

May 24, 2004

URS

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Project: Navy Contract N44255-02-D-2008 0504.510  
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DO 0010 Long-Term Marine Monitoring, Adak, Alaska

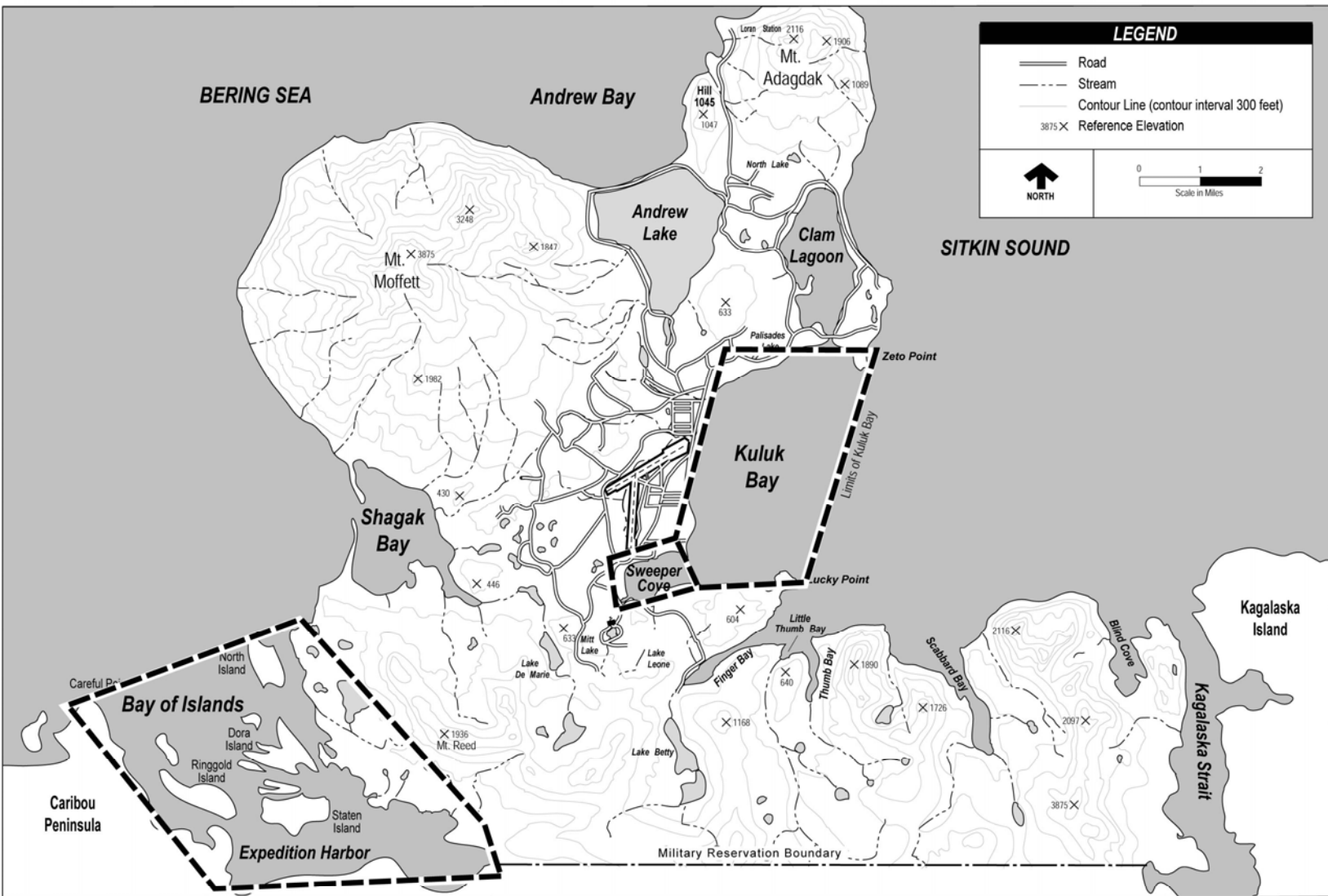
Subject: Technical Memorandum  
Evaluation of Adak Island Blue Mussel and Rock Sole Tissue 1999 Through 2003

Dear Mr. Brown,

In accordance with the Navy scope of work (SOW) dated February 26, 2003, this technical memorandum (in letter report format) provides an evaluation of polychlorinated biphenyl (PCB) concentrations in rock sole (*Lepidopsetta bilineata*) and blue mussel (*Mytilus edulis*) collected from the vicinity of Adak Island, Alaska (Figure 1) each summer from 1999 through 2003. This technical memorandum also summarizes the marine sampling effort performed in the summer of 2003. This data evaluation was performed as part of Delivery Order 10 – Long-Term Marine Monitoring, Adak, Alaska; Navy ID/IQ Contract N44255-02-D-2008.

The primary conclusions drawn from the evaluation of the 5-year baseline marine monitoring effort are that (1) total PCB concentrations appear to be increasing in rock sole from Sweeper Cove and Kuluk Bay (2) total PCB concentrations in rock sole from Sweeper Cove and Kuluk Bay exceed the risk-based action level (RBAL) of 6.5 ug/kg, (3) total PCB concentrations in blue mussel from Sweeper Cove slightly exceed the RBAL of 31 ug/kg, but are trending downward, and (4) total PCB concentrations in blue mussel from Kuluk Bay are trending upward, but remain below the RBAL.

URS recommends that the Navy maintain current fish consumption advisories with the exception of the advisory for blue mussels from Kuluk Bay. URS also recommends continued sampling for rock sole and blue mussel from Sweeper Cove and Kuluk Bay but at a reduced sampling frequency of every other year (2005, 2007, and 2009) through the next five-year review period to monitor the trends in the total PCB concentrations.



**Figure 1**  
**Marine Tissue Sampling Areas**

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Adak Island, AK  
TECHNICAL MEMORANDUM

## **Objective**

The objective of the marine fish and shellfish monitoring program at Adak is to determine temporal trends in the PCB concentrations in fish and shellfish from Adak which may be consumed by humans, and to determine whether institutional controls (i.e. fish consumption advisories) on fish and shellfish from Kuluk Bay and Sweeper Cove can be removed. The 2003 sampling event concludes five years of marine sampling required by the Record of Decision (ROD) for Operable Unit A (OU A) Naval Air Facility (NAF) Adak. Five years of data establishes the baseline that can be evaluated for temporal trends.

## **Introduction to the Marine Biomonitoring Program for Adak**

As part of the ROD for Operable Unit A, remedial action criteria for total PCB concentrations in marine fish and shellfish were established. These risk-based action level (RBAL) concentrations are: 6.5 ug/kg PCB for marine fish and 31 ug/kg PCB for marine shellfish. Rock sole and blue mussels were selected for evaluation as the key species for fish and shellfish, respectively, because they are readily available source of seafood at Adak.

PCB concentrations in fish or shellfish above the RBAL have a potential to pose unacceptable human health risks to subsistence consumers under the subsistence exposure scenario outlined in the ROD. Within the ROD, unacceptable carcinogenic risks are defined as risks greater than  $1.0 \times 10^{-5}$ , based upon State of Alaska regulations. Both marine fish species and blue mussels from Sweeper Cove and Kuluk Bay contained total PCB concentrations in excess of the RBAL at the time the ROD was signed. Because of these exceedances, a consumption advisory on fish and shellfish from Sweeper Cove and Kuluk Bay has been in place for several years.

In conjunction with regulatory agencies, the Navy developed a comprehensive monitoring plan (CMP) published in 2001 (Revision 1 in 2004), which includes monitoring of fish and shellfish in the marine environment. The marine monitoring program is designed to document the effectiveness of remedial actions on Adak, and also to make a determination of whether the fish/shellfish consumption advisories need to remain in place. This technical memorandum evaluates the total PCB concentrations in rock sole and blue mussel tissue collected in 1999, 2000, 2001, 2002, and 2003 from Sweeper Cove, Kuluk Bay, and Bay of Islands (reference area). Remedial actions to control sources of PCBs affecting Sweeper Cove and Kuluk Bay were completed in 1999.

The Biological Resources Division (BRD) of the United States Geological Survey (USGS) collected samples from 1999 through 2002, and URS collected samples in 2003. The BRD provided the analytical results from their sampling efforts so that all rock sole and blue mussel data could be evaluated.

## Fish Consumption Advisory Description, Risk-Based Action Level Derivation

The risk assessment process used to develop the Adak marine fish (6.5 ug/kg PCB) and shellfish (31 ug/kg PCB) RBALs is described below, together with the derivation of the RBALs. The Adak fish consumption advisory presented in the ROD is expressed in terms of the maximum allowable PCB concentration in fish and shellfish (i.e. the RBAL).

