes with interferences, the final confirmation is left to the judgment of the analyst.

Method efficiency by calculating percent recovery of ^{13}C-surrogates: To account for variations in GC/HRMS analysis, a known amount of internal standard was spiked into the final extract and used to calculate the amounts of the surrogates recovered in the final extract. The efficiency of the extraction and cleanup procedure was measured by comparing the quantity of the surrogates detected in the *final* isolated extract (at GC/HRMS analysis) with the quantity spiked into the sample.

RESULTS AND DISCUSSION

Brief Summary: Samples were analyzed together with other biota samples and a calibration set of six standards with data file name DF26. Table 1 contains concentrations of the 17 PCDFs and PCDDs, expressed in pg/g. Table 2 contains QC recovery percentages of the ^{13}C-labeled PCDFs and PCDDs.

Analytical Results: Optimum GC/HRMS performance provided detection limits for all analytes well below 1 pg/g to near 0.1 pg/g. Concentrations of PCDD/PCDFs in the blood samples were also typically below 1 pg/g and, in fact, are sometimes less than method detection limits (MDL) determined from the QC blank samples. Table 1 presents the concentrations measured, instead of "<MDL" to show the extremely low levels that are present; one should be cautious about interpreting these values because they are in the same range as the QC blank samples.

TCDF concentrations ranged from 0.3 to 1.7 pg/g. TCDD concentrations were ≤1.5 pg/g in the blood samples. TCDD in sample 14973 was cross-contaminated during sample cleanup by a TCDD standard; all other PCDD/PCDFs were ≤1.3 pg/g in this sample. The contamination was identified by the QC matrix blank sample of 7/22/97.

Detection of Other Compounds: No other compounds were detected in this fraction (with detection limits of approximately 5 pg/g).

Quality Control Results: In the procedure **blanks**, amounts of native PCDFs and PCDDs are expressed as total mass (pg) divided by 6 to simulate background sample concentrations (Table 1). Values in the blanks are nearly the same as the lowest concentrations in the eagle blood samples. Simulated concentrations in the procedure blanks were ≤1 pg/g for all analytes except OCDD and OCDF. Except for the one **chicken egg blank** sample that was contaminated by a TCDD standard, almost all analytes were well below 1 pg/g in the **chicken egg blanks**.

Concentrations of native PCDFs and PCDDs in the **chicken egg spikes** were within 25% of that expected, except for OCDF and OCDD, which were slightly higher. Analyte concentrations in the **positive control Saginaw carp samples** closely compared (within 25%) with the average values from over 20 previous QC analyses (Table 1).

Recoveries of the ^{13}C-labeled PCDFs and PCDDs (Table 2) were generally within the expected QC range of 25-125%, except for sample 14980, which were just under 25%. Ion ratios of the primary ions for all detected analytes in both samples and calibration standards generally varied within the QC range (±15%) of theoretical, except where noted by NQ (not quantifiable).

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2,3,7,8-Substituted Dibenzo-p-dioxins and Dibenzofurans Results

Table 1. 2,3,7,8-Substituted Polychlorinated Dibenzo-*p*-dioxin and Dibenzofuran Concentrations (pg/g) in Eagle Blood Samples from New Jersey

Work Unit 30096, File: DF26FR.xls
Lab Report: FY-98-30-19
Date Analyzed: Jun 2-7, 1998

Sample Site/Matrix:	Cohansey River	Cohansey River	Stow Creek	Stow Creek	Bear Swamp	Union Lake
ECRC Number:	14952	14953	14954	14955	14956	14957
GC/HRMS Set DF26 Injection No.	41	42	43	44	46	47
Sample Submitter No.	629-39833	629-39834	629-39835	629-39836	629-39838	629-39839
Sample Mass Extracted (grams):	6.58	3.98	6.57	7.2	6.32	6.98
DIOXINS						
2,3,7,8-Tetrachloro	0.3 NQ	0.9 NQ	0.3	0.5	0.5	0.5 NQ
1,2,3,7,8-Pentachloro	0.4	0.6 NQ	0.3 NQ	0.5 NQ	0.1 ND	0.3 NQ
1,2,3,4,7,8-Hexachloro	0.5 NQ	0.4 NQ	0.1 ND	0.1 ND	0.1 ND	0.1 ND
1,2,3,6,7,8-Hexachloro	0.9	1.0	0.4 NQ	0.7	0.3 NQ	0.5 NQ
1,2,3,7,8,9-Hexachloro	0.2 NQ	0.3 NQ	0.3 NQ	0.2 NQ	0.4 NQ	0.1 ND
1,2,3,4,6,7,8-Heptachloro	0.7 NQ	1.3	0.5 NQ	0.9	0.5	0.5
Octachloro	4.0	3.3 NQ	2.5	6.7	1.3	3.8
FURANS 2,3,7,8-Tetrachloro	0.4	0.7	0.3 NQ	0.4 NQ	0.3 NQ	0.5
1,2,3,7,8-Pentachloro	0.1 ND	0.3 NQ	0.1 ND	0.3 NQ	0.1 ND	0.3
2,3,4,7,8-Pentachloro	0.4 NQ	0.7 NQ	0.2 NQ	0.3	0.1 ND	0.1 NQ
1,2,3,4,7,8-Hexachloro	0.4	0.4 NQ	0.1 ND	0.2 NQ	0.1 ND	0.1 ND
1,2,3,6,7,8-Hexachloro	0.2 NQ	0.4 NQ	0.1 ND	0.1 NQ	0.2 NQ	0.1 NQ
1,2,3,7,8,9-Hexachloro	0.1 NQ	0.2 NQ	0.1 NQ	0.1 NQ	0.1 NQ	0.2 NQ
2,3,4,6,7,8-Hexachloro	0.2 NQ	0.1 NQ	0.1 NQ	0.1 ND	0.1 NQ	0.1 ND
1,2,3,4,6,7,8-Heptachloro	0.3 NQ	0.3	0.2 NQ	0.2 NQ	0.3 NQ	0.2 NQ
1,2,3,4,7,8,9-Heptachloro	0.1 ND	0.1 ND	0.1 ND	0.1 ND	0.1 ND	0.1 ND
Octachloro	1.1	1.7	1.4	1.3 NQ	0.6 NQ	1.1 NQ

NQ Not Quantitated at Specified Concentration due to Incomplete Ion Cluster or Inaccurate Ion Ratio
ND Not Detected at Specified Detection Limit

Table 1. 2,3,7,8-Substituted Polychlorinated Dibenzo-*p*-dioxin and Dibenzofuran Concentrations (pg/g) in Eagle Blood Samples from New Jersey

Work Unit 30096, File: DF26FR.xls
Lab Report: FY-98-30-19
Date Analyzed: Jun 2-7, 1998

Sample Site/Matrix:	Union Lake	Belleplain	Belleplain	Cohansey River	Cohansey River	Stow Creek
ECRC Number:	14958	14959	14960	14961	14962	14963
GC/HRMS Set DF26 Injection No.	48	49	51	52	53	54
Sample Submitter No.	629-39840	629-39841	629-39842	629-39843	629-39844	629-39845
Sample Mass Extracted (grams):	6.11	7.49	7.39	7.23	5.55	5.85
DIOXINS						
2,3,7,8-Tetrachloro	0.4 NQ	0.5	0.5	0.5 NQ	0.8 NQ	0.4 NQ
1,2,3,7,8-Pentachloro	0.1 ND	0.4 NQ	0.2 NQ	0.2 NQ	0.1 ND	0.1 ND
1,2,3,4,7,8-Hexachloro	0.3 NQ	0.1 ND	0.2 NQ	0.1 ND	0.1 ND	0.1 ND
1,2,3,6,7,8-Hexachloro	0.6 NQ	0.4 NQ	0.5	0.1 ND	0.6 NQ	0.5 NQ
1,2,3,7,8,9-Hexachloro	0.1 ND	0.1 ND	0.2	0.1 ND	0.5 NQ	0.1 ND
1,2,3,4,6,7,8-Heptachloro	0.6	0.6	1.0	0.4 NQ	0.9 NQ	0.6 NQ
Octachloro	1.5 NQ	1.8	6.0	0.8	9.2 NQ	3.2
FURANS 2,3,7,8-Tetrachloro	0.7 NQ	0.8	0.5 NQ	0.6 NQ	1.0	0.5 NQ
1,2,3,7,8-Pentachloro	0.2 NQ	0.1 ND	0.1 ND	0.1 ND	0.6 NQ	0.4 NQ
2,3,4,7,8-Pentachloro	0.3 NQ	0.3 NQ	0.3 NQ	0.1 ND	0.5 NQ	0.1 ND
1,2,3,4,7,8-Hexachloro	0.1 ND	0.1 ND	0.4 NQ	0.1 ND	0.1 ND	0.1 ND
1,2,3,6,7,8-Hexachloro	0.1 ND	0.1 ND	0.1 NQ	0.1 ND	0.1 ND	0.3 ND
1,2,3,7,8,9-Hexachloro	0.2 NQ	0.3 NQ	0.2 NQ	0.1 NQ	0.4 NQ	0.1 NQ
2,3,4,6,7,8-Hexachloro	0.1 ND	0.1 ND	0.1 ND	0.3 NQ	0.1 ND	0.1 NQ
1,2,3,4,6,7,8-Heptachloro	0.1 ND	0.2	0.4 NQ	0.1 ND	0.2 NQ	0.4 NQ
1,2,3,4,7,8,9-Heptachloro	0.1 ND	0.1 ND	0.1 ND	0.1 ND	0.1 ND	0.1 ND
Octachloro	0.9	0.8 NQ	1	0.9	1.3	0.6 NQ

NQ Not Quantitated at Specified Concentration due to Incomplete Ion Cluster or Inaccurate Ion Ratio
ND Not Detected at Specified Detection Limit

Table 1. 2,3,7,8-Substituted Polychlorinated Dibenzo-*p*-dioxin and Dibenzofuran Concentrations (pg/g) in Eagle Blood Samples from New Jersey

Work Unit 30096, File: DF26FR.xls
Lab Report: FY-98-30-19
Date Analyzed: Jun 2-7, 1998

Sample Site/Matrix:	Stow Creek	Stow Creek	Belleplain	Belleplain	Bear Swamp	Bear Swamp
ECRC Number:	14964	14965	14966	14967	14968	14969
GC/HRMS Set DF26 Injection No.	56	57	58	59	61	62
Sample Submitter No.	629-39846	629-39847	629-39848	629-39849	629-39850	629-39851
Sample Mass Extracted (grams):	6.84	7.02	6.46	6.91	7.13	4.18
DIOXINS						
2,3,7,8-Tetrachloro	0.3 NQ	0.2 NQ	0.4 NQ	0.1 ND	0.9 NQ	1.5 NQ
1,2,3,7,8-Pentachloro	0.3 NQ	0.1 ND	0.3 NQ	0.1 ND	0.4 NQ	0.9
1,2,3,4,7,8-Hexachloro	0.1 NQ	0.1 ND	0.1 ND	0.1 ND	0.3 NQ	0.1 ND
1,2,3,6,7,8-Hexachloro	0.3 NQ	0.3 NQ	0.1 ND	0.1 ND	0.3 NQ	0.7
1,2,3,7,8,9-Hexachloro	0.2 NQ	0.1 ND	0.1 ND	0.1 ND	0.1 ND	0.2 NQ
1,2,3,4,6,7,8-Heptachloro	0.7 NQ	0.3 NQ	0.3 NQ	0.3 NQ	0.7 NQ	0.5 NQ
Octachloro	2.8	1	2.0 NQ	0.1 NQ	6.3	3.4
FURANS 2,3,7,8-Tetrachloro	0.6 NQ	0.4 NQ	0.5 NQ	0.4 NQ	0.9 NQ	1.7 NQ
1,2,3,7,8-Pentachloro	0.2 NQ	0.2	0.1 ND	0.1 ND	0.3 NQ	0.8 NQ
2,3,4,7,8-Pentachloro	0.4	0.1 ND	0.3 NQ	0.1 ND	0.5 NQ	0.9
1,2,3,4,7,8-Hexachloro	0.1 NQ	0.1 ND	0.1 ND	0.1 ND	0.4 NQ	0.1 ND
1,2,3,6,7,8-Hexachloro	0.1	0.1 ND	0.1 NQ	0.1 ND	0.4	0.1 ND
1,2,3,7,8,9-Hexachloro	0.3 NQ	0.2 NQ	0.1 NQ	0.3 NQ	0.5 NQ	0.4 NQ
2,3,4,6,7,8-Hexachloro	0.1 ND	0.1 ND	0.1 ND	0.1 ND	0.1 ND	0.1 ND
1,2,3,4,6,7,8-Heptachloro	0.2	0.1 NQ	0.2 NQ	0.2 NQ	0.7 NQ	0.5 NQ
1,2,3,4,7,8,9-Heptachloro	0.1 ND	0.1 ND	0.1 ND	0.1 ND	1 NQ	0.1 ND
Octachloro	0.9 NQ	1.0	0.9	1.2 NQ	2.4	1.5