A fish consumption advisory (fish here is taken to mean both fish and shellfish) describes the maximum amount of fish that can be consumed without posing an unacceptable risk to humans. Unacceptable risk for carcinogenic chemicals, a group that includes PCBs, is defined as a lifetime  $1 \times 10^{-5}$  (1 in 100,000) excess cancer risk. This maximum excess lifetime cancer risk is defined in State of Alaska regulations. Once the maximum acceptable risk has been identified, the amount of fish consumed and the concentration of chemicals the fish contains determine whether or not the risk to an individual exceeds the maximum acceptable risk.

An exposure scenario, in the context of the Adak fish consumption advisory, defines how people obtain and consume fish and shellfish from Sweeper Cove and Kuluk Bay. The exposure scenario describes how often people consume fish, how much fish is consumed, the portion of a lifetime an individual consumes fish, where the fish are obtained, and how much of the total fish consumed comes from Sweeper Cove and Kuluk Bay. To estimate the maximum permissible concentration of PCBs in fish tissue (i.e. the RBAL), the exposure scenario is combined with the maximum allowable risk level and information on the potential of PCBs to cause cancer. Equation 1 illustrates how the RBAL for Adak was calculated.

$$\text{Equation 1: } RBAL = \frac{(TCR \times BW \times AT_C)}{(CSF_o \times IR \times FI \times EF \times ED \times UCF)}$$

Where:

- RBAL = PCB risk-based action level (6.5 or 31 ug/kg wet weight)
- TCR = target cancer risk ( $1 \times 10^{-5}$ , unitless)
- BW = body weight (70 kg)
- $AT_C$  = carcinogenic averaging time (25,550 days = 70 years)
- $CSF_o$  = oral cancer slope factor for PCB [ $(2000 \text{ ug/kg-day})^{-1}$ ]
- IR = ingestion rate (126 g/day for fish, 26 g/day for shellfish)
- FI = fraction ingested from source area (1.0, unitless)
- EF = exposure frequency (365 days/year)
- ED = exposure duration (30 years)
- UCF = unit conversion factor ( $10^{-3}$  kg/g)

## 2003 Sample Collection and Analysis

In July and August 2003, the URS sampling team collected five rock sole composite samples from Kuluk Bay and five rock sole composite samples (in addition to one field duplicate sample) from Sweeper Cove. Figure 3 shows the trawl lines where rock soles were collected in Kuluk Bay and Sweeper Cove. Table A-1 lists the starting and ending points of each of the trawl lines in the three embayments where rock sole were collected.

Five rock sole composite samples were collected from the Bay of Islands on the western side of Adak to establish background PCB levels that are not a result of Navy activity near Sweeper Cove or Kuluk Bay. Multiple trawls were completed in each embayment until an adequate number of individual fish were caught for the required number of composite samples. Five trawls were completed in Kuluk Bay, eight in Sweeper Cove, and six in Bay of Islands. Each composite sample consisted of five individual fish that were from more than one trawl line. Therefore, there is no direct correlation between a specific trawl line in Figure 3 and a specific rock sole composite sample. Because fish are mobile, composite samples represent the rock sole in the entire embayments from where the samples were collected and not specific areas within the embayments. During trawling, the sampling crew used a 7.5-meter otter trawl net that was dragged along the sea floor because rock sole are bottom fish. Individual fish sampled for analyses ranged in age from approximately 4 to 10 years based on lengths ranging from approximately 23 to 36 centimeters, which is similar to the range of lengths of rock sole collected for analyses in previous years. URS chartered *Fishing Vessel Chesapeake* (Figure 2) with a captain and crew to perform the trawling. Rock sole samples were collected and processed for analysis according to the Final Project Management Plan (URS 2003).



**Figure 2. *Fishing Vessel Chesapeake* Near Adak During Sampling in 2003**

Blue mussel composite samples were also collected in July and August 2003 during low tide from five locations in Sweeper Cove, five locations in Kuluk Bay, and five locations in the Bay of Islands. All samples from Sweeper Cove and Kuluk Bay were collected from along the Adak Island shoreline with the exception of KB-102, which was collected offshore at Gannet Rocks as

shown on Figure 3. Six of the 10 sampling locations were near sampling sites that USGS used for sample collection. Table A-2 identifies the samples (Company Sample IDs) collected from 1999 through 2003 and the associated sampling sites from where they were collected. Future sampling locations to be specified in a revised Project Management plan will coincide with specific sampling sites to evaluate PCB trends at individual locations.

Each composite mussel sample consisted of approximately 30 to 40 blue mussels. Individual blue mussels collected for analyses were approximately 2 to 4 years old based on shell lengths ranging from approximately 3.5 to 6.1 centimeters, which is similar to the range of shell lengths of blue mussels collected for analyses in previous years. Samples were collected by hand and processed for analysis according to the Final Project Management Plan (URS 2003). Refer to Figure 3 for locations of samples collected in Sweeper Cove and Kuluk Bay. Global positioning system (GPS) coordinates are provided for each blue mussel sampling location in the attached electronic file on CD-ROM.

All rock sole and blue mussel samples were analyzed using EPA Method 1668A for 209 PCB congeners (defined in the next paragraph). Alta Analytical Laboratory in El Dorado, California analyzed the samples.

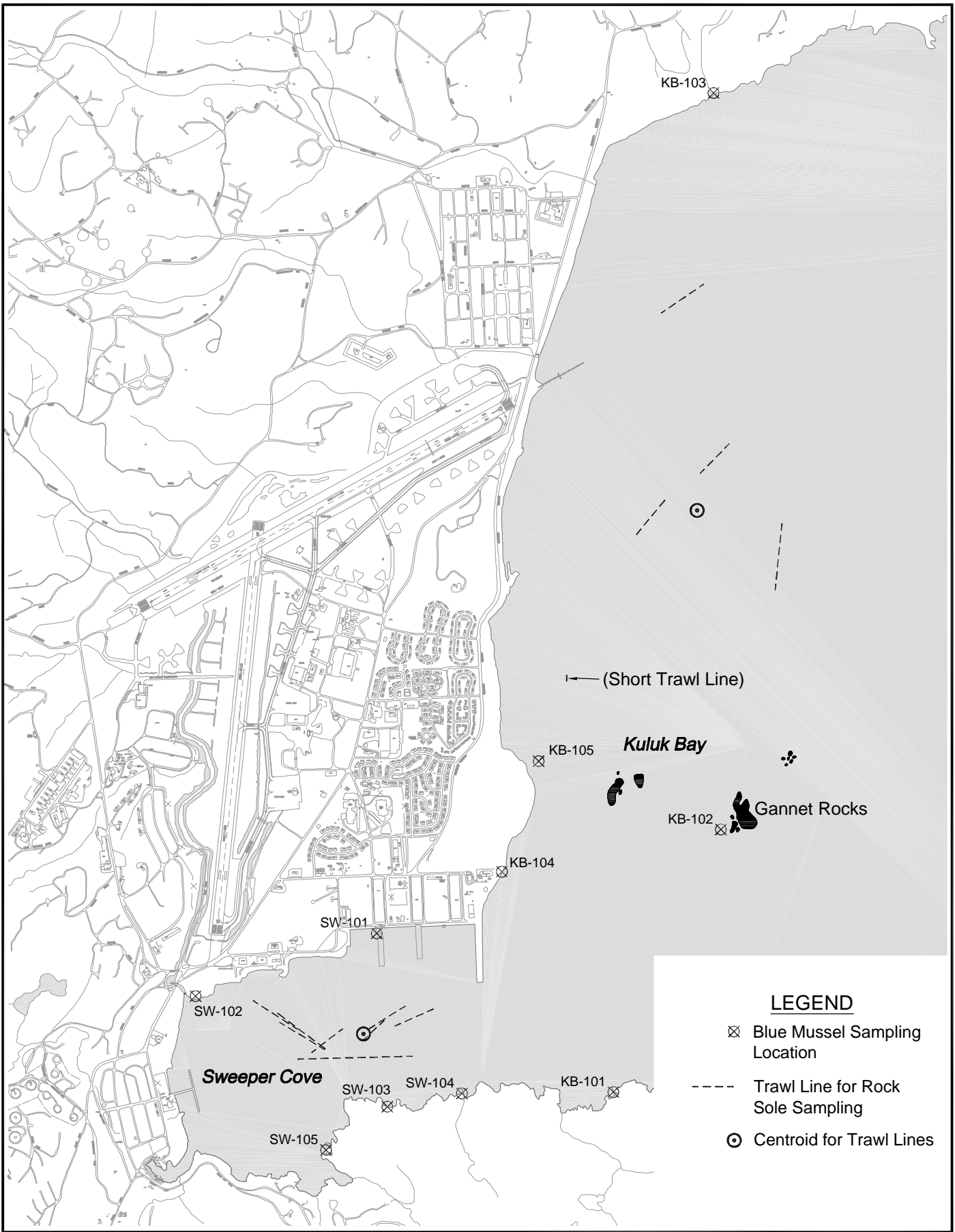
PCBs are a group of 209 individual chemical compounds. Each of the 209 different PCB compounds is termed a congener, thus, there are 209 PCB congeners. The total number and position of chlorine atoms in the PCB molecule defines a specific PCB congener. PCB congeners contain between 1 and 10 chlorine atoms. Chlorine atoms can be attached to any combination of the 10 available binding locations on the biphenyl molecule that is the base of all PCB congeners. The resulting 209 possible combinations of numbers of chlorines and their binding locations on a biphenyl molecule account for the 209 congeners. The 209 PCB congeners each have their own physical, chemical and toxicological properties that are unique to each congener.

All data quality objectives specified in the Final Project Management plan was met. Analytical results were provided within 30 days of receipt. Because all planned samples were collected and analyzed, 100 percent completeness was achieved, and the project objective of 95 percent was exceeded. The bias generally ranged from 80 to 140 percent recovery that exceeds the project objective of 30 to 150 percent recovery. The results that were associated with the recoveries that were not within the 80 to 140 percent range were qualified as estimated. Precision was calculated as a relative percent difference of 17 based on a duplicate mussel sample from Sweeper Cove; this meets the objective of  $\pm 50$  relative percent difference. Results of the data validation performed by Ecochem showed that 99.97 percent of the data was usable.

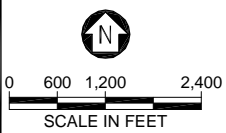
### **Statistical Assessment of Analytical Data**

All rock sole and blue mussel datasets collected were assessed for normality to determine the statistical methods of assessment. It was determined that the data for all sets of tissue samples were non-normally distributed. In all cases, the W-test results were consistent with a lognormal distribution of the data. Based on this observation, nonparametric statistical procedures were

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**Figure 3**  
**2003 Marine Sampling Locations**  
**in Sweeper Cove and Kuluk Bay**

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chosen to compare (1) PCB concentrations to the RBAL and (2) PCB concentrations for Kuluk Bay and Sweeper Cove against the reference area. The comprehensive monitoring plan states that statistical comparisons to the RBAL will be performed on an embayment-by-embayment basis. This is the reason for splitting the data into Sweeper Cove and Kuluk Bay datasets.

PCB concentrations in both species from Kuluk Bay and Sweeper Cove were compared to the RBAL using the one-sample Sign Test. Data were considered to be significantly different when  $p < 0.05$ .

PCB concentrations in both species from Kuluk Bay and Sweeper Cove were compared against PCB concentrations in the same species from the Bay of Islands reference area using the non-parametric Mann-Whitney Test. Data were considered to be significantly different when  $p < 0.05$ .

An estimation of temporal trends in PCB concentrations found in blue mussel and rock sole from Kuluk Bay and Sweeper Cove was calculated using a simple linear regression technique. Mean concentrations for both species were plotted for each embayment over time and a “best-fit” linear regression equation was calculated. The resulting equation for each species in each embayment is an estimate of the change in concentration over time.

In addition, the R squared ( $R^2$ ) value for each equation is shown. The  $R^2$  value documents the proportion of variation that is explained by the model. The closer the  $R^2$  value is to 1, the better the fit of the equation to the data. An equation with a low  $R^2$  represents a relatively “poor” fit to the data.

### **Analytical Method Considerations**

It should be noted that the number of congeners analyzed for a given sampling round varied; however, the total PCB concentrations are comparable. Approximately 60 congeners were included in the analyses of the samples collected in 1999 and 2000, approximately 90 congeners were included in the analyses of the samples collected in 2001 and 2002 (several congeners coeluted), and 209 congeners were included in the analyses of the samples collected in 2003. A laboratory analysis may have reported one concentration for two or more congeners. For example, PCB-3 and PCB-30 were combined as PCB-3/30 in one test with one value during the 1999 analyses because these two congeners coeluted, or were not distinguishable during testing with the laboratory instruments. When PCB congeners coelute, the congeners produce a similar peak on a chromatogram, which cannot be differentiated. Therefore, the number of single tests for a sample, which can include coeluting congeners, may differ from the number of congeners tested for. Coeluting congeners are considered as one analyte for reporting purposes. The number of analytes tested for each sample collected from 1999 through 2003 is presented in Table A-3.

The number of congeners reported varied because the three laboratories that analyzed the marine tissue used different analytical methods. The University of Utah laboratory analyzed the 1999 and 2000 samples using EPA Method 8082/1668A Modified; Axys Analytical Services analyzed the 2001 and 2002 samples using EPA Method 8082/1668A Modified, and Alta Analytical

Laboratory analyzed the 2003 samples using EPA Method 1668A. The analytical methods used from 1999 through 2002 could not reliably quantify congeners that have very low concentrations that are typically measured in the parts per trillion range. The 2003 samples were analyzed using Method 1668A, which is capable of analyzing for the 209 PCB congeners. Total PCBs were calculated for each of the five years by summing the detected concentrations of the individual congeners.

The 2003 marine tissue data was used to evaluate the difference between mean total PCB concentrations based on the congeners tested for in 1999 and 2000 and mean total PCB concentrations based on the 209 congeners tested for in 2003. As one would expect, the mean total PCBs using the results from all 209 congeners were higher (4 to 16 relative percent difference) than the total PCBs based on the congeners tested for in the 1999 and 2000. This suggests that the approximately 60 congeners tested for in 1999 and 2000 contribute to approximately 84 percent or more towards the total PCB concentration that would result if 209 congeners were reported and included in the total PCB concentration in a sample. The overall trends in PCB concentrations over the past five years (discussed in the following sections) remained the same (increasing or decreasing) whether using the total PCB concentrations calculated from the results of the 209 congeners or the results of the approximately 60 congeners tested for in 1999 and 2000.

The mean reporting limits for nondetected values are approximately 0.1 ug/kg for samples collected in 1999 and 2000 and analyzed by the University of Utah, 0.064 ug/kg in 2001 and 0.055 ug/kg in 2002 for samples analyzed by Axys, and 0.0046 for samples collected in 2003 and analyzed by Alta. These detection limits are adequately low to detect total PCB concentrations in excess of the RBAL. The 1999 through 2002 mean reporting limits are approximately 50 to 1000 times less than the mean total PCB concentrations detected in Sweeper Cove and Kuluk Bay. The 2003 mean reporting limit is three to four orders of magnitude below the mean total PCB concentrations detected in Sweeper Cove and Kuluk Bay. If one-half of the detection limits for each nondetected congener (approximately 35 congeners in 1999 through 2002 and 95 congeners in 2003) were included in the calculation of the total PCB concentrations, there would be either a similar increase in total PCB concentrations of the samples within an embayment or no substantial difference in the resulting total PCB concentration.

### **Rock Sole Analytical Results**

Total PCBs in rock sole tissue collected in 1996 and 1999 through 2003 in Sweeper Cove, Kuluk Bay, and Bay of Islands are reported as wet weight concentrations in Table 1. All analytical results used for this technical memorandum are included in electronic format on the attached CD-ROM. Table A-3 summarizes the total PCB concentrations in rock sole samples collected in Sweeper Cove, Kuluk Bay, and Bay of Islands from 1999 through 2003.

Mean total PCB concentrations of rock sole data from Sweeper Cove range from 56.2 ug/kg in 2000 to 96.0 in 2003 (Table 1). The mean concentration for each year has increased and is above the RBAL of 6.5 ug/kg. The PCB concentration in the one sample collected in 1999 was less than the mean PCB concentrations in the following years. The graph of the results by year (Figure 4a) shows an upward trend in total PCB concentrations in rock sole collected from

Sweeper Cove. Figure 4a also shows the range of the total PCB concentrations for each mean value. In 1996 rock sole samples from Sweeper Cove, which were analyzed for total PCBs using EPA Method 8080, contained a mean concentration of 186 ug/kg. This concentration is more than three times higher than the 1999 and 2000 mean concentrations.