NQ Not Quantitated at Specified Concentration due to Incomplete Ion Cluster or Inaccurate Ion Ratio
ND Not Detected at Specified Detection Limit

Table 1. 2,3,7,8-Substituted Polychlorinated Dibenzo-*p*-dioxin and Dibenzofuran Concentrations (pg/g) in Eagle Blood Samples from New Jersey

Work Unit 30096, File: DF26FR.xls
Lab Report: FY-98-30-19
Date Analyzed: Jun 2-7, 1998

Sample Site/Matrix:		Union Lake	Union Lake	Union Lake	Maurice River	Maurice River	Round Valley
ECRC Number:		14970	14971	14972	14973	14974	14975
GC/HRMS Set DF26 Injection No.		63	64	66	67	68	69
Sample Submitter No.		629-39852	629-39853	629-39854	629-39855	629-39856	629-39857
Sample Mass Extracted (grams):		6.52	7.09	7.24	7.13	6.93	6.39
DIOXINS							
	2,3,7,8-Tetrachloro	0.7 NQ	0.4 NQ	0.2 NQ	NR	0.2 NQ	0.2 NQ
	1,2,3,7,8-Pentachloro	0.2 NQ	0.3 NQ	0.3 NQ	0.3	0.2 NQ	0.1 ND
	1,2,3,4,7,8-Hexachloro	0.1 NQ	0.1 ND	0.1 ND	0.1 ND	0.1 ND	0.1 ND
	1,2,3,6,7,8-Hexachloro	0.4 NQ	0.2 NQ	0.3 NQ	0.2	0.2 NQ	0.1 ND
	1,2,3,7,8,9-Hexachloro	0.2 NQ	0.1 ND	0.1 ND	0.1 ND	0.1 NQ	0.1 ND
	1,2,3,4,6,7,8-Heptachloro	0.4	0.3	0.3 NQ	0.4 NQ	0.5 NQ	0.4 NQ
	Octachloro	2.1	1.4 NQ	0.3	1.3	2.0	1.9
FURANS	2,3,7,8-Tetrachloro	0.5	0.4 NQ	0.3 NQ	0.3 NQ	0.3 NQ	0.3
	1,2,3,7,8-Pentachloro	0.4 NQ	0.2 NQ	0.3 NQ	0.2 NQ	0.2 NQ	0.1 ND
	2,3,4,7,8-Pentachloro	0.2 NQ	0.2 NQ	0.1 NQ	0.2	0.2 NQ	0.1 ND
	1,2,3,4,7,8-Hexachloro	0.4 NQ	0.2 NQ	0.1 ND	0.1 ND	0.1 ND	0.1 NQ
	1,2,3,6,7,8-Hexachloro	0.3 NQ	0.2 NQ	0.1 NQ	0.2 NQ	0.1 NQ	0.1 NQ
	1,2,3,7,8,9-Hexachloro	0.1 NQ	0.2 NQ	0.2	0.1 NQ	0.1 NQ	0.2 NQ
	2,3,4,6,7,8-Hexachloro	0.1 ND	0.1 NQ	0.1 ND	0.1 ND	0.1 NQ	0.1 ND
	1,2,3,4,6,7,8-Heptachloro	0.2 NQ	0.2 NQ	0.1 ND	0.2	0.2 NQ	0.2 NQ
	1,2,3,4,7,8,9-Heptachloro	0.1 ND	0.1 ND	0.1 ND	0.1 ND	0.1 ND	0.1 ND
	Octachloro	1.2 NQ	1.1 NQ	0.7	1	0.9	1.9 NQ

NQ Not Quantitated at Specified Concentration due to Incomplete Ion Cluster or Inaccurate Ion Ratio
ND Not Detected at Specified Detection Limit
NR Not Reported, This sample was cross-contaminated with TCDD Standard

Table 1. 2,3,7,8-Substituted Polychlorinated Dibenzo-*p*-dioxin and Dibenzofuran Concentrations (pg/g) in Eagle Blood Samples from New Jersey

Work Unit 30096, File: DF26FR.xls
Lab Report: FY-98-30-19
Date Analyzed: Jun 2-7, 1998

Sample Site/Matrix:	Round Valley	Bear Swamp	Union Lake	Maurice River	Maurice River	Stow Creek
ECRC Number:	14976	14977	14978	14979	14980	14981
GC/HRMS Set DF26 Injection No.	71	72	73	74	76	77
Sample Submitter No.	629-39858	629-39859	629-39860	629-39861	629-39862	629-39863
Sample Mass Extracted (grams):	6.7	5.86	6.77	5.97	5.68	6.63
DIOXINS						
2,3,7,8-Tetrachloro	0.2 NQ	0.6	0.3 NQ	0.3	0.9	1.5
1,2,3,7,8-Pentachloro	0.2 NQ	0.3 NQ	0.3 NQ	0.1 NQ	0.1 ND	0.4 NQ
1,2,3,4,7,8-Hexachloro	0.1 ND	0.1 ND	0.1 ND	0.1 ND	0.1 ND	0.1 ND
1,2,3,6,7,8-Hexachloro	0.1 ND	0.3 NQ	0.2 NQ	0.2 NQ	0.1 ND	0.7 NQ
1,2,3,7,8,9-Hexachloro	0.2 NQ	0.1 ND	0.1 ND	0.1 ND	0.1 ND	0.1 ND
1,2,3,4,6,7,8-Heptachloro	0.3 NQ	0.3	0.3	0.3	0.1 ND	0.6 NQ
Octachloro	0.4	0.7 NQ	0.7 NQ	0.3	2.6 NQ	2.1 NQ
FURANS 2,3,7,8-Tetrachloro	0.3 NQ	0.5 NQ	0.5 NQ	0.4	1.4 NQ	0.3 NQ
1,2,3,7,8-Pentachloro	0.1 NQ	0.3 NQ	0.2 NQ	0.3 NQ	0.1 ND	0.1 ND
2,3,4,7,8-Pentachloro	0.1 NQ	0.3 NQ	0.1 NQ	0.2 NQ	0.1 ND	0.1 ND
1,2,3,4,7,8-Hexachloro	0.1 ND	0.1 ND	0.1 ND	0.1 ND	0.1 ND	0.1 ND
1,2,3,6,7,8-Hexachloro	0.1 ND	0.2 NQ	0.2 NQ	0.1 ND	0.1 ND	0.2 NQ
1,2,3,7,8,9-Hexachloro	0.2 NQ	0.4 NQ	0.3 NQ	0.3 NQ	0.1 ND	0.1 NQ
2,3,4,6,7,8-Hexachloro	0.1 ND	0.1 ND	0.1 ND	0.1 ND	0.1 ND	0.1 ND
1,2,3,4,6,7,8-Heptachloro	0.2 NQ	0.2 NQ	0.2 NQ	0.1 ND	0.1 ND	0.2
1,2,3,4,7,8,9-Heptachloro	0.1 ND	0.1 ND	0.1 ND	0.1 ND	0.1 ND	0.3 NQ
Octachloro	1 NQ	1	1.1 NQ	1.3	1.6 NQ	1 NQ

NQ Not Quantitated at Specified Concentration due to Incomplete Ion Cluster or Inaccurate Ion Ratio
ND Not Detected at Specified Detection Limit

Table 1. 2,3,7,8-Substituted Polychlorinated Dibenzo-*p*-dioxin and Dibenzofuran Concentrations (pg/g) in Eagle Blood Samples from New Jersey

Work Unit 30096, File: DF26FR.xls
Lab Report: FY-98-30-19
Date Analyzed: Jun 2-7, 1998

Sample Site/Matrix:		Stow Creek	Stow Creek	Appaquinimink Creek	Bear Swamp	Murder Kill
ECRC Number:		14982	14983	14984	14985	14986
GC/HRMS Set DF26 Injection No.		78	79	81	82	83
Sample Submitter No.		629-32120	629-32122	629-33938	629-32125	629-33934
Sample Mass Extracted (grams):		5.25	6.73	5.9	5.64	7.04
DIOXINS						
	2,3,7,8-Tetrachloro	0.3 NQ	0.4 NQ	0.4	0.4 NQ	0.1 ND
	1,2,3,7,8-Pentachloro	0.1 ND	0.3 NQ	0.4 NQ	0.2 NQ	0.1 ND
	1,2,3,4,7,8-Hexachloro	0.1 ND	0.1 ND	0.1 ND	0.3 NQ	0.1 ND
	1,2,3,6,7,8-Hexachloro	0.1 ND	0.3 NQ	0.4 NQ	0.2 NQ	0.1 ND
	1,2,3,7,8,9-Hexachloro	0.1 ND	0.2 NQ	0.1 ND	0.1 ND	0.1 ND
	1,2,3,4,6,7,8-Heptachloro	0.1 ND	0.7 NQ	1.7	0.3 NQ	0.4 NQ
	Octachloro	0.9 NQ	2.4 NQ	17.8	0.1	0.8 NQ
FURANS	2,3,7,8-Tetrachloro	0.6	0.5	0.7 NQ	0.4 NQ	0.3 NQ
	1,2,3,7,8-Pentachloro	0.1 ND	0.1 ND	0.4 NQ	0.2 NQ	0.1 ND
	2,3,4,7,8-Pentachloro	0.3 NQ	0.3 NQ	0.4 NQ	0.1 ND	0.2 NQ
	1,2,3,4,7,8-Hexachloro	0.1 ND	0.4 NQ	0.2 NQ	0.1 ND	0.3 NQ
	1,2,3,6,7,8-Hexachloro	0.3 NQ	0.2 NQ	0.2 NQ	0.4 NQ	0.1 ND
	1,2,3,7,8,9-Hexachloro	0.1 ND	0.2 NQ	0.2 NQ	0.1 ND	0.3 NQ
	2,3,4,6,7,8-Hexachloro	0.1 ND	0.3 NQ	0.1 ND	0.2 NQ	0.1 ND
	1,2,3,4,6,7,8-Heptachloro	0.2 NQ	0.3 NQ	0.6 NQ	0.2 NQ	0.1 ND
	1,2,3,4,7,8,9-Heptachloro	0.1 ND	0.2 NQ	0.1 ND	0.1 ND	0.1 ND
	Octachloro	1.1 NQ	1.7	1.6	1.2	0.6

NQ Not Quantitated at Specified Concentration due to Incomplete Ion Cluster or Inaccurate Ion Ratio
ND Not Detected at Specified Detection Limit

Table 1. 2,3,7,8-Substituted Polychlorinated Dibenzo-*p*-dioxin and Dibenzofuran Concentrations (pg/g) in Eagle Blood Samples from New Jersey

Work Unit 30096, File: DF26FR.xls
Lab Report: FY-98-30-19
Date Analyzed: Jun 2-7, 1998