**Table 1**  
**Summary Statistics for Total PCBs in Rock Sole**

Embayment	Year Sampled	Number of Composite Samples	Minimum Concentration (ug/kg)	Maximum Concentration (ug/kg)	Mean Concentration (ug/kg)
Sweeper Cove	1996	5	Not Detected	341	185.5
	1999	1 <sup>a</sup>	52.9	52.9	-
	2000	2	31.1	81.4	56.2
	2001	2	44.6	79.4	62
	2002	2	55.5	120	87.5
	2003	6	73.4	132	96.0
Kuluk Bay	1996	5	14	60	32.4
	1999	1 <sup>a</sup>	10.6	10.6	-
	2000	3	2.52	9.21	5.01
	2001	2	0.93	14.6	7.75
	2002	2	1.48	8.41	4.94
	2003	5	8.88	21.0	13.5
Bay of Islands	1999	0	-	-	-
	2000	2	1.05	1.14	1.10
	2001	0	-	-	-
	2002	0	-	-	-
	2003	5	0.28	0.35	0.32

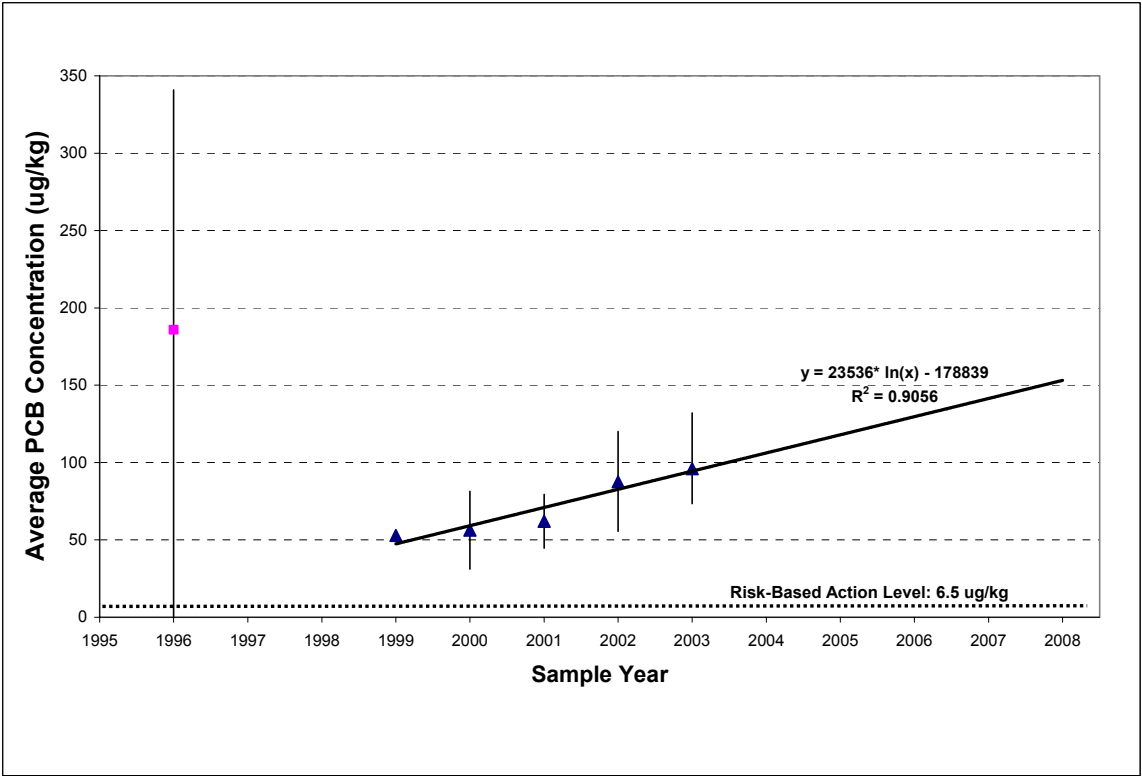
<sup>a</sup> Sample consisted of a single rock sole and is therefore not a composite sample

Notes: All concentrations are based on wet weight.

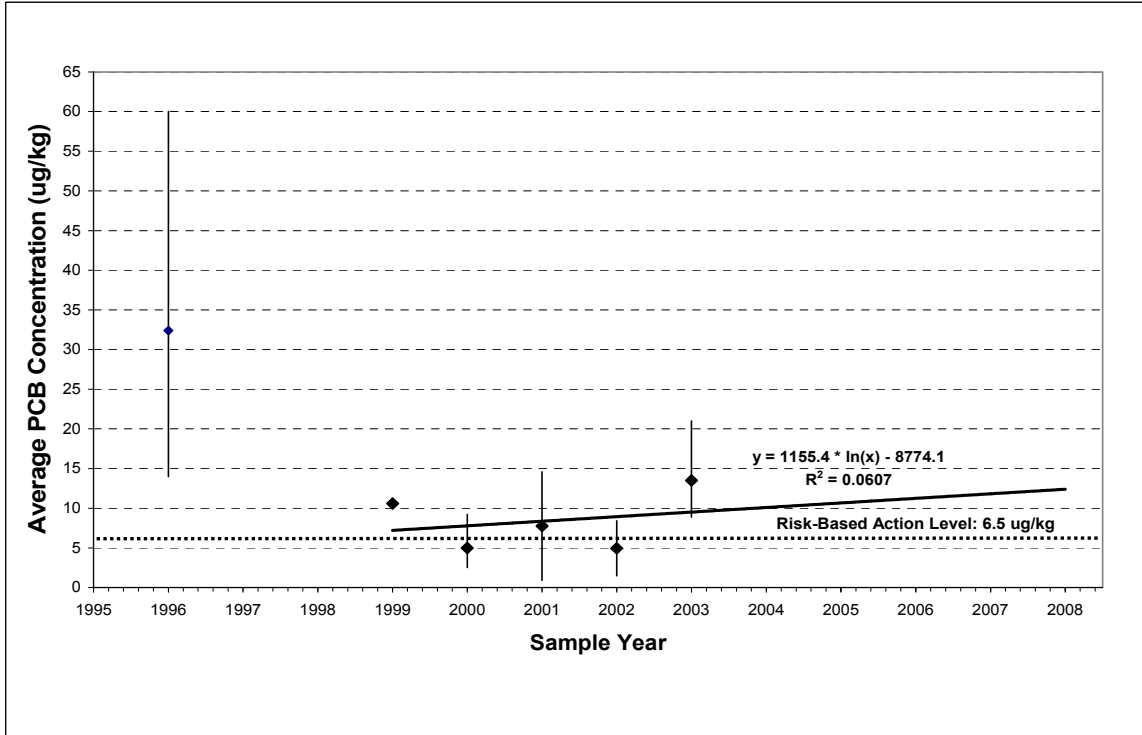
Adak risk-based action level for rock sole is 6.5 ug/kg wet weight.

Mean total PCB concentrations of rock sole data from Kuluk Bay range from 4.94 ug/kg in 2002 to 13.5 in 2003 (Table 1). The mean concentration for each year has not consistently increased or decreased over time. The total PCB concentration of the sample collected in 1999 and the mean total PCB concentrations detected in 2001 and 2003 were above the RBAL of 6.5 ug/kg. The graph of the results by year (Figure 4b) shows a slight upward trend in total PCB concentrations in rock sole collected from Kuluk Bay. In 1996 rock sole samples from Kuluk Bay, which were analyzed for total PCBs using EPA Method 8080, contained a mean concentration of 32.4 ug/kg.

Rock sole was sampled in 2000 and 2003 at the reference area, Bay of Islands. Mean total PCB concentrations of rock sole data from Bay of Islands were 1.10 ug/kg in 2000 and 0.32 in 2003 (Table 1). There is a decrease in concentrations from 2000 to 2003. The mean and maximum



**Figure 4a. Lognormal Curve Fit Expressions, Goodness of Fit, and Five Year Extrapolations for Rock Sole in Sweeper Cove**



**Figure 4b. Lognormal Curve Fit Expressions, Goodness of Fit, and Five Year Extrapolations for Rock Sole in Kuluk Bay**

total PCB concentrations for both years are below the RBAL of 6.5 ug/kg. With only two years of data, a meaningful trend cannot be identified.

### **Statistical Comparison of 2003 PCB Concentrations in Rock Sole Against Background and the RBAL**

PCB concentrations in rock sole tissue collected in 2003 from Kuluk Bay and Sweeper Cove are significantly greater ( $p < .01$ ) than PCB concentrations in samples collected from the Bay of Islands reference area. Because PCB concentrations from both embayments differ from natural background concentrations, samples from Kuluk Bay and Sweeper Cove were compared against the RBAL.

PCB concentrations in rock sole collected from Kuluk Bay and Sweeper Cove in 2003 were significantly higher ( $p < 0.05$ ) than the RBAL of 6.5 ug/kg. It should also be noted that the minimum detected PCB concentrations in the 2003 samples collected from both embayments were higher than the RBAL. PCB concentrations for rock sole tissue collected from Bay of Islands were found to be significantly lower ( $p < 0.05$ ) than the RBAL of 6.5 ug/kg.

### **Blue Mussel Analytical Results**

Total PCBs (wet weight) in blue mussel tissue collected from 1999 through 2003 in Sweeper Cove, Kuluk Bay, and Bay of Islands are provided in Table 2. All analytical results are contained on the attached CD-ROM. Table A-3 summarizes the total PCB concentrations in blue mussel samples collected in Sweeper Cove, Kuluk Bay, and Bay of Islands from 1999 through 2003.

Mean total PCB concentrations of blue mussel data from Sweeper Cove range from 24.4 ug/kg in 2001 to 60.9 in 2000 (Table 2). The mean total PCB concentrations detected in 1999, 2000, and 2003 were above the RBAL of 31 ug/kg. The graph of the results by year (Figure 5a) shows a downward trend in total PCB concentrations in blue mussel collected from Sweeper Cove. Figure 5a also shows the range of the total PCB concentrations for each mean value.

Mean total PCB concentrations of blue mussel data from Kuluk Bay range from 4.07 ug/kg in 1999 to 16.5 in 2001 (Table 2). Mean total PCB concentrations for each year are below the RBAL of 31 ug/kg. The graph of the results by year (Figure 5b) shows an upward trend in total PCB concentrations in blue mussel tissue collected from Kuluk Bay.

Mean total PCB concentrations of blue mussel data from Bay of Islands range from 0.024 ug/kg in 2001 to 0.59 in 2000 (Table 2). Mean and maximum total PCB concentrations for each year are below the RBAL of 31 ug/kg.

### **Statistical Comparison of 2003 PCB Concentrations in Blue Mussel Against Background and the RBAL**

PCB concentrations in blue mussel tissue collected in 2003 from Kuluk Bay and Sweeper Cove are significantly greater ( $p < 0.01$ ) than PCB concentrations in samples collected from the Bay of

Islands reference area. Because PCB concentrations from both embayments differ from natural background concentrations, samples from Kuluk Bay and Sweeper Cove were compared against the RBAL.

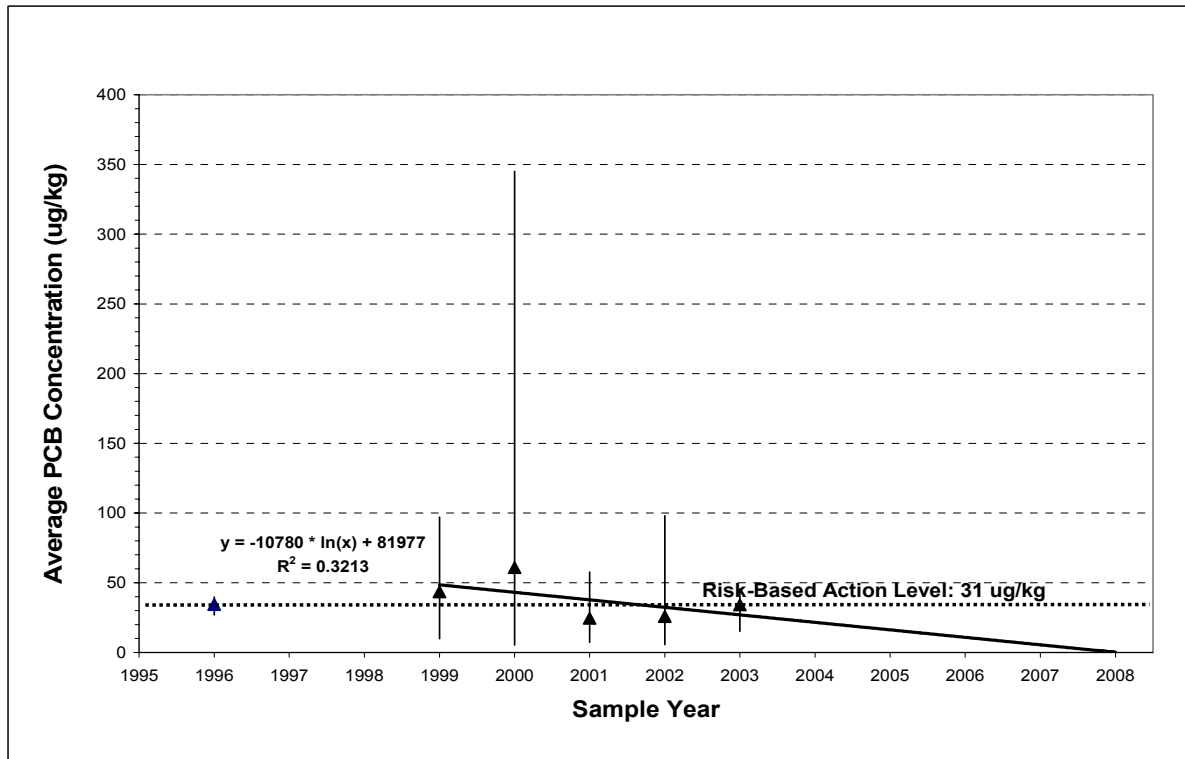
PCB tissue concentrations collected from Kuluk Bay in 2003 are significantly lower ( $p < 0.05$ ) than the RBAL of 31 ug/kg. In contrast, the PCB concentrations (mean of 34.1 ug/kg) from Sweeper Cove mussel tissue collected in 2003 are higher than the RBAL of 31 ug/kg.

**Table 2**  
**Summary Statistics for Total PCBs in Blue Mussel**

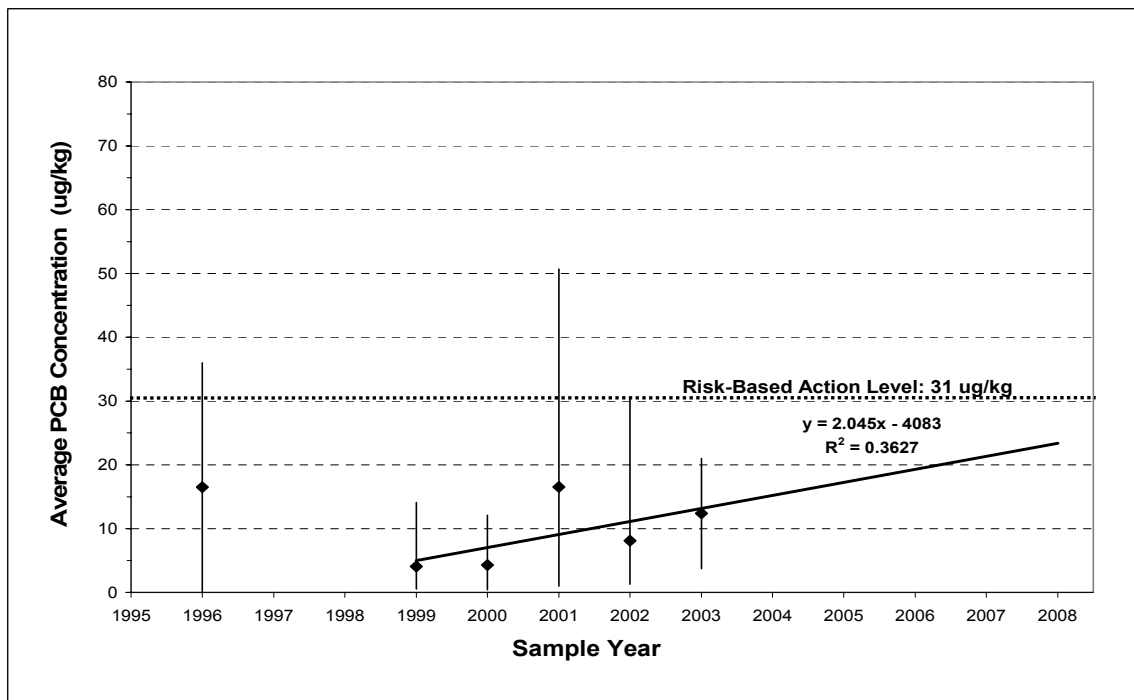
Embayment	Year Sampled	Number of Composite Samples	Minimum Concentration (ug/kg)	Maximum Concentration (ug/kg)	Mean Concentration (ug/kg)
Sweeper Cove	1996	6	26.9	39.6	34.3
	1999	8	9.7	97.0	43.5
	2000	7	5.22	345	60.9
	2001	7	7.19	57.7	24.4
	2002	7	5.50	98.0	25.7
	2003	6	15.2	45.7	34.1
Kuluk Bay	1996	11	Not Detected	36.0	16.5
	1999	9	0.55	14.1	4.07
	2000	9	0.41	12.1	4.31
	2001	9	0.99	50.7	16.5
	2002	9	1.27	30.4	8.10
	2003	5	3.73	21.0	12.4
Bay of Islands	1999	4	0.072	0.43	0.27
	2000	4	0.091	1.98	0.59
	2001	3	0.01	0.04	0.024
	2002	4	0.019	0.058	0.035
	2003	5	0.11	0.27	0.18

Notes: All concentrations are based on wet weight.

Adak risk-based action level for blue mussel is 31 ug/kg wet weight.