Sample Site/Matrix:	Quality Assurance Samples					
ECRC Number:	Proc. Blank	Proc. Blank	Proc. Blank	Chicken Egg Blank	Chicken Egg Blank	Chicken Egg Blank
GC/HRMS Set DF26 Injection No.	26	27	28	29	31	32
	7/9/97	7/15/97	7/22/97	7/9/97	7/15/97	7/22/97
Sample Submitter No.		Conc. (pg/g-eq) based on blood				
Sample Mass Extracted (grams):		wgts 6 g		6.0	6.01	6.01
DIOXINS						
2,3,7,8-Tetrachloro	0.8	0.1 ND	0.4 NQ	0.7 NQ	0.9	38.3 CC
1,2,3,7,8-Pentachloro	0.1 ND	0.2 NQ	0.2 NQ	0.1 ND	0.5 NQ	0.4 NQ
1,2,3,4,7,8-Hexachloro	0.1 ND	0.1 ND	0.1 NQ	0.1 ND	0.1 ND	0.1 ND
1,2,3,6,7,8-Hexachloro	0.2 NQ	0.1 ND	0.1 NQ	0.4 NQ	0.5	0.1 ND
1,2,3,7,8,9-Hexachloro	0.1 ND	0.1 ND	0.1 NQ	0.1 ND	0.2 NQ	0.1 ND
1,2,3,4,6,7,8-Heptachloro	1.1	0.1 ND	0.3 NQ	2.7 NQ	1	0.5 NQ
Octachloro	4.5	0.1	2.2	23.8	12.1	8.6
FURANS 2,3,7,8-Tetrachloro	0.3	0.1 ND	0.2 NQ	0.2	0.3	0.1 ND
1,2,3,7,8-Pentachloro	0.1 ND	0.1 ND	0.1 ND	0.1 ND	0.2	0.1 ND
2,3,4,7,8-Pentachloro	0.1 ND	0.1 ND	0.2 NQ	0.1 ND	0.3	0.1 ND
1,2,3,4,7,8-Hexachloro	0.1 ND	0.1 ND	0.3 NQ	0.2 NQ	0.3 NQ	0.1 ND
1,2,3,6,7,8-Hexachloro	0.1 NQ	0.1 NQ	0.2 NQ	0.2 NQ	0.3 NQ	0.1 ND
1,2,3,7,8,9-Hexachloro	0.2 NQ	0.2 NQ	0.2 NQ	0.1	0.2 NQ	0.1 NQ
2,3,4,6,7,8-Hexachloro	0.1 NQ	0.2 NQ	0.1 ND	0.1 ND	0.2 NQ	0.1 ND
1,2,3,4,6,7,8-Heptachloro	0.2 NQ	0.2 NQ	0.2 NQ	0.2 NQ	0.4 NQ	0.1 ND
1,2,3,4,7,8,9-Heptachloro	0.1 ND	0.1 ND	0.1 ND	0.2 NQ	0.1 ND	0.3 NQ
Octachloro	1.9 NQ	1.5	1.3 NQ	1.4 NQ	2.0	0.9

NQ Not Quantitated at Specified Concentration due to Incomplete Ion Cluster or Inaccurate Ion Ratio
ND Not Detected at Specified Detection Limit
CC Identified as Cross-Contaminated from TCDD Standard

Table 1. 2,3,7,8-Substituted Polychlorinated Dibenzo-*p*-dioxin and Dibenzofuran Concentrations (pg/g) in Eagle Blood Samples from New Jersey

Work Unit 30096, File: DF26FR.xls
Lab Report: FY-98-30-19
Date Analyzed: Jun 2-7, 1998

Sample Site/Matrix:	Chicken Egg Spike	Chicken Egg Spike	Chicken Egg Spike
ECRC Number:	33	34	36
GC/HRMS Set DF26 Injection No.	7/9/97	7/15/97	7/22/97
Sample Submitter No.	250 or 1250 pg (42 or 208 pg/g)	250 or 1250 pg (42 or 208 pg/g)	250 or 1250 pg (42 or 208 pg/g)
Sample Mass Extracted (grams):	6	6.02	6.02
DIOXINS			
2,3,7,8-Tetrachloro	41.1	39.2	38.5
1,2,3,7,8-Pentachloro	38	38.7	39.2
1,2,3,4,7,8-Hexachloro	44.8	41.6	41.9
1,2,3,6,7,8-Hexachloro	46.8	47.1	46
1,2,3,7,8,9-Hexachloro	53	51.2	49
1,2,3,4,6,7,8-Heptachloro	46	41.9	42.5
Octachloro	325	309	312
FURANS 2,3,7,8-Tetrachloro	41.9	41	40.6
1,2,3,7,8-Pentachloro	42.5	41.3	41.6
2,3,4,7,8-Pentachloro	45.6	43.6	42
1,2,3,4,7,8-Hexachloro	49.4	42.9	43.8
1,2,3,6,7,8-Hexachloro	45.5	41.9	42.2
1,2,3,7,8,9-Hexachloro	41.7	41.7	44
2,3,4,6,7,8-Hexachloro	45.3	46.7	51
1,2,3,4,6,7,8-Heptachloro	39.4	39.1	39.5
1,2,3,4,7,8,9-Heptachloro	44.1	43.3	43
Octachloro	310	293	285

NQ Not Quantitated at Specified Concentration due to Incomplete Ion Cluster or Inaccurate Ion Ratio
ND Not Detected at Specified Detection Limit

Table 1. 2,3,7,8-Substituted Polychlorinated Dibenzo-*p*-dioxin and Dibenzofuran Concentrations (pg/g) in Eagle Blood Samples from New Jersey

Work Unit 30096, File: DF26FR.xls
Lab Report: FY-98-30-19
Date Analyzed: Jun 2-7, 1998

Sample Site/Matrix:	Quality Assurance Samples			
ECRC Number:	Pos.Ctrl Sag. Carp	Pos.Ctrl Sag. Carp	Pos.Ctrl Sag. Carp	*QC*
GC/HRMS Set DF26 Injection No.	37	38	39	*AVG.*
	7/9/97	7/15/97	7/22/97	*from*
Sample Submitter No.				*1994-*
				1997
Sample Mass Extracted (grams):	4.99	5.02	5	
DIOXINS				
2,3,7,8-Tetrachloro	22.3	21.1	21.1	*21.6*
1,2,3,7,8-Pentachloro	10.9	10.5	10.9	*11.4*
1,2,3,4,7,8-Hexachloro	5.0	5.3	5.4	*4.4*
1,2,3,6,7,8-Hexachloro	16.7	16.4	16.4	*14.8*
1,2,3,7,8,9-Hexachloro	3.2	2.1	3.0 NQ	*2.1*
1,2,3,4,6,7,8-Heptachloro	19.4	19.1	18	*18.5*
Octachloro	24.7	23.9	27.5 NQ	*16.9*
FURANS 2,3,7,8-Tetrachloro	34.2	35.1	34.6	*34.2*
1,2,3,7,8-Pentachloro	13.6	12.8	13.2	*12.5*
2,3,4,7,8-Pentachloro	37.6	34.5	40.1	*36.1*
1,2,3,4,7,8-Hexachloro	10.0	9.7	10.4	*9.2*
1,2,3,6,7,8-Hexachloro	7.7	7.4	7.5	*6.4*
1,2,3,7,8,9-Hexachloro	1.0 NQ	0.7 NQ	1 NQ	*0.2*
2,3,4,6,7,8-Hexachloro	3.5	3.1	3.6	*5.4*
1,2,3,4,6,7,8-Heptachloro	8.9	8.7 NQ	9.8	*11.9*
1,2,3,4,7,8,9-Heptachloro	0.5	0.3 NQ	0.6 NQ	*0.6*
Octachloro	3.4	1.8 NQ	4.1	*3.6*

NQ Not Quantitated at Specified Concentration due to Incomplete Ion Cluster or Inaccurate Ion Ratio
ND Not Detected at Specified Detection Limit

Table 2. Percent Recovery of ^{13}C-Substituted Polychlorinated Dibenzo-*p*-dioxins and Dibenzofurans in Eagle Blood Samples from New Jersey

Work Unit 30096, File: DF26FR.xls
Lab Report: FY-98-30-19
Date Analyzed: Jun 2-7, 1998

Sample Site/Matrix:	Cohansey River	Cohansey River	Stow Creek	Stow Creek	Bear Swamp	Union Lake
ECRC Number:	14952	14953	14954	14955	14956	14957
GC/HRMS Set DF26 Injection No.	41	42	43	44	46	47
Sample Submitter No.	629-39833	629-39834	629-39835	629-39836	629-39838	629-39839
Sample Mass Extracted (grams):	6.58	3.98	6.57	7.2	6.32	6.98
DIOXINS						
2,3,7,8-Tetrachloro	78	89	73	63	69	74
1,2,3,7,8-Pentachloro	91	102	90	77	87	84
1,2,3,4,7,8-Hexachloro	85	89	79	71	78	80
1,2,3,6,7,8-Hexachloro	89	92	79	72	77	78
1,2,3,7,8,9-Hexachloro	84	89	73	67	74	72
1,2,3,4,6,7,8-Heptachloro	91	93	75	72	75	76
Octachloro	73	70	62	57	55	57
FURANS						
2,3,7,8-Tetrachloro	87	94	82	67	78	76
1,2,3,7,8-Pentachloro	84	96	76	66	81	77
2,3,4,7,8-Pentachloro	83	89	75	67	75	74
1,2,3,4,7,8-Hexachloro	84	88	73	67	71	73
1,2,3,6,7,8-Hexachloro	92	99	81	73	78	78
1,2,3,7,8,9-Hexachloro	86	91	76	70	76	72
1,2,3,4,6,7,8-Heptachloro	98	103	86	71	80	82
1,2,3,4,7,8,9-Heptachloro	89	93	74	67	70	67

Table 2. Percent Recovery of ^{13}C-Substituted Polychlorinated Dibenzo-*p*-dioxins and Dibenzofurans in Eagle Blood Samples from New Jersey

Work Unit 30096, File: DF26FR.xls
Lab Report: FY-98-30-19
Date Analyzed: Jun 2-7, 1998

Sample Site/Matrix:	Union Lake	Belleplain	Belleplain	Cohansey River	Cohansey River	Stow Creek
ECRC Number:	14958	14959	14960	14961	14962	14963
GC/HRMS Set DF26 Injection No.	48	49	51	52	53	54
Sample Submitter No.	629-39840	629-39841	629-39842	629-39843	629-39844	629-39845
Sample Mass Extracted (grams):	6.11	7.49	7.39	7.23	5.55	5.85
DIOXINS						
2,3,7,8-Tetrachloro	50	78	75	68	59	83
1,2,3,7,8-Pentachloro	77	93	79	76	59	90
1,2,3,4,7,8-Hexachloro	75	82	72	66	53	76
1,2,3,6,7,8-Hexachloro	79	80	70	64	52	78
1,2,3,7,8,9-Hexachloro	69	77	68	58	47	70
1,2,3,4,6,7,8-Heptachloro	77	81	67	63	51	74
Octachloro	57	57	48	48	35	52
FURANS						
2,3,7,8-Tetrachloro	54	87	78	68	59	84
1,2,3,7,8-Pentachloro	67	94	80	64	54	80
2,3,4,7,8-Pentachloro	68	80	69	63	55	77
1,2,3,4,7,8-Hexachloro	68	75	66	63	46	71
1,2,3,6,7,8-Hexachloro	78	83	74	63	53	81
1,2,3,7,8,9-Hexachloro	68	77	68	60	48	73
1,2,3,4,6,7,8-Heptachloro	75	83	75	68	51	75
1,2,3,4,7,8,9-Heptachloro	68	71	61	57	46	67

Table 2. Percent Recovery of ^{13}C-Substituted Polychlorinated Dibenzo-*p*-dioxins and Dibenzofurans in Eagle Blood Samples from New Jersey

Work Unit 30096, File: DF26FR.xls
Lab Report: FY-98-30-19
Date Analyzed: Jun 2-7, 1998

Sample Site/Matrix:	Stow Creek	Stow Creek	Belleplain	Belleplain	Bear Swamp	Bear Swamp
ECRC Number:	14964	14965	14966	14967	14968	14969
GC/HRMS Set DF26 Injection No.	56	57	58	59	61	62
Sample Submitter No.	629-39846	629-39847	629-39848	629-39849	629-39850	629-39851
Sample Mass Extracted (grams):	6.84	7.02	6.46	6.91	7.13	4.18
DIOXINS						
2,3,7,8-Tetrachloro	85	82	79	72	75	79
1,2,3,7,8-Pentachloro	90	88	88	85	83	95
1,2,3,4,7,8-Hexachloro	83	79	83	83	81	86
1,2,3,6,7,8-Hexachloro	78	79	80	80	73	88
1,2,3,7,8,9-Hexachloro	74	75	79	77	73	83
1,2,3,4,6,7,8-Heptachloro	84	72	76	87	77	90
Octachloro	56	52	57	61	57	66
FURANS						
2,3,7,8-Tetrachloro	85	86	88	87	81	88
1,2,3,7,8-Pentachloro	84	86	85	82	82	86
2,3,4,7,8-Pentachloro	82	82	83	77	75	87
1,2,3,4,7,8-Hexachloro	75	72	72	75	75	81
1,2,3,6,7,8-Hexachloro	79	81	76	88	75	90
1,2,3,7,8,9-Hexachloro	73	73	83	82	76	82
1,2,3,4,6,7,8-Heptachloro	82	80	82	87	82	90
1,2,3,4,7,8,9-Heptachloro	73	75	73	79	71	86

Table 2. Percent Recovery of ^{13}C-Substituted Polychlorinated Dibenzo-*p*-dioxins and Dibenzofurans in Eagle Blood Samples from New Jersey

Work Unit 30096, File: DF26FR.xls
Lab Report: FY-98-30-19
Date Analyzed: Jun 2-7, 1998

Sample Site/Matrix:	Union Lake	Union Lake	Union Lake	Maurice River	Maurice River	Round Valley
ECRC Number:	14970	14971	14972	14973	14974	14975
GC/HRMS Set DF26 Injection No.	63	64	66	67	68	69
Sample Submitter No.	629-39852	629-39853	629-39854	629-39855	629-39856	629-39857
Sample Mass Extracted (grams):	6.52	7.09	7.24	7.13	6.93	6.39
DIOXINS						
2,3,7,8-Tetrachloro	81	74	85	73	76	74
1,2,3,7,8-Pentachloro	99	84	98	83	91	83
1,2,3,4,7,8-Hexachloro	89	81	88	77	80	73
1,2,3,6,7,8-Hexachloro	88	78	87	76	79	71
1,2,3,7,8,9-Hexachloro	82	73	84	69	80	74
1,2,3,4,6,7,8-Heptachloro	88	80	81	77	76	70
Octachloro	62	56	60	57	58	51
FURANS						
2,3,7,8-Tetrachloro	91	80	93	78	83	79
1,2,3,7,8-Pentachloro	95	80	91	76	83	79
2,3,4,7,8-Pentachloro	82	78	87	70	71	72
1,2,3,4,7,8-Hexachloro	76	74	79	72	73	65
1,2,3,6,7,8-Hexachloro	94	82	92	78	81	73
1,2,3,7,8,9-Hexachloro	78	72	81	68	72	68
1,2,3,4,6,7,8-Heptachloro	93	79	85	77	80	73
1,2,3,4,7,8,9-Heptachloro	79	70	78	66	72	66

Table 2. Percent Recovery of ^{13}C-Substituted Polychlorinated Dibenzo-*p*-dioxins and Dibenzofurans in Eagle Blood Samples from New Jersey

Work Unit 30096, File: DF26FR.xls
Lab Report: FY-98-30-19
Date Analyzed: Jun 2-7, 1998

Sample Site/Matrix:	Round Valley	Bear Swamp	Union Lake	Maurice River	Maurice River	Stow Creek
ECRC Number:	14976	14977	14978	14979	14980	14981
GC/HRMS Set DF26 Injection No.	71	72	73	74	76	77
Sample Submitter No.	629-39858	629-39859	629-39860	629-39861	629-39862	629-39863
Sample Mass Extracted (grams):	6.7	5.86	6.77	5.97	5.68	6.63
DIOXINS						
2,3,7,8-Tetrachloro	82	64	62	68	24	74
1,2,3,7,8-Pentachloro	94	73	76	79	26	79
1,2,3,4,7,8-Hexachloro	84	66	68	74	23	79
1,2,3,6,7,8-Hexachloro	82	66	65	71	21	71
1,2,3,7,8,9-Hexachloro	77	63	61	67	21	66
1,2,3,4,6,7,8-Heptachloro	76	65	62	69	21	75
Octachloro	54	49	41	48	14	47
FURANS						
2,3,7,8-Tetrachloro	87	68	66	70	24	72
1,2,3,7,8-Pentachloro	84	66	68	72	24	78
2,3,4,7,8-Pentachloro	82	64	71	64	21	68
1,2,3,4,7,8-Hexachloro	76	58	61	66	20	64
1,2,3,6,7,8-Hexachloro	83	66	65	68	22	73
1,2,3,7,8,9-Hexachloro	72	58	58	63	19	60
1,2,3,4,6,7,8-Heptachloro	81	65	62	70	21	72
1,2,3,4,7,8,9-Heptachloro	71	55	56	58	18	57

Table 2. Percent Recovery of ^{13}C-Substituted Polychlorinated Dibenzo-*p*-dioxins and Dibenzofurans in Eagle Blood Samples from New Jersey

Work Unit 30096, File: DF26FR.xls
Lab Report: FY-98-30-19
Date Analyzed: Jun 2-7, 1998

Sample Site/Matrix:	Stow Creek	Stow Creek	Appaquinimink Creek	Bear Swamp	Murder Kill
ECRC Number:	14982	14983	14984	14985	14986
GC/HRMS Set DF26 Injection No.	78	79	81	82	83
Sample Submitter No.	629-32120	629-32122	629-33938	629-32125	629-33934
Sample Mass Extracted (grams):	5.25	6.73	5.9	5.64	7.04
DIOXINS					
2,3,7,8-Tetrachloro	74	51	72	72	48
1,2,3,7,8-Pentachloro	84	71	87	83	57
1,2,3,4,7,8-Hexachloro	76	67	82	77	54
1,2,3,6,7,8-Hexachloro	69	60	84	75	52
1,2,3,7,8,9-Hexachloro	69	63	76	70	50
1,2,3,4,6,7,8-Heptachloro	67	62	87	81	51
Octachloro	54	48	61	57	38
FURANS					
2,3,7,8-Tetrachloro	68	57	73	74	50
1,2,3,7,8-Pentachloro	74	61	78	77	54
2,3,4,7,8-Pentachloro	64	58	80	73	49
1,2,3,4,7,8-Hexachloro	62	58	76	68	48
1,2,3,6,7,8-Hexachloro	67	65	81	78	52
1,2,3,7,8,9-Hexachloro	62	58	74	69	43
1,2,3,4,6,7,8-Heptachloro	70	68	84	77	52
1,2,3,4,7,8,9-Heptachloro	58	56	73	68	44

Table 2. Percent Recovery of ^{13}C-Substituted Polychlorinated Dibenzo-*p*-dioxins and Dibenzofurans in Eagle Blood Samples from New Jersey

Work Unit 30096, File: DF26FR.xls
Lab Report: FY-98-30-19
Date Analyzed: Jun 2-7, 1998

Sample Site/Matrix:	Quality Assurance Samples					
ECRC Number:	Proc. Blank	Proc. Blank	Proc. Blank	Chicken Egg Blank	Chicken Egg Blank	Chicken Egg Blank
GC/HRMS Set DF26 Injection No.	26	27	28	29	31	32
Sample Submitter No.	7/9/97	7/15/97	7/22/97	7/9/97	7/15/97	7/22/97
Sample Mass Extracted (grams):				6.0	6.01	6.01
DIOXINS						
2,3,7,8-Tetrachloro	88	79	80	74	79	76
1,2,3,7,8-Pentachloro	102	93	92	93	85	88
1,2,3,4,7,8-Hexachloro	93	87	83	74	75	72
1,2,3,6,7,8-Hexachloro	91	84	83	74	74	78
1,2,3,7,8,9-Hexachloro	80	78	76	72	68	70
1,2,3,4,6,7,8-Heptachloro	82	83	77	73	70	71
Octachloro	53	54	50	53	46	50
FURANS						
2,3,7,8-Tetrachloro	83	82	83	79	80	78
1,2,3,7,8-Pentachloro	98	90	90	85	80	82
2,3,4,7,8-Pentachloro	90	90	91	81	77	79
1,2,3,4,7,8-Hexachloro	99	78	77	71	70	70
1,2,3,6,7,8-Hexachloro	101	90	83	78	79	77
1,2,3,7,8,9-Hexachloro	89	86	74	72	74	69
1,2,3,4,6,7,8-Heptachloro	93	86	80	80	76	70
1,2,3,4,7,8,9-Heptachloro	87	74	73	71	65	61

Table 2. Percent Recovery of ^{13}C-Substituted Polychlorinated Dibenzo-*p*-dioxins and Dibenzofurans in Eagle Blood Samples from New Jersey

Work Unit 30096, File: DF26FR.xls
Lab Report: FY-98-30-19
Date Analyzed: Jun 2-7, 1998

Sample Site/Matrix:	Quality Assurance Samples					
ECRC Number:	Chicken Egg Spike	Chicken Egg Spike	Chicken Egg Spike	Pos.Ctrl Sag. Carp	Pos.Ctrl Sag. Carp	Pos.Ctrl Sag. Carp
GC/HRMS Set DF26 Injection No.	33	34	36	37	38	39
Sample Submitter No.	7/9/97	7/15/97	7/22/97	7/9/97	7/15/97	7/22/97
Sample Mass Extracted (grams):	6	6.02	6.02	4.99	5.02	5
DIOXINS						
2,3,7,8-Tetrachloro	72	78	85	83	74	83
1,2,3,7,8-Pentachloro	77	92	91	86	81	98
1,2,3,4,7,8-Hexachloro	69	83	80	72	82	92
1,2,3,6,7,8-Hexachloro	72	80	74	74	82	92
1,2,3,7,8,9-Hexachloro	65	73	73	66	75	90
1,2,3,4,6,7,8-Heptachloro	66	75	73	67	84	94
Octachloro	52	51	48	45	65	73
FURANS						
2,3,7,8-Tetrachloro	66	77	87	79	79	90
1,2,3,7,8-Pentachloro	72	83	85	79	80	93
2,3,4,7,8-Pentachloro	67	81	86	75	77	86
1,2,3,4,7,8-Hexachloro	64	80	73	70	74	89
1,2,3,6,7,8-Hexachloro	70	82	83	75	85	92
1,2,3,7,8,9-Hexachloro	65	73	68	69	82	95
1,2,3,4,6,7,8-Heptachloro	73	78	76	77	87	103
1,2,3,4,7,8,9-Heptachloro	65	71	68	65	83	93

Appendix E

Determination of Elements in Blood Collected from Eagles in New Jersey and Delaware: 1993-1996

U.S. Department of the Interior
U.S. Geological Survey
Biological Resources Division
Environmental and Contaminants Research Center
4200 New Haven Road
Columbia, Missouri 65201

Final Laboratory Report FY98-32-04

DETERMINATION OF ELEMENTS IN BLOOD COLLECTED FROM EAGLES IN NEW JERSEY AND DELAWARE: 1993-1996

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To: Robert A. Frakes, Assistant Supervisor
USFWS Ecological Services, Pleasantville, NJ

Date: March 1, 1998

SAMPLE HISTORY:

On March 6, 1997, a shipment of samples was received by the Inorganic Chemistry Section of the Environmental and Contaminants Research Center (ECRC) from Bob Frakes of the U.S. Fish and Wildlife Service in Pleasantville, NJ. The samples consisted of blood collected from 35 nestling eagles in New Jersey and Delaware during the 1993-1996 breeding seasons. There were two tubes submitted for each sample, one containing packed blood cells, and the other blood plasma, thus the total number of submitted sample tubes was 70. Once received by the ECRC, the samples were inventoried, logged-in, assigned ECRC Batch (#404) and identification numbers (#14396-14465), and stored at -80°C until further preparation. Because inorganic and organic constituents were requested for the blood, it was decided to combine each plasma and packed cell sample into one whole blood sample. The resulting 35 whole blood samples were assigned ECRC Batch (#412) and identification

numbers (#14952-14986). It was requested that each whole blood sample be analyzed for an ICP-MS metals scan, As, Se, Hg, an organochlorine scan including total PCBs, non-ortho PCBs (congener specific), and an H4IIE bioassay for TCDD equivalents. The purpose of this report is to present the metals portion of the requested analyses.

METHODS:

Sample Preparation:
Two 1 mL aliquots were removed from each whole blood sample for the metals portion of the analyses. One aliquot was reserved for dry ashing for As and Se, the other for Hg and the semi-quantitative metals scan. The remainder of each whole blood sample was returned to the ECRC Organic Chemistry group.

Chemical Preparation:
Two mL HCl was added to 1 mL blood in a polyethylene test tube and allowed to digest at room temperature for 1 hour. This mixture was placed in a water bath at 70°C for two hours. The resulting digestate was poured into a 100 mL beaker, with the test tube being rinsed with 2 mL of HNO_3 followed by a final rinse of 2 mL ultra-pure H_2O. This resulting mixture was subjected to a combination nitric acid wet digestion and magnesium nitrate dry ashing in preparation for the determination of As and Se by hydride generation. The standard operating procedure (SOP) describing this preparation technique was C5.26. For mercury and the semi-quantitative metals scan, 2 mL of concentrated HNO_3 were added to 1 mL of blood in a polyethylene test tube and placed in a 70°C water bath for 4 hours. This mixture was poured into a CEM® Teflon bomb, and the test tube was rinsed with 1 mL of ultra-pure water which was also added to the bomb. The bomb mixture was sujected to a HNO_3-H_2O_2 microwave digestion procedure (SOP C5.94). The digestate was diluted to 20 mL, with 10 mL being transferred to a glass test tube and preserved with 0.1 mL HCl for subsequent Hg determination

Instrumental Analysis:
The determination of As and Se in eagle blood was accomplished by flow injection hydride generation atomic spectroscopy (SOPs C5.172 and SOP C5.171). Mercury in eagle blood was determined by flow injection cold vapor atomic spectroscopy (SOP C5.157). Semi-quantitative elemental scans of biota and sediment were conducted using ICP-MS instrumentation as described in SOP C5.212. The accuracy of the semi-quantitative scan is reported by the manufacturer to be $\pm$ 30% to $\pm$ 50%, depending on the matrix and element.