**Figure 5a. Curve Fit Expressions, Goodness of Fit, and Five Year Extrapolations for Blue Mussel in Sweeper Cove**



**Figure 5b. Curve Fit Expressions, Goodness of Fit, and Five Year Extrapolations for Blue Mussel in Kuluk Bay**

## **Evaluation of PCB Concentrations in Blue Mussel at Selected Locations Over Time**

Total PCB concentrations in samples from the mussel sampling sites in Table A-2 were plotted for Sweeper Cove in Figures A-1 and A-2 and for Kuluk Bay in Figures A-3 and A-4. Not all sites were sampled during each of the five sampling years.

Three of the nine sampling sites in Sweeper Cove have five data points (one for each year), and four sites have four data points. It appears that PCB concentrations at sites 27 and 31 may be trending upward. Sites 27 and 31 are located in the central area of the southern and northern shorelines of Sweeper Cove, respectively. Without additional data, it is difficult to identify apparent trends at other locations. Site 28 consistently had the highest concentrations.

Three of the 11 sampling sites in Kuluk Bay have five data points, and five sites have four data points. It appears that PCB concentrations at sites 03, 04, 05, 06, and 23 may be trending upward slightly. Sites 03, 04, 05, and 06 are located along the Kuluk Bay shoreline from north of Metals Landfill to the entrance to Clam Lagoon. Site 23 is located along the far southeast shoreline of Kuluk Bay. Sites 01 and 02, located offshore of Metals Landfill, typically contained the highest PCB concentrations, but have shown a decreasing trend since 2001.

## **Evaluation of Estimated Aroclor Concentrations**

The marine tissue samples collected in 1996 for the Remedial Investigation/Feasibility Study were analyzed for Aroclors, which are commercial mixtures of PCB congeners. No PCB congeners were analyzed for in 1996. The OU A ROD specified Aroclor 1254 as a chemical of concern in rock sole in Kuluk Bay and Aroclor 1260 as a chemical of concern in rock sole and blue mussel in Sweeper Cove. Because the ROD for Operable Unit A specified the RBAL based on total PCBs, PCB congener analyses have been conducted on marine tissue from 1999 through 2003.

There is no simple, direct conversion of PCB congener concentrations to Aroclor concentrations. However, maximum Aroclor concentrations can be estimated from PCB congener results based on the percentages of PCB congeners that comprise Aroclor 1254 and 1260. A study published in *Journal of High Resolution Chromatography* (Frame, et al 1996) analyzed Aroclor 1254 and Aroclor 1260 samples to determine the percentages of congeners in these Aroclors. The percentages of congeners in the Aroclors that were evaluated by Frame et al are summarized in a spreadsheet included on the attached CD ROM. To estimate an Aroclor concentration, individual PCB congener concentrations found in tissue samples were divided by their corresponding percent (converted to a decimal fraction) in that specific Aroclor to give a range of equivalent Aroclor concentration. For example, a congener concentration found to be present at 5 ug/kg, which is present in Aroclor 1254 at the 10% level, would indicate that an estimated 50 ug/kg of Aroclor 1254 was present. The estimated maximum Aroclor concentration would be limited by the lowest equivalent Aroclor concentration in the range. Using anything higher than the minimum Aroclor estimate would result in overestimating the observed congener concentration in the sample results. This method assumes that the percentages of PCB congeners that comprise Aroclor 1254 and 1260 are constant over time. Only the 2003 data was used to estimate the

Aroclor concentrations because the 2003 samples were tested for all 209 PCB congeners, and the 1999 to 2002 samples were tested for a partial list of the PCB congeners.

Table A-4 lists the estimated maximum Aroclor 1254 concentration in rock sole in Kuluk Bay and estimated maximum Aroclor 1260 concentrations in rock sole and blue mussel in Sweeper Cove based on the mean PCB congener concentrations that were detected in the 2003 samples. The estimated maximum Aroclor 1254 concentration in Kuluk Bay rock sole is 0.758 ug/kg, which is below the RBAL of 6.5 ug/kg. The estimated maximum Aroclor 1260 concentration in Sweeper Cove blue mussel is 0.373 ug/kg, which is below the RBAL of 31 ug/kg. The estimated maximum Aroclor 1260 concentration in Sweeper Cove rock sole is 8.75 ug/kg, which is above the RBAL of 6.5 ug/kg.

## **Discussion**

As expected, the highest PCB concentrations in rock sole are consistently found in Sweeper Cove, which is nearest the former PCB sources on Adak Island. Figure 4a shows a trend of increasing concentrations in Sweeper Cove rock sole based on the mean concentrations over the past 5 years. Maintaining the consumption advisory in place for rock sole caught in Sweeper Cove is recommended.

Rock sole in Kuluk Bay have mean PCB concentrations that are significantly less than concentrations in rock sole from Sweeper Cove. Mean concentrations exceeded the RBAL during 3 of the 5 years. The trend line of PCBs in Kuluk Bay rock sole in Figure 4b shows a slight increasing concentration, which nearly parallels the RBAL. Because the 2003 sample results exceeded the RBAL and the trend suggests a slight increase in concentrations, keeping the consumption advisory in place for rock sole caught in Kuluk Bay is recommended.

The highest PCB concentrations in blue mussel are consistently found in Sweeper Cove. The mean concentrations exceeded the RBAL of 31 ug/kg for 3 of the 5 years, and all minimum concentrations were less than the RBAL. Figure 5a shows a decreasing trend in Sweeper Cove blue mussels suggesting that future sampling events may contain concentrations below the RBAL. Because the 2003 sample results reported mean total PCB concentrations in excess of the RBAL, continuing the consumption advisory for blue mussel collected in Sweeper Cove is recommended. Future sampling events may show that the downward trend is continuing and the consumption advisory may not be necessary at that time.

Blue mussel tissue in Kuluk Bay have mean PCB concentrations that are significantly less than concentrations in blue mussel from Sweeper Cove. One maximum concentration (50.7 ug/kg) in a composite sample from Kuluk Bay collected in 2001 exceeded the RBAL; however, the mean values for 2001 and other years are significantly less than the RBAL. Figure 5b shows a trend toward increasing concentrations in Kuluk Bay blue mussels. The trend suggests that PCB concentrations will remain below the RBAL for the next five years as well. Because the mean PCB concentrations are significantly below the RBAL, removing the consumption advisory for blue mussel collected in Kuluk Bay is recommended.

## Conclusions and Recommendations

Trends in total PCB concentrations show increasing concentrations in rock sole from Sweeper Cove and slightly increasing concentrations in rock sole from Kuluk Bay (Figure 4b). Rock sole samples collected in 2003 from Sweeper Cove contained a mean total PCB concentration that is approximately 15 times higher than the RBAL of 6.5 ug/kg, whereas rock sole samples collected in 2003 from Kuluk Bay contained a mean total PCB concentration that is approximately twice the RBAL. However, a lognormal best fit curve of the data extrapolated out for a five-year period suggests no significant increase above the RBAL for rock sole in Kuluk Bay (Figure 4b).

The reason for the increasing trends in the rock sole in Sweeper Cove is not certain. All known PCB sources on Adak have been removed, and sediment that enters the embayments should be relatively “clean.” The increasing concentrations may be caused by bioaccumulation of PCBs as rock sole feed off the sea floor. Maximum lifespans are 15 and 22 years for female and males, respectively. PCBs in the fish are expected to decrease as clean sediment covers the existing sediment and new generations of rock sole inhabit the area.

The trend of mean PCB concentrations in blue mussel tissue from Sweeper Cove is one of decreasing concentrations that appear to be nominally below the RBAL of 31 ug/kg (Figure 5a). The trend of mean PCB concentrations in blue mussel samples from Kuluk Bay is one of increasing concentrations; however, these concentrations currently remain below the RBAL, and are expected to remain so for an extrapolated period of five years.

URS recommends maintaining the fish consumption advisory for rock sole collected from Sweeper Cove and Kuluk Bay, and for blue mussels collected from Sweeper Cove. The fish consumption advisory does not appear to be necessary for blue mussel collected from Kuluk Bay.

URS also recommends continued sampling of rock sole and blue mussel from Sweeper Cove and Kuluk Bay on a reduced sampling frequency. The recommendation would be to reduce the sampling frequency to once every other year (2005, 2007, and 2009) through the next 5-year review period. Monitoring beyond that point would be the subject of the five-year review. No additional sampling at the Bay of Islands is necessary, because there are adequate data to establish background total PCB concentrations from the reference area.