Quality Control:
For the determination of As, Se, and Hg, samples were processed through the

analytical flow scheme in two blocks, based upon analyte and matrix chemical preparation and instrumental requirements. Each block was assigned a block initiation date (BID), and included the following quality control: procedural blanks, replicate sample preparation and analysis, reference materials, digestion spikes, and analysis spikes. Semi-quantitative analysis by ICP-MS was conducted on one of the two sample blocks and included the following quality control parameters: laboratory control sample, replicate sample preparation and analysis, reference materials, and digestion spikes. All quality control results were tabulated to provide an overview of quality assurance and to facilitate interpretation.

RESULTS AND DISCUSSION:

Arsenic, Selenium, and Mercury in Eagle Blood:
Arsenic in eagle blood (Table 1) ranged from < 27.4 ug/L to 137 ug/L and averaged 50.7 ug/L. Selenium concentrations in eagle blood averaged 716 ug/L and ranged from 498 ug/L to 950 ug/L (Table 1). Mercury ranged from 38.5 ug/L to 1549 ug/L and averaged 269 ug/L.

Semi-quantitative scan for eagle blood:
Concentrations of elements determined by ICP-MS semi-quantitative scan are indicated in Table 1 for eagle blood. Although these scans are generally only $\pm$ 30% to $\pm$ 50% in accuracy, they are comprehensive in their elemental profile and are capable of revealing inordinate and unexpected levels of elements when they occur. Major cations (Na, Mg, K, and Ca) are in mg/L (ppm) as opposed to results for all other elements, which are in ug/L or ppb. The major cation concentrations were very consistent across all samples, with Na at 3000 ppm, Mg 70-80 ppm, K at 2000 ppm and Ca 90-100 ppm. With few exceptions, concentrations of Li, Co, Ga, Zr, Mo, Ag, Cd, Sn, Sb, Cs, and Ce were < 10 ug/L. Concentrations of Mg and Mn were generally under 100 ug/L, whereas Al, V, Cr, Cu, and Sr were between 100 ug/L and 1000 ug/L. Concentrations of Ti, Zn, and Rb were generally between 1000 ug/L and 10,000 ug/L. Titanium was very consistent across all samples (2000-3000 ug/L), which could indicate the presence of an interferent rather than a true Ti concentration.

Quality Control; Arsenic, Selenium, and Mercury:
Calibration of analytical instrumentation during instrumental analysis of As, Se, and Hg was verified through the use of National Instititute of Standards and Technology (NIST) 3100 series solutions (Table 2). Recoveries of elements from various reference and research materials is indicated in Table 3. Results were within upper and lower limits for each material except for one slightly low arsenic recovery in NIST RM50 tuna tissue. Triplicate preparation and analysis of IAEA A-13 reference blood samples (Table 4) produced percent relative standard deviations (%RSD) of 2.7 for Se but a poorer 40

%RSD for Hg. Arsenic %RSD was not determined due to replicate concentrations being less than the method limit of detection (MLOD). Recoveries of arsenic, selenium, and mercury in digested sample spikes ranged from 89 to 113% (Table 5). Analysis spikes, conducted to check for enhancement or suppression of the analyte signal, ranged from 94 to 108% recovery (Table 6). Blank equivalent concentrations were less than the method limit of detection for all elements (Table 7). The instrument detection limits and method limits of detection and quantitation are indicted in Tables 8 and 9. The MLOD for As was higher than expected due to contamination in digestion blanks. Finally, instrumental precision throughout analytical runs exhibited %RSDs < 8, which is indicated in Table 10.

Quality Control: Semi-quantitative Scans

Within run precision was measured by the analysis of a reference solution every 10 samples, which resulted in %RSDs < 23 (Table 11). The triplicate preparation and analysis of IAEA A-13 blood reference material produced %RSDs less than 44 (Table 12), except for Al, which was much worse at 103 %RSD. Digested sample spike recoveries for blood were generally on the high side (Table 13) ranging from 102% to 139% and averaging 122%, excluding one Cu spike that was apparently contaminated. Recoveries of elements from digested tissue reference or research materials are indicated in Table 14. Recoveries generally ranged between 100% and 136% and averaged 110%, excluding poorer recoveries for Ca, and K in IAEA A-13 animal blood (162% and 157%) and K in NIST RM50 tuna (156%). Blank equivalent concentrations (digestion blanks) are indicated in Table 15. The semi-quantitative data in Table 1 was not corrected for this digestion blank background. Overall, quality control results were considered within limits specified by ECRC.

Table 1. Concentrations[a] of elements in eagle whole blood samples determined by semi-quantitative scan.

Element	629-39833 ECRC# 14952	629-39834 ECRC# 14953	629-39835 ECRC# 14954	629-39836 ECRC# 14955	629-39838 ECRC# 14956	629-39839 ECRC# 14957	629-39840 ECRC# 14958	629-39841 ECRC# 14959	629-39842 ECRC# 14960	629-39843 ECRC# 14961	629-39844 ECRC# 14962	629-39845 ECRC# 14963
Li	4	5	3	3	4	< 1	2	5	3	6	4	3
Be	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Na	3000	3000	3000	2000	3000	3000	3000	3000	3000	3000	3000	3000
Mg	80	80	80	80	90	80	80	70	70	70	80	60
Al	200	200	700	300	200	100	300	60	100	200	300	200
K	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	1000
Ca	100	100	100	100	100	100	90	100	100	90	90	100
Ti	3000	3000	3000	3000	3000	3000	3000	2000	2000	3000	3000	2000
V	100	200	100	100	100	200	100	100	100	100	100	100
Cr	500	400	300	300	400	400	400	300	300	300	300	300
Mn	70	70	70	70	50	60	60	60	70	50	50	60
Fe	416000	378000	376000	371000	418000	332000	341000	319000	346000	328000	342000	286000
Co	6	3	3	5	6	4	3	1	3	2	3	6
Ni	60	20	8	30	20	30	10	5	30	2	100	40
Cu	600	600	900	600	500	500	400	500	500	600	600	400
Zn	6000	8000	7000	8000	8000	7000	7000	6000	6000	7000	7000	6000
Ga	7	7	5	7	5	6	6	5	6	6	6	5
Ge	0.2	0.6	0.6	0.6	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
As[b]	43.0	33.0	53.0	< 27.4	< 27.4	< 27.4	< 27.4	88.0	60.0	37.0	56.0	33.0
Se[b]	666.	730.	851.	808.	735.	685.	694.	762.	801.	824.	897.	644.
Rb	1000	1000	900	1000	2000	3000	3000	2000	2000	1000	900	800
Sr	200	200	200	200	100	70	60	200	200	200	200	100
Y	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Zr	20	30	6	30	10	7	5	3	5	7	20	10
Nb	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Mo	10	9	8	7	7	6	7	6	7	30	9	6
Ru	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Pd	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Ag	1	1	1	1	1	0.4	0.6	1	1	1	1	1
Cd	3	1	1	20	0.2	2	< 0.1	0.6	< 0.1	< 0.1	2	1
In	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Sn	7	9	7	10	9	7	4	6	6	4	9	5

[a]Concentration units ug/L for all elements except Na,Mg,Ca, and K, which are mg/L.

[b]As and Se determined by flow injection hydride generation atomic absorption spectrometry.

Table 1. Concentrations[a] of elements in eagle whole blood samples determined by semi-quantitative scan....(cont'd).

Element	629-39846 ECRC# 14964	629-39847 ECRC# 14965	629-39848 ECRC# 14966	629-39849 ECRC# 14967	629-39850 ECRC# 14968	629-39851 ECRC# 14969	629-39852 ECRC# 14970	629-39853 ECRC# 14971	629-39854 ECRC# 14972	629-39855 ECRC# 14973	629-39856 ECRC# 14974	629-39857 ECRC# 14975
Li	4	3	6	3	3	1	< 1	3	3	6	4	1
Be	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Na	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000
Mg	80	80	80	80	80	70	70	70	80	70	70	80
Al	600	200	100	100	70	70	40	100	100	80	100	200
K	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Ca	100	100	100	100	100	100	100	90	100	90	90	100
Ti	3000	2000	3000	3000	2000	2000	3000	3000	2000	2000	2000	3000
V	100	100	200	100	100	200	300	300	200	200	200	100
Cr	300	400	400	300	300	300	300	400	300	300	300	300
Mn	80	60	60	90	50	70	40	50	40	50	40	100
Fe	306000	331000	351000	358000	325000	278000	328000	360000	372000	305000	324000	364000
Co	9	2	7	2	10	2	2	4	3	10	6	2
Ni	20	1	20	< 1	40	4	5	9	10	10	10	10
Cu	500	500	600	600	500	900	600	500	400	500	500	600
Zn	6000	7000	7000	7000	7000	5000	6000	6000	7000	5000	6000	7000
Ga	5	6	6	6	6	5	6	6	4	4	5	7
Ge	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.4	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
As[b]	< 27.4	35.0	137.	109.	32.0	< 27.4	< 27.4	< 27.4	< 27.4	36.0	41.0	39.0
Se[b]	505.	682.	764.	867.	721.	838.	699.	604.	595.	689.	664.	688.
Rb	900	800	1000	2000	2000	2000	3000	3000	2000	700	700	2000
Sr	100	100	100	100	200	200	80	100	100	200	200	60
Y	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Zr	20	10	30	5	10	3	7	10	5	30	20	6
Nb	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Mo	6	8	10	7	7	4	6	30	8	9	9	7
Ru	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Pd	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Ag	1	1	1	1	1	0.4	0.6	0.8	0.6	1	0.8	0.6
Cd	< 0.1	< 0.1	0.4	0.8	0.6	0.6	0.6	2	1	0.4	1	0.6
In	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Sn	4	5	7	6	5	5	6	10	4	5	7	7

[a]Concentration units ug/L for all elements except Na,Mg,Ca, and K, which are mg/L.

[b]As and Se determined by flow injection hydride generation atomic absorption spectrometry.

Table 1. Concentrations[a] of elements in eagle whole blood samples determined by semi-quantitative scan....(cont'd).

Element	629-39858 ECRC# 14976	629-39859 ECRC# 14977	629-39860 ECRC# 14978	629-39861 ECRC# 14979	629-39862 ECRC# 14980	629-39863 ECRC# 14981	629-32120 ECRC# 14982	629-32122 ECRC# 14983	629-33938 ECRC# 14984	629-32125 ECRC# 14985	629-33934 ECRC# 14986
Li	< 1	2	1	4	3	4	5	3	2	2	2
Be	< 1	< 1	4	< 1	< 1	1	< 1	< 1	1	2	< 1
Na	3000	3000	3000	3000	3000	4000	3000	3000	3000	3000	3000
Mg	80	80	80	100	80	50	80	80	80	90	80
Al	100	90	90	80	80	500	200	100	100	300	60
K	2000	2000	2000	2000	2000	1000	2000	2000	2000	2000	2000
Ca	90	90	100	100	100	100	100	100	100	90	80
Ti	3000	3000	3000	2000	2000	2000	3000	2000	2000	3000	3000
V	100	100	100	100	200	100	100	100	200	100	100
Cr	300	300	300	400	300	200	300	300	400	300	400
Mn	80	60	60	70	40	40	80	50	40	60	50
Fe	362000	416000	335000	420000	368000	217000	374000	322000	372000	401000	369000
Co	1	3	5	3	5	2	5	4	1	4	2
Ni	4	20	10	6	20	10	20	20	6	8	7
Cu	600	500	500	600	600	500	600	500	500	1000	500
Zn	6000	7000	7000	7000	6000	5000	6000	7000	7000	6000	7000
Ga	6	6	5	5	5	4	5	5	6	6	6
Ge	< 0.1	0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
As[b]	< 27.4	167.	34.0	< 27.4	30.0	< 27.4	< 27.4	< 27.4	< 27.4	< 27.4	< 27.4
Se[b]	731.	950.	579.	670.	611.	498.	661.	708.	696.	924.	634.
Rb	2000	900	2000	1000	1000	800	1000	1000	1000	2000	1000
Sr	40	100	100	200	200	100	100	100	100	100	100
Y	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Zr	7	10	7	6	8	10	10	8	7	8	7
Nb	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Mo	6	8	8	8	9	30	10	9	8	7	8
Ru	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Pd	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Ag	< 0.1	0.8	0.8	0.6	0.6	1	0.8	0.6	0.8	0.8	1
Cd	0.2	1	< 0.1	< 0.1	0.8	0.8	10	0.4	0.4	< 0.1	0.2
In	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Sn	4	3	5	4	4	3	9	3	7	5	3

[a]Concentration units ug/L for all elements except Na, Mg, Ca, and K, which are mg/L.

[b]As and Se determined by flow injection hydride generation atomic absorption spectrometry.

Table 1. Concentrations[a] of elements in eagle whole blood samples determined by semi-quantitative scan.....(cont'd).

Element	629-39833 ECRC# 14952	629-39834 ECRC# 14953	629-39835 ECRC# 14954	629-39836 ECRC# 14955	629-39838 ECRC# 14956	629-39839 ECRC# 14957	629-39840 ECRC# 14958	629-39841 ECRC# 14959	629-39842 ECRC# 14960	629-39843 ECRC# 14961	629-39844 ECRC# 14962	629-39845 ECRC# 14963
Sb	2	1	0.6	2	0.2	0.8	0.6	0.4	0.4	2	1	1
Te	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cs	1	1	1	1	1	5	5	4	8	< 1	1	< 1
Ba	80	100	80	90	70	80	70	70	80	70	90	80
La	0.6	0.8	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.8	0.8
Ce	4	5	4	5	5	5	4	4	5	5	5	6
Pr	0.2	< 0.1	< 0.1	0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Nd	< 0.1	0.4	< 0.1	0.4	< 0.1	0.4	0.2	< 0.1	0.2	< 0.1	0.2	0.2
Sm	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Eu	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Gd	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Tb	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dy	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Ho	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Er	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Tm	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Yb	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Lu	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Hf	0.4	0.6	< 0.1	0.6	0.4	< 0.1	< 0.1	< 0.1	< 0.1	0.2	< 0.1	0.4
Ta	2	0.8	0.6	0.8	0.6	0.2	0.2	0.2	0.2	2	0.8	0.4
W	< 0.1	< 0.1	< 0.1	0.2	0.6	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Re	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Os	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Ir	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Pt	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Au	7	7	5	4	5	4	2	3	2	20	9	5
Tl	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Hg[b]	99.6	110.	122.	129.	164.	1372.	1549.	152.	145.	85.5	97.7	46.4
Pb	30	30	10	50	40	20	10	20	20	20	30	20
Bi	< 1	< 1	1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
U	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1

[a]Concentration units ug/L for all elements except Na,Mg,Ca, and K, which are mg/L.

[b]Hg determined by flow injection cold vapor atomic absorption spectrometry.

Table 1. Concentrations[a] of elements in eagle whole blood samples determined by semi-quantitative scan...(cont'd).

Element	629-39846 ECRC# 14964	629-39847 ECRC# 14965	629-39848 ECRC# 14966	629-39849 ECRC# 14967	629-39850 ECRC# 14968	629-39851 ECRC# 14969	629-39852 ECRC# 14970	629-39853 ECRC# 14971	629-39854 ECRC# 14972	629-39855 ECRC# 14973	629-39856 ECRC# 14974	629-39857 ECRC# 14975
Sb	0.6	< 0.1	0.4	0.6	0.4	2	0.2	3	0.8	0.8	1	0.4
Te	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cs	1	< 1	1	1	2	2	2	3	3	< 1	< 1	< 1
Ba	80	80	80	80	70	90	80	80	70	70	80	70
La	0.8	1	0.6	0.6	0.4	2	0.4	0.6	0.6	0.6	0.6	0.4
Ce	5	5	5	4	3	3	3	4	3	3	4	4
Pr	0.2	0.2	< 0.1	0.2	0.2	< 0.1	0.2	0.2	< 0.1	< 0.1	< 0.1	< 0.1
Nd	0.6	0.6	0.2	< 0.1	< 0.1	< 0.1	< 0.1	0.2	0.2	0.2	< 0.1	< 0.1
Sm	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Eu	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Gd	< 0.1	0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Tb	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dy	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Ho	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Er	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Tm	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Yb	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Lu	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Hf	0.6	0.2	0.4	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.8	0.6	< 0.1
Ta	0.2	0.4	0.2	0.2	0.2	0.2	0.2	2	0.6	0.4	0.4	0.2
W	4	2	< 0.1	< 0.1	0.2	< 0.1	0.2	< 0.1	0.2	0.2	< 0.1	< 0.1
Re	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Os	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Ir	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Pt	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Au	4	4	3	3	2	3	5	20	7	5	4	3
Tl	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Hg[b]	45.9	58.2	136.	184.	276.	413.	845.	911.	756.	104.	127.	58.5
Pb	20	20	20	20	20	40	6	20	10	30	30	30
Bi	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
U	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1

[a]Concentration units ug/L for all elements except Na,Mg Ca, and K, which are mg/L.

[b]Hg determined by flow injection cold vapor atomic absorption spectrometry

Table 1. Concentrations[a] of elements in eagle whole blood samples determined by semi-quantitative scan....(cont'd).

Element	629-39858 ECRC# 14976	629-39859 ECRC# 14977	629-39860 ECRC# 14978	629-39861 ECRC# 14979	629-39862 ECRC# 14980	629-39863 ECRC# 14981	629-32120 ECRC# 14982	629-32122 ECRC# 14983	629-33938 ECRC# 14984	629-32125 ECRC# 14985	629-33934 ECRC# 14986
Sb	0.2	0.8	0.4	0.2	0.2	2	1	0.6	1	0.4	0.4
Te	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cs	< 1	2	2	1	< 1	1	1	1	< 1	1	< 1
Ba	70	90	70	70	80	300	80	70	90	80	90
La	0.8	0.6	0.4	0.4	0.4	0.4	0.8	0.4	0.6	0.8	0.4
Ce	4	5	3	4	4	5	6	5	6	6	6
Pr	< 0.1	0.2	< 0.1	< 0.1	< 0.1	0.2	0.2	0.2	< 0.1	0.2	< 0.1
Nd	0.4	0.2	0.2	0.2	< 0.1	0.2	0.4	< 0.1	< 0.1	0.2	0.2
Sm	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Eu	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Gd	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Tb	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dy	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Ho	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Er	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Tm	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Yb	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Lu	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Hf	< 0.1	< 0.1	< 0.1	< 0.1	0.2	< 0.1	0.2	< 0.1	< 0.1	< 0.1	< 0.1
Ta	0.2	0.2	0.2	0.2	0.2	0.8	0.6	0.4	0.4	0.2	0.2
W	< 0.1	0.2	< 0.1	< 0.1	< 0.1	< 0.1	0.4	0.2	0.2	0.2	< 0.1
Re	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Os	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Ir	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Pt	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Au	3	2	2	1	3	20	7	5	4	3	3
Tl	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Hg[b]	57.5	131.	287.	150.	146.	38.5	98.6	76.2	54.2	283.	114.
Pb	20	20	10	20	20	10	30	20	30	30	20
Bi	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	1.00	< 1	< 1
U	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1

[a]Concentration units ug/L for all elements except Na,Mg,Ca, and K, which are mg/L.

[b]Hg determined by flow injection cold vapor atomic absorption spectrometry

Table 2. Performance of NBS 3100 series solutions used for instrument calibration during mercury, arsenic, and selenium analysis.

BID[a]	Ele.	Run Date	Ref. Material	Actual Conc	Meas Conc 1	Meas Conc 2	% Error 1	% Error 2	ISOP[b]	Oper Init.
10/6/97	Hg	10/17/97	NIST 3133	10.	10.06	10.21	0.6	2.1	C5.157	MJW
10/28/97	As	11/4/97	NIST 3103	10.	9.78	10.06	-2.2	0.6	C5.172	MJW
10/28/97	Se	11/10/97	NIST 3149	5.	5.13	4.74	2.6	-5.3	C5.171	MJW

[a]BID = Block Initiation Date: a date assigned to each member of a group of samples that will identify the sample as a member of the group or "block."

[b]ISOP = instrumental standard operating procedure.

Table 3. Concentration of mercury, arsenic, and selenium in various reference and/or research materials. Measured concentrations (Meas. Conc.) expressed as μg/g unless otherwise specified.

BID[a]	Ele.	QC #	Meas. Conc.	Reference Material	Matrix	Upper Limit	Lower Limit	Pass/ Fail	Prep SOP	Prep Init.	ISOP[b]	Oper. Init.
10/6/97	Hg	2	2.18	ECRC STRIPED BASS[c]	FISH (WHOLE)	2.77	1.75	+	C5.94h	MJW	C5.157	MJW
10/6/97	Hg	53	1.00	NIST RM50[d]	TUNA FISH FILLET	1.05	0.85	+	C5.94h	MJW	C5.157	MJW
10/28/97	As	2	3.09	ECRC STRIPED BASS	FISH (WHOLE)	3.70	2.70	+	C5.26	MJW	C5.172	MJW
10/28/97	As	53	2.56	NIST RM50	TUNA FISH FILLET	3.70	2.90	-	C5.26	MJW	C5.172	MJW
10/28/97	Se	2	2.37	ECRC STRIPED BASS	FISH (WHOLE)	2.46	2.06	+	C5.26	MJW	C5.171	MJW
10/28/97	Se	53	3.80	NIST RM50	TUNA FISH FILLET	4.00	3.20	+	C5.26	MJW	C5.171	MJW
10/28/97	Se	43	0.27	IAEA A-13[e]	BLOOD	0.32	0.16	+	C5.26	MJW	C5.171	MJW

[a]BID = Block Initiation Date: a date assigned to each member of a group of samples that will identify the sample as a member of the group or "block."

[b]ISOP = instrumental standard operating procedure.

[c]ECRC STRIPED BASS = Environmental and Contaminants Research Center research material: whole striped bass powder.

[d]NIST RM50 = National Institute of Standards and Technology tuna research material RM50.

[e]IAEA A-13 = International Atomic Energy Agency Certified Reference Material: freeze dried animal blood A-13 (not certified for As or Hg).

Table 4. Percent relative standard deviation from triplicate preparation and analysis of samples for mercury, arsenic, and selenium.

BID[a]	Ele.	Matrix	Rep 1	Rep 2	Rep 3	Mean	Units	SD[b]	%RSD[c]	PSOP[d]	Prep. Init.	ISOP[e]	Oper. Init.
10/6/97	Hg	BLOOD	9.27	13.8	21.0	14.7	ng/g	5.92	40.	C5.94h	MJW	C5.157	MJW
10/28/97	As	BLOOD	-1.96[f]	0.00[f]	-3.98[f]	-1.98[f]	ng/g	1.99	—[f]	C5.26	MJW	C5.172	MJW
10/28/97	Se	BLOOD	0.27	0.26	0.26	0.26	ug/g	0.007	2.7	C5.26	MJW	C5.171	MJW

[a]BID = Block Initiation Date: a date assigned to each member of a group of samples that will identify the sample as a member of the group or "block."

[b]SD = standard deviation.

[c]%RSD = percent relative standard deviation.

[d]PSOP = standard operating procedure used for chemical preparation of sample.

[e]ISOP = standard operating procedure used for instrumental analysis of sample.

[f]%RSD invalid due to replicate concentrations being below method limit of detection.

Table 5. Percent recoveries of mercury, arsenic, and selenium in digested spikes.