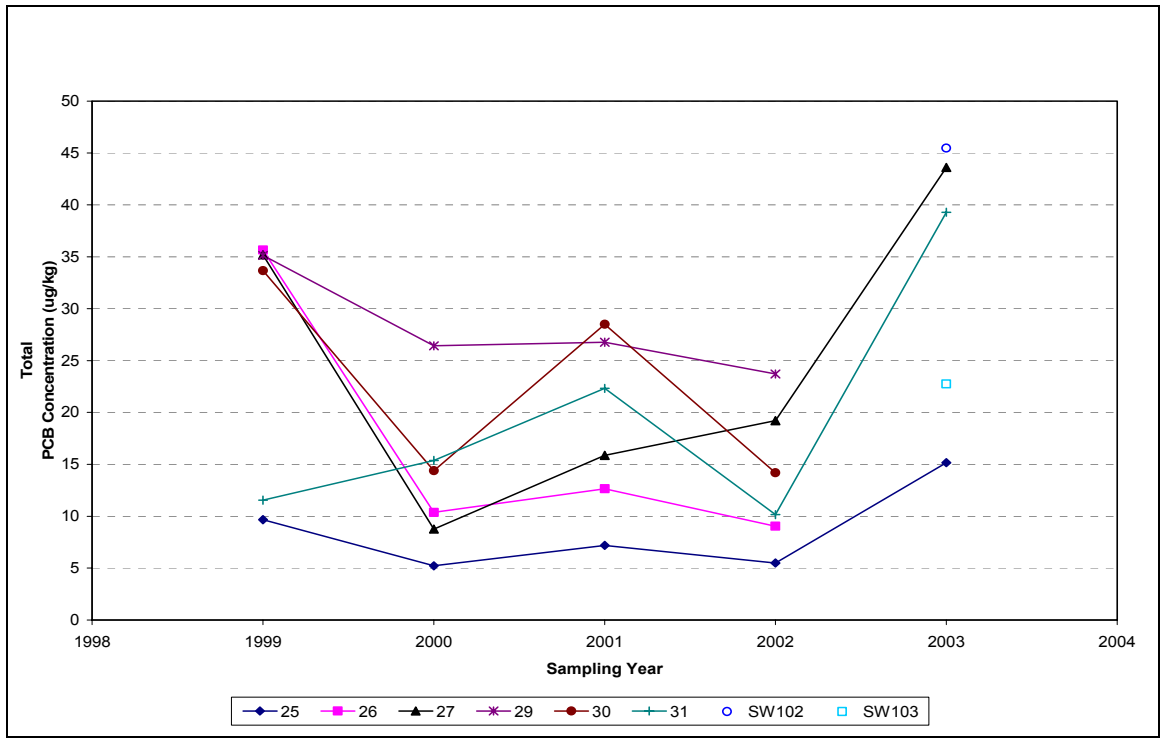
We trust this information is sufficient for your current needs. Please contact me at (206) 438-2296 with any questions or comments you may have.

Very truly yours,

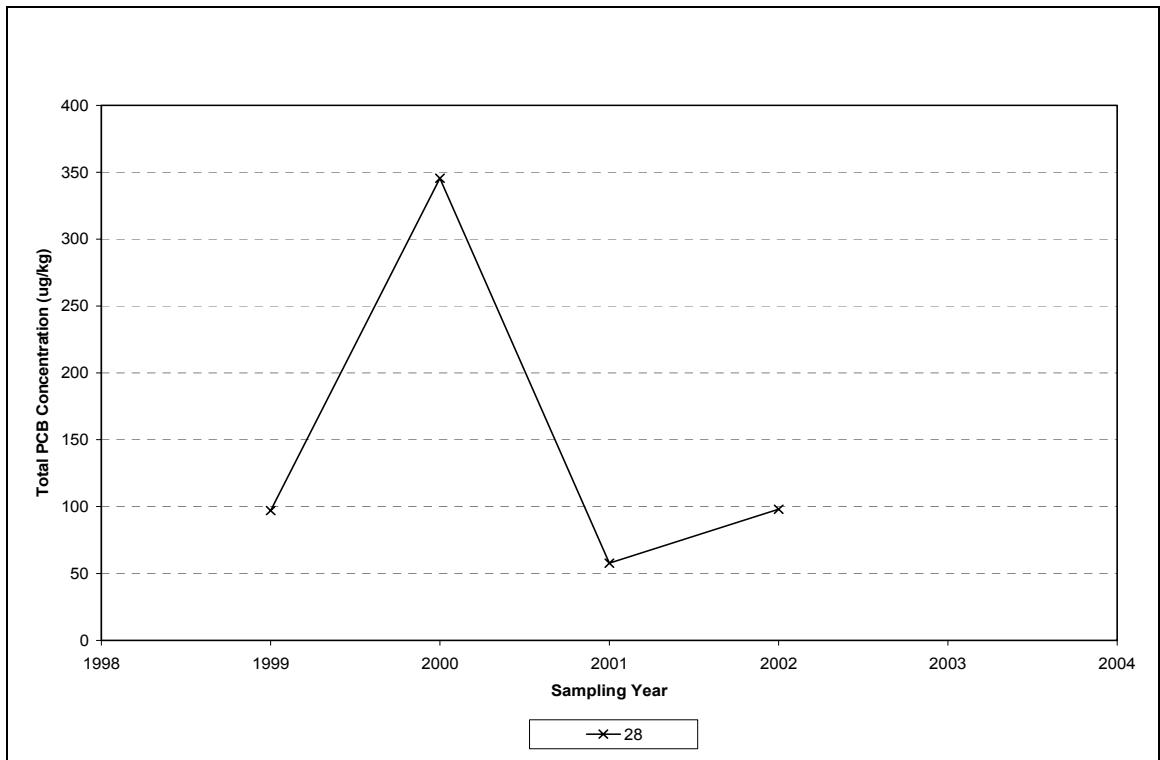
A handwritten signature in blue ink, appearing to be 'W. Rohrer', with a stylized, cursive style.