1 BID[a]	2 Ele.	3 Spike Form	4 Amt.[b] µg	5 Matrix	6 Total µg[c] Meas.	7 Bkgd.[d] µg	8 Spk/Bkdg[e]	9 Spk/Bkg[d] SD	10 % REC[f]	PSOP	Prep. Init.	ISOP	Oper. Init.
10/6/97	Hg	Hg+2	1.	ANIMAL BLOOD	1.14	0.003	333.	826.	113.	C5.94h	MJW	C5.157	MJW
10/6/97	Hg	Hg+2	2.	ANIMAL BLOOD	2.27	0.003	667.	1667.	113.	C5.94h	MJW	C5.157	MJW
10/6/97	Hg	Hg+2	1.	BLOOD BLANK	1.02	0.000	20000.	15552.	102.	C5.94h	MJW	C5.157	MJW
10/6/97	Hg	Hg+2	2.	BLOOD BLANK	2.09	0.000	40000.	31104.	104.	C5.94h	MJW	C5.157	MJW
10/6/97	Hg	Hg+2	1.	BLOOD BLANK	0.962	0.000	100000.	2257.	96.	C5.94h	MJW	C5.157	MJW
10/6/97	Hg	Hg+2	2.	BLOOD BLANK	2.12	0.000	200000.	4515.	106.	C5.94h	MJW	C5.157	MJW
10/28/97	As	(CH3)4AsI	2.	ANIMAL BLOOD	1.89	-0.001	2000.	2000.	95.	C5.26	MJW	C5.172	MJW
10/28/97	As	As+3	20.	ANIMAL BLOOD	19.5	-0.001	20000.	20000.	98.	C5.26	MJW	C5.172	MJW
10/28/97	As	(CH3)4AsI	2.	BLOOD BLANK	1.80	0.007	286.	225.	90.	C5.26	MJW	C5.172	MJW
10/28/97	As	As+3	20.	BLOOD BLANK	17.8	0.007	2857.	2250.	89.	C5.26	MJW	C5.172	MJW
10/28/97	Se	SeMETH	2.	ANIMAL BLOOD	2.19	0.133	15.	565.	103.	C5.26	MJW	C5.171	MJW
10/28/97	Se	Se+4	20.	ANIMAL BLOOD	21.05	0.132	152.	5698.	104.	C5.26	MJW	C5.171	MJW
10/28/97	Se	SeMETH	2.	BLOOD BLANK	1.86	0.001	2000.	1081.	93.	C5.26	MJW	C5.171	MJW
10/28/97	Se	Se+4	20.	BLOOD BLANK	19.7	0.001	20000.	10811.	99.	C5.26	MJW	C5.171	MJW

[a]BID = Block Initiation Date: a date assigned to each member of a group of samples that will identify the sample as a member of the group or "block."

[b]Amt µg = the absolute microgram (µg) amount of the spike in the form listed in column 3 which was added to a sample.

[c]Total µg Meas. = the microgram (µg) of the analyte in the sample spike measured by the instrument (spike + background).

[d]Bkgd (µg) = Mean background amount in µg; the mean amount in µg from three aliquots of sample taken through the preparation and analysis methodology.

[e]Spk/Bkgd = the ratio of the spike amount added (column 4) divided by the mean sample background concentration (column 7).

[f]%REC = Total µg Meas. (column 6) - Bkgd. µg (column 7) divided by the Amt. µg (column 4) X 100.

Table 6. Percent recoveries of mercury, arsenic, and selenium in analysis spikes analyzed as matrix suppression or enhancement checks.

BID[a]	Ele.	Matrix	Analysis Units	Spk. Amt. µg[b]	Vol.	Effec. Conc.[c]	Bkgd. Conc.[d]	Total Conc.[e]	%REC[f]	SOP	Prep. Init.	ISOP	Oper. Init.
10/6/97	Hg	BLOOD	ng/mL	0.05	5.	10.	6.41	15.85	94.	C5.94h	MJW	C5.157	MJW
10/6/97	Hg	BLOOD	ng/mL	0.05	5.	10.	2.90	13.74	108.	C5.94h	MJW	C5.157	MJW
10/28/97	As	BLOOD	ng/mL	0.10	10.	10.	0.31	10.30	100.	C5.26	MJW	C5.172	MJW
10/28/97	As	BLOOD	ng/mL	0.10	10.	10.	0.60	10.74	101.	C5.26	MJW	C5.172	MJW
10/28/97	Se	BLOOD	ng/mL	0.05	10.	5.	5.04	10.45	108.	C5.26	MJW	C5.171	MJW
10/28/97	Se	BLOOD	ng/mL	0.05	10.	5.	5.94	11.11	103.	C5.26	MJW	C5.171	MJW

[a]BID = Block Initiation Date: a date assigned to each member of a group of samples that will identify the sample as a member of the group or "block."

[b] Spk Amt. µg = the absolute microgram (µg) amount of the spike in the form listed in column 3 which was added to a sample.

[c]Effec. Conc. = the Spike Amt divided by the total solution volume.

[d]Bkgd. Conc. = the measured concentration of the sample prior to spiking.

[e]Total Conc. = the measured concentration of the spiked sample (spike + background).

[f]%REC = percent recovery.

Table 7. Blank equivalent concentrations (BEC) of mercury, arsenic, and selenium for procedural blank solutions analyzed as part of a sample group or "block."

BID[a]	Ele.	Matrix	Soln. Units	Soln 1 Conc.	Soln 2 Conc.	Soln 3 Conc.	Dil. Vol.	Mean Conc.[b]	Sample Vol.[c]	Mean BE ng/mL	BEC SD ng/mL	PSOP	Prep. Init.
10/6/97	Hg	BLOOD	ng/mL	0.005	0.004	-0.001	20.2	0.00267	1.0	0.054	0.065	C5.94h	MJW
10/6/97	Hg	BLOOD	ng/mL	0.025	-0.010	-0.016	20.2	-0.00033	1.0	- 0.007	0.447	C5.94h	MJW
10/28/97	As	BLOOD	ng/mL	-0.050	0.130	0.030	100.	0.03667	1.0	3.67	9.00	C5.26	MJW
10/28/97	As	BLOOD	ng/mL	0.040	0.170	0.000	100.	0.07000	1.0	7.00	8.90	C5.26	MJW
10/28/97	Se	BLOOD	ng/mL	0.041	0.004	0.038	100.	0.02767	1.0	2.80	2.10	C5.26	MJW
10/28/97	Se	BLOOD	ng/mL	0.023	0.006	-0.014	100.	0.00500	1.0	0.50	1.80	C5.26	MJW

[a]BID = Block Initiation Date: a date assigned to each member of a group of samples that will identify the sample as a member of the group or "block."

[b]Mean Conc. = the mean solution concentration of the procedural blanks for a block, n = 3.

[c]Sample Vol. = volume (mL) used for BEC calculation.

Table 8. Instrument detection limit for mercury, arsenic, and selenium.

BID	Run Date[a]	Ele.	Std. Conc.[b]	Std SD 1[c]	Std SD 2	Std SD 3	IDL[d]	Units	SOP	Oper. Init.
10/6/97	10/24/97	Hg	0.25	0.00850	0.01707	0.02116	0.047	ng/mL	C4.95	ng/mL
10/28/97	11/6/97	As	1.0	0.07050	0.11865	0.06589	0.255	ng/mL	C4.95	ng/mL
10/28/97	9/18/97	Se	0.40	0.01976	0.02430	0.03055	0.075	ng/mL	C4.95	ng/mL
10/28/97	11/6/97	As	1.0	0.07050	0.11865	0.06589	0.255	ng/mL	C4.95	ng/mL

[a]date of 3rd consecutive day analysis, following which IDL was computed.

[b]concentration of low level standard used in analysis, in ppb.

[c]standard deviation from analysis of standard 7 consecutive times in one day.

[d]IDL = instrument detection limit, computed as 3 times the mean of standard deviations.

Table 9. Limit of detection (LOD) and limit of quantitation (LOQ) values for mercury, arsenic, and selenium.

BID[a]	Ele.	Matrix	W/D/L[b]	Sample SD[c]	Blank SD[d]	LOD[e]	LOQ[f]	PSOP	Prep. Init.	ISOP	Oper. Init.	Units
10/6/97	Hg	BLOOD	L	0.423237	0.065	1.28	4.24	C5.94h	MJW	C5.157	MJW	ng/mL
10/28/97	As	BLOOD	L	1.527525	9.02	27.4	90.6	C5.26	MJW	C5.172	MJW	ng/mL
10/28/97	Se	BLOOD	L	1.006645	2.06	6.87	22.7	C5.26	MJW	C5.171	MJW	ng/mL

[a]BID = Block Initiation Date: a date assigned to each member of a group of samples that will identify the sample as a member of the group or "block."

[b]W/D/L = wet, dry, or liquid (starting sample state).

[c]Sample SD = the standard deviation of low level sample concentrations.

[d]Blank SD = the standard deviation of procedural blank concentrations.

[e]LOD = limit of detection calculated as:

$$3\,[SD_b^2 + SD_s^2]^{1/2}$$

where SD_b = standard deviation of the blank and SD_s = standard deviation of a low level sample.

[f]LOQ = limit of quantitation calculated as 3.3 X LOD. Values between LOD and LOQ have poorer accuracy and thus poorer reliability.

Table 10. Instrumental precision and sensitivity within an analytical "run" for mercury, arsenic, and selenium determined by cold vapor or hydride generation techniques.

BID[a]	Ele.	Run Date	Std. Conc.[b]	Volc (µL)	Initial Abs/Read	Mean Read[d]	# of checks	SD[e]	%RSD[f]	Char. Mass[g]	ISOP	Oper. Init.
10/6/97	Hg	10/17/97	5.	500	0.088	0.09090	10	0.005043	5.5	N/A	C5.157	MJW
10/28/97	As	11/4/97	10.	500	0.104	0.11645	11	0.008371	7.2	N/A	C5.172	MJW
10/28/97	Se	11/10/97	5.	500	0.139	0.14627	15	0.004234	2.9	N/A	C5.171	MJW

[a]BID = Block Initiation Date: a date assigned to each member of a group of samples that will identify the sample as a member of the group or "block."

[b]Std. Conc. = units in ppb unless otherwise noted.

[c]Vol (µL) = microliters of standard injected into graphite furnace.

[d]Mean Read = units are absorbance, concentration, or intensity depending upon instrumentation used.

[e]SD = standard deviation.

[f]%RSD = percent relative standard deviation.

[g]Char. Mass = picograms of the analyte that will give 1% absorption (applicable for graphite furnace techniques only).

Table 11. Percent relative standard deviation from repeated analysis of Trace Metals in Drinking Water Standard[a] during blood run. Results expressed in ng/mL.

Element	Run #1	Run #2	Run #3	Run #4	Run #5	Run #6	Run #7	Run #8	Actual Conc	Mean Conc	SD	% RSD
Li	15.	15.	16.	20.	20.	21.	20.	18.	20.	18.	2.6	15.
Be	17.	18.	18.	20.	19.	21.	20.	20.	20.	19.	1.4	7.6
Na	5248.	5572.	5733.	6334.	6373.	6781.	6582.	6281.	6000.	6007.	579.	9.6
Mg	7741.	7843.	8242.	8856.	9260.	9886.	9412.	9772.	9000.	8638.	847.	9.8
Al	102.	99.	108.	117.	113.	124.	124.	118.	120.	110.	9.4	8.5
K	2646.	2831.	3030.	3289.	3150.	3317.	3416.	3414.	2500.	3044.	264.	8.7
Ca	36564.	34779.	36645.	40586.	41648.	46627.	44375.	43661.	35000.	39475.	4374.	11.
V	30.	29.	32.	33.	33.	36.	36.	35.	30.	32.	2.4	7.6
Cr	18.	19.	21.	23.	21.	23.	23.	22.	20.	21.	2.1	9.7
Mn	37.	38.	42.	41.	44.	44.	49.	45.	40.	41.	3.1	7.6
Fe	131.	123.	151.	112.	119.	141.	147.	142.	100.	129.	15.	11.
Co	23.	23.	26.	28.	28.	28.	26.	29.	25.	26.	2.5	9.6
Ni	60.	61.	64.	67.	68.	72.	69.	67.	60.	65.	4.7	7.1
Cu	16.	16.	19.	20.	20.	21.	21.	20.	20.	18.	2.3	13.
Zn	56.	56.	63.	69.	69.	71.	71.	69.	70.	64.	7.0	11.
As	68.	66.	75.	83.	81.	78.	78.	77.	80.	75.	6.8	9.1
Rb	8.4	8.4	9.4	9.6	9.4	9.3	9.6	9.7	10.	9.1	0.5	6.0
Sr	206.	227.	230.	238.	218.	265.	268.	235.	250.	231.	20.	8.7
Mo	91.	84.	98.	94.	101.	101.	96.	95.	100.	95.	6.5	6.9
Ag	1.9	1.7	1.9	1.9	1.8	1.8	1.9	1.8	2.0	1.8	0.1	4.0
Cd	9.5	9.4	9.5	9.5	10.	9.5	9.1	9.7	10.	9.6	0.3	3.5
Sb	10.	8.8	10.3	9.4	9.3	9.3	9.2	9.9	10.	9.5	0.5	5.7
Te	3.0	3.1	3.2	3.2	3.1	3.2	3.1	3.1	3.0	3.1	0.1	3.0
Ba	41.	48.	48.	47.	45.	48.	46.	49.	50.	46.	2.7	5.8
Pr	11.	10.	11.	10.	10.	10.	10.	10.	10.	10.	0.5	5.1
Tb	11.	10.	10.	9.8	9.7	9.6	10.	11.	10.	10.	0.5	5.4
Tm	10.	9.6	11.	10.	10.	10.	9.3	10.	10.	10.	0.5	4.9
Ta	9.4	8.5	9.8	9.4	8.4	7.9	7.0	5.7	10.	8.9	0.7	8.2
Au	10.	5.9	10.	8.5	7.1	6.6	4.8	6.0	10.	8.0	1.8	22.
Tl	10.	9.7	10.	10.	9.7	10.	10.	9.3	10.	10.	0.3	3.0
Pb	41.	38.	40.	42.	42.	39.	42.	38.	40.	40.	1.6	3.9
Bi	9.5	9.0	9.9	9.5	8.6	9.4	9.4	8.8	10.	9.3	0.5	4.8
U	10.	9.9	11.	11.	10.	10.	9.9	9.6	10.	10.	0.3	3.1

[a]High Purity Trace Metals in Drinking Water, Cat# CRM-TMDW, Charleston, SC., Pr, Tb, Tm, Ta, and Au manually added to represent rare earth area of mass spectral range.

Table 12. Percent relative standard deviation from the triplicate preparation and analysis of a blood sample.

Element	IAEA A-13 Rep1	IAEA A-13 Rep2	IAEA A-13 Rep2	Mean	SD	%RSD
Li	< 1	< 1	< 1	—	—	—
Be	< 1	< 1	< 1	—	—	—
Na	20000	10000	10000	13333	5774	43
Mg	100	< 100	100	—	—	—
Al	7	2	0.7	3	3.3	103
K	3000	3000	4000	3333	577	17
Ca	400	400	400	400	0	0
Ti	2	2	2	2	0.0	0
V	0.5	0.6	1	0.7	0.3	38
Cr	2	2	1	2	0.6	35
Mn	0.1	< 0.1	< 0.1	—	—	—
Fe	3000	2000	3000	2667	577	22
Co	< 0.1	< 0.1	< 0.1	—	—	—
Ni	< 1	< 1	< 1	—	—	—
Cu	5	5	5	5	0.0	0
Zn	10	10	20	13	5.8	43
Ga	< 0.1	< 0.1	< 0.1	—	—	—
Ge	< 0.1	< 0.1	< 0.1	—	—	—
As	< 0.1	< 0.1	< 0.1	—	—	—
Rb	3	3	2	2.67	0.6	22
Sr	< 1	< 1	< 1	—	—	—
Y	< 1	< 1	< 1	—	—	—
Zr	< 1	< 1	< 1	—	—	—
Nb	< 1	< 1	< 1	—	—	—
Mo	< 0.1	< 0.1	< 0.1	—	—	—
Ru	< 1	< 1	< 1	—	—	—
Pd	< 0.1	< 0.1	< 0.1	—	—	—
Ag	< 0.1	< 0.1	< 0.1	—	—	—
Cd	< 0.1	< 0.1	< 0.1	—	—	—
In	< 1	< 1	< 1	—	—	—
Sn	< 0.1	< 0.1	< 0.1	—	—	—

Element	IAEA A-13 Rep1	IAEA A-13 Rep2	IAEA A-13 Rep2	Mean	SD	%RSD
Sb	< 0.1	< 0.1	< 0.1	—	—	—
Te	< 0.1	< 0.1	< 0.1	—	—	—
Cs	< 1	< 1	< 1	—	—	—
Ba	< 1	< 1	< 1	—	—	—
La	< 0.1	< 0.1	< 0.1	—	—	—
Ce	< 0.1	< 0.1	< 0.1	—	—	—
Pr	< 0.1	< 0.1	< 0.1	—	—	—
Nd	< 0.1	< 0.1	< 0.1	—	—	—
Sm	< 0.1	< 0.1	< 0.1	—	—	—
Eu	< 0.1	< 0.1	< 0.1	—	—	—
Gd	< 0.1	< 0.1	< 0.1	—	—	—
Tb	< 0.1	< 0.1	< 0.1	—	—	—
Dy	< 0.1	< 0.1	< 0.1	—	—	—
Ho	< 0.1	< 0.1	< 0.1	—	—	—
Er	< 0.1	< 0.1	< 0.1	—	—	—
Tm	< 0.1	< 0.1	< 0.1	—	—	—
Yb	< 0.1	< 0.1	< 0.1	—	—	—
Lu	< 0.1	< 0.1	< 0.1	—	—	—
Hf	< 0.1	< 0.1	< 0.1	—	—	—
Ta	< 0.1	< 0.1	< 0.1	—	—	—
W	< 0.1	< 0.1	< 0.1	—	—	—
Re	< 0.1	< 0.1	< 0.1	—	—	—
Os	< 0.1	< 0.1	< 0.1	—	—	—
Ir	< 0.1	< 0.1	< 0.1	—	—	—
Pt	< 0.1	< 0.1	< 0.1	—	—	—
Au	< 0.1	< 0.1	< 0.1	—	—	—
Tl	< 0.1	< 0.1	< 0.1	—	—	—
Pb	< 1	< 1	< 1	—	—	—
Bi	< 1	< 1	< 1	—	—	—
U	< 1	< 1	< 1	—	—	—

Table 13. Recovery of elements spiked into blanks or reference blood material prior to acid digestion.

a. Method Blank 1 (low spike)

Element	Spike Conc (ug/mL)	Bkgd Conc (ug/mL)	Spk/Bkgd Ratio	Total Conc (ug/mL	% Recovery
Cu	1.0	0.045	22.	1.2	119.
Zn	10.	-0.049	204.	10.	102.
Cd	1.0	0.001	833.	1.1	115.
Pb	1.0	0.009	108.	1.4	139.

b. Method Blank 1 (high spike)

Element	Spike Conc (ug/mL)	Bkgd Conc (ug/g)	Spk/Bkgd Ratio	Total Conc (ug/g)	% Recovery
Cu	2.0	0.045	44.	4.9	245.
Zn	20.	-0.049	407.	22.	111.
Cd	2.0	0.001	1667.	2.3	117.
Pb	2.0	0.009	216.	2.7	136.

c. Digestion Blank 1 (low spike)

Element	Spike Conc (ug/mL)	Bkgd Conc (ug/mL)	Spk/Bkgd Ratio	Total Conc (ug/mL	% Recovery
Cu	1.0	0.005	205.	1.3	133.
Zn	10.	-0.022	445.	12.	125.
Cd	1.0	0.000	2500.	1.2	118.
Pb	1.0	0.007	147.	1.3	131.

d. Digestion Blank 2 (high spike)

Element	Spike Conc (ug/g)	Bkgd Conc (ug/g)	Spk/Bkgd Ratio	Total Conc (ug/g)	% Recovery
Cu	2.0	0.005	411.	2.8	138.
Zn	20.	-0.022	890.	24.	119.
Cd	2.0	0.000	5000.	2.4	120.
Pb	2.0	0.007	294.	2.8	142.

e. IAEA A-13 (low spike)

Element	Spike Conc (ug/g)	Bkgd Conc (ug/g)	Spk/Bkgd Ratio	Total Conc (ug/g)	% Recovery
Cu	4.9	5.1	1.	11.	118.
Zn	49.	16.	3.	76.	123.
Cd	4.9	0.006	783.	6.	116.
Pb	4.9	0.29	17.	6.	114.

f. IAEA A-13 (high spike)

Element	Spike Conc (ug/g)	Bkgd Conc (ug/g)	Spk/Bkgd Ratio	Total Conc (ug/g)	% Recovery
Cu	9.8	5.	2.	18.	130.
Zn	98.	16.	6.	122.	109.
Cd	9.8	0.01	1566.	11.3	116.
Pb	9.8	0.29	34.	12.	116.

Table 14. Recovery of elements from tissue reference materials.

a. ECRC Striped Bass

Element	Units	Meas. Conc.	Cert. Mean	Upper Limit	Lower Limit	% Rec
Al	ug/g dry	24.4	21.1	25.7	16.5	100.
Cr	ug/g dry	2.93	1.40	2.60	0.20	113.
Fe	ug/g dry	332.	269.	297.	241.	112.
Ni	ug/g dry	2.27	1.80	3.20	0.40	100.
Cu	ug/g dry	5.61	4.20	4.70	3.70	119.
Zn	ug/g dry	50.3	43.9	45.9	41.9	110.
As	ug/g dry	4.25	3.20	3.70	2.70	115.
Cd	ug/g dry	0.29	0.33	0.45	0.21	100.
Pb	ug/g dry	5.09	3.62	4.79	2.45	106.

c. IAEA A-13 Animal Blood

Element	Units	Meas. Conc.	Cert. Mean	Upper Limit	Lower Limit	% Rec
Na	ug/g dry	15876.	12600.	13550.	11650.	136.
Mg	ug/g dry	108.	(99.)[a]	N/A	N/A	N/A[b]
K	ug/g dry	3385	2500.	2850.	2150.	157.
Ca	ug/g dry	378.	286.	339.	233.	162.
Fe	ug/g dry	2550.	2400.	2550.	2250.	100.
Ni	ug/g dry	0.081	(1.)[a]	N/A	N/A	N/A[b]
Cu	ug/g dry	5.3	4.3	4.9	3.7	108.
Zn	ug/g dry	14.1	13.0	14.0	12.0	101.
23 Rb	ug/g dry	2.6	2.3	3.0	1.6	100.
Pb	ug/g dry	0.23	(0.18)[a]	N/A	N/A	N/A[b]

[a]values in parentheses are not certified.

[b]recovery not applicable (N/A).

c. NIST RM50 Tuna

Element		Meas. Conc.	Cert. Mean	Upper Limit	Lower Limit	% Rec
Na	ug/g dry	1227.	(1100.)	1210.	990.	124.
K	ug/g dry	17150.	(12200.)	13420.	10980.	156.
Zn	ug/g dry	14.8	13.60	14.60	12.60	101.
As	ug/g dry	3.75	3.30	3.70	2.90	101.
Pb	ug/g dry	0.51	(0.46)	0.51	0.41	100.

Table 15. Blank equivalent concentrations (ug/L[a]) of elements in method blanks analyzed with eagle blood.

Element	BEC Blk 1	BEC Blk 2	BEC Blk 3	Element	BEC Blk 1	BEC Blk 2	BEC Blk 3
Li	0.0014	0.0024	0.0012	Sb	0.0018	0.0014	0.0012
Be	0.0	0.0016	0.0016	Te	0.0002	0.0006	0.0
Na	0.44	0.42	1.59	Cs	0.0	0.0	0.0
Mg	0.068	0.080	0.23	Ba	0.0024	0.0016	0.0036
Al	0.12	0.22	0.19	La	0.0024	0.0004	0.0002
K	0.85	2.02	2.56	Ce	0.0024	0.0004	0.0004
Ca	8.62	8.98	11.6	Pr	0.0004	0.0	0.0
Ti	0.025	0.031	0.015	Nd	0.0010	0.0002	0.0002
V	0.036	0.054	0.070	Sm	0.0	0.0	0.0
Cr	0.058	0.079	0.023	Eu	0.0	0.0	0.0
Mn	0.0054	0.0086	0.0066	Gd	0.0	0.0	0.0
Fe	9.94	3.07	9.58	Tb	0.0	0.0	0.0
Co	0.0008	0.0056	0.0006	Dy	0.0	0.0	0.0
Ni	0.016	0.025	0.0058	Ho	0.0	0.0	0.0
Cu	0.043	0.042	0.051	Er	0.0	0.0	0.0
Zn	0.0	0.0	0.0	Tm	0.0	0.0	0.0
Ga	0.0002	0.0	0.0	Yb	0.0	0.0	0.0
Ge	0.0	0.0	0.0	Lu	0.0	0.0	0.0
As	0.0094	0.0036	0.0	Hf	0.0	0.0	0.0
Rb	0.0002	0.0002	0.0004	Ta	0.0002	0.0002	0.0002
Sr	0.0030	0.0026	0.0062	W	0.0004	0.0008	0.0002
Y	0.0	0.0	0.0	Re	0.0	0.0	0.0
Zr	0.0030	0.0060	0.0034	Os	0.0	0.0	0.0
Nb	0.0002	0.0002	0.0	Ir	0.0	0.0	0.0
Mo	0.0056	0.0032	0.0018	Pt	0.0	0.0	0.0
Ru	0.0	0.0	0.0	Au	0.0098	0.0050	0.0026
Pd	0.0	0.0	0.0	Tl	0.0	0.0	0.0
Ag	0.0006	0.0002	0.0002	Pb	0.011	0.010	0.0066
Cd	0.0008	0.0014	0.0014	Th	0.0	0.0	0.0
In	0.0	0.0	0.0	U	0.0	0.0	0.0
Sn	0.014	0.0086	0.010				

[a]concentrations of Ca,Mg,K,Na in mg/L.