William L. Rohrer, Ph.D., P.G.  
Project Manager

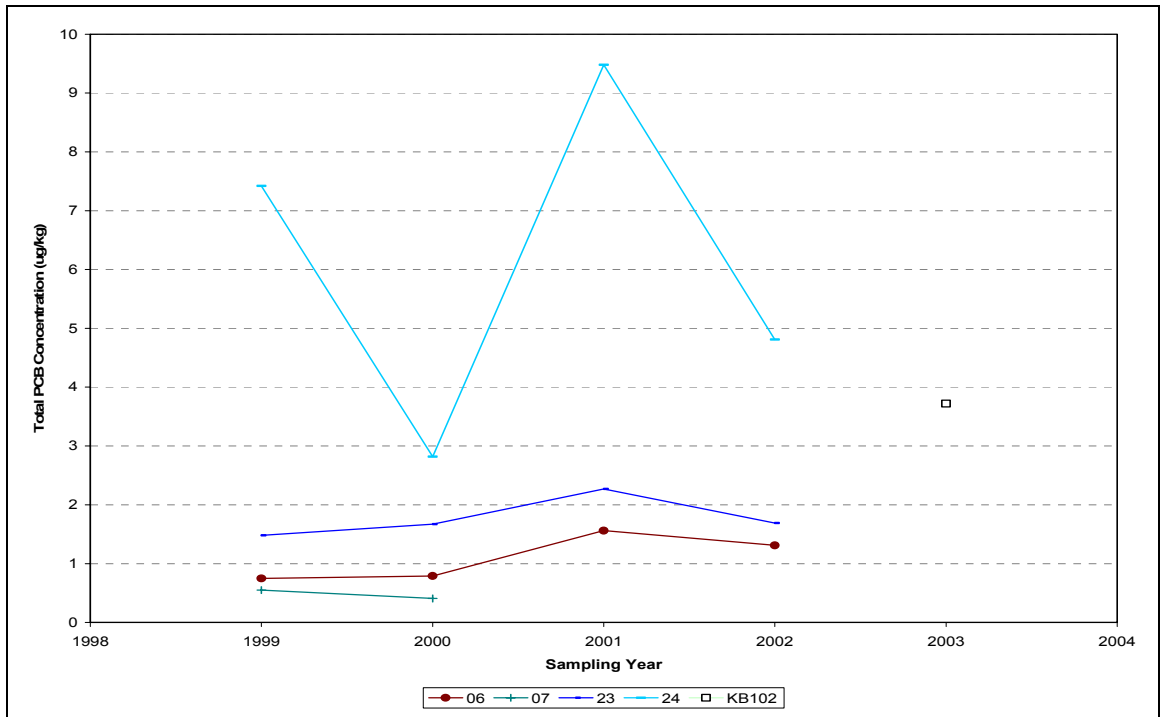
cc: M. Murphy/EFA NW  
Tom Abbott/URS



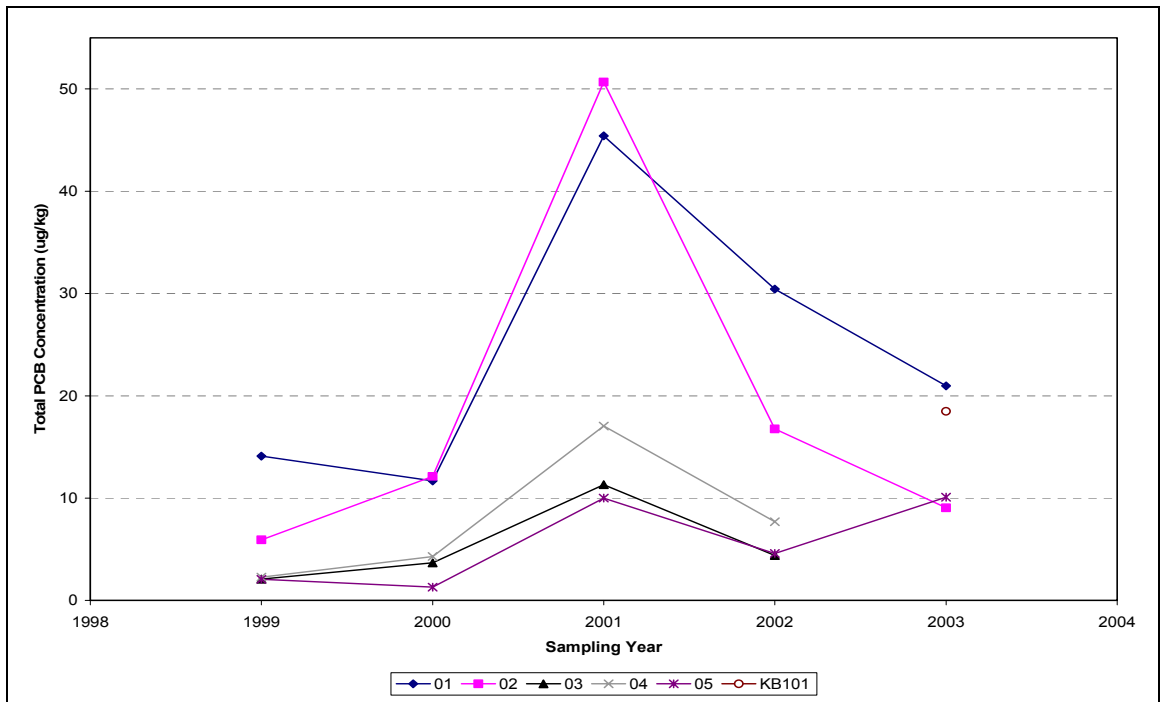
**Figure A-1. Total PCB concentrations in blue mussel from eight sampling sites in Sweeper Cove from 1999 through 2003**



**Figure A-2. Total PCB concentrations in blue mussel from sampling site 28 in Sweeper Cove from 1999 through 2002**



**Figure A-3. Total PCB concentrations in blue mussel collected from five sampling sites in Kuluk Bay from 1999 through 2003**



**Figure A-4. Total PCB concentrations in blue mussel collected from six additional sampling sites in Kuluk Bay from 1999 through 2003**

**Table A-1  
Coordinates of 2003 Trawl Lines**

<b>Embayment</b>	<b>Cross Reference</b>	<b>Start or End</b>	<b>Northing</b>	<b>Easting</b>
<b>Bay of Islands</b>	BI, Trawl 1	Start	291685.1366	3092743.5870
	BI, Trawl 1	End	291679.9107	3093196.2498
	BI, Trawl 2	Start	291690.3752	3092290.9243
	BI, Trawl 2	End	292044.9275	3093200.4588
	BI, Trawl 3	Start	292407.3361	3093430.9891
	BI, Trawl 3	End	292034.5136	3094105.7646
	BI, Trawl 4	Start	293145.2031	3092760.4636
	BI, Trawl 4	End	292407.3361	3093430.9891
	BI, Trawl 5	Start Only	290865.4629	3100657.1240
	BI, Trawl 6	Start	290490.4447	3101558.4743
	BI, Trawl 6	End	290115.4765	3102459.8656
	BI, Trawl 7	Start	290492.9398	3101332.1263
	BI, Trawl 7	End	290120.4448	3102007.1593
	<b>Kuluk Bay</b>	KB, Trawl 1	Start	320046.0931
KB, Trawl 1		End	320046.0931	3140071.1202
KB, Trawl 2		Start Only	321463.8790	3145053.9442
KB, Trawl 3		Start	322933.4575	3143936.6658
KB, Trawl 3		End	321838.3852	3143927.4354
KB, Trawl 4		Start Only	323306.1228	3143036.1762
KB, Trawl 5		Start	324401.1941	3143045.4674
KB, Trawl 5		End	323674.9860	3142587.5003
KB, Trawl 6		Start	327325.2210	3142618.5728
KB, Trawl 6		End	326600.9560	3141934.8210
KB, Trawl 7		Start	323315.7451	3141906.7187
KB, Trawl 7		End	322589.5689	3141448.6706
<b>Sweeper Cove</b>	SC, Trawl 1	Start	313150.4384	3135490.3594
	SC, Trawl 1	End	313511.4252	3135945.6796
	SC, Trawl 2	Start	313148.4184	3135716.3922
	SC, Trawl 2	End	313874.4352	3136174.9568
	SC, Trawl 3	Start	313503.3895	3136849.7910
	SC, Trawl 3	End	314225.4519	3137760.3306
	SC, Trawl 4	Start	313134.3665	3137298.6228
	SC, Trawl 4	End	313142.3773	3136394.4909
	SC, Trawl 5	Start	313517.4851	3135267.5963
	SC, Trawl 5	End	314241.4724	3135952.1886

**Table A-1 (Continued)**  
**Coordinates of 2003 Trawl Lines**

<b>Embayment</b>	<b>Cross Reference</b>	<b>Start or End</b>	<b>Northing</b>	<b>Easting</b>
	SC, Trawl 6	Start	313507.4011	3136397.7352
	SC, Trawl 6	End	313864.4143	3137305.0709
	SC, Trawl 7	Start	313507.4011	3136397.7352
	SC, Trawl 7	End	313864.4143	3137305.0709
	SC, Trawl 8	Start	313148.4184	3135716.3922
	SC, Trawl 8	End	313874.4352	3136174.9568

**Table A-2**  
**Mussel Samples Collected At or Near Sampling Sites in Sweeper Cove and**  
**Kuluk Bay for Samples Collected in 1999 through 2003**

Sampling Sites*	Embayment	Company Sample ID (CSI)**				
		1999	2000	2001	2002	2003
01	Kuluk Bay	ADAK67	AM01	A01M01	A02M01	KB104
02	Kuluk Bay	ADAK41	AM02	A01M02	A02M02	KB105
03	Kuluk Bay	ADAK42	AM03	A01M03	A02M03	-
04	Kuluk Bay	ADAK43	AM04	A01M04	A02M04	-
05	Kuluk Bay	ADAK44	AM05	A01M05	A02M05	KB103
06	Kuluk Bay	ADAK45	AM06	A01M06	A02M06	-
07	Kuluk Bay	ADAK46	AM07	-	-	-
23	Kuluk Bay	ADAK66	AM23	A01M23	A02M23	-
24	Kuluk Bay	ADAK70	AM24	A01M24	A02M24	-
25	Sweeper Cove	ADAK73	AM25	A01M25	A02M25	SW104
26	Sweeper Cove	ADAK74	AM26	A01M26	A02M26	-
27	Sweeper Cove	ADAK77	AM27	A01M27	A02M27	SW105
28	Sweeper Cove	ADAK76	AM28	A01M28	A02M28	-
29	Sweeper Cove	ADAK75	AM29	A01M29	A02M29	-
30	Sweeper Cove	ADAK78	AM30	A01M30	A02M30	-
31	Sweeper Cove	ADAK81	AM31	A01M31	A02M31	SW101
SW102	Sweeper Cove	-	-	-	-	SW102
SW103	Sweeper Cove	-	-	-	-	SW103
KB101	Kuluk Bay	-	-	-	-	KB101
KB102	Kuluk Bay	-	-	-	-	KB102

\*Sampling Sites were named based on either the last two digits of the USGS CSI or the single 2003 sample.

\*\*For 2003, the Location Cross-Reference was used.

**Table A-3**  
**Summary of Adak Rock Sole and Blue Mussel Total PCBs for Samples**  
**Collected from Bay of Islands, Kuluk Bay, and Sweeper Cove, 1999 - 2003**

Embayment	Sample Number	Company Sample ID	Approximate Sample Date	Number of Analytes Tested	Number of Analytes Detected	Sum of Detected Analytes	Units (wet weight)	
<b>Bay of Islands</b>								
<i>Blue Mussel</i>	227686	ADAK98	8/1/99 12:00	57	14	0.434	ug/kg	
	227687	ADAK99	8/1/99 12:00	57	11	0.249	ug/kg	
	227688	ADAK100	8/1/99 12:00	57	11	0.32	ug/kg	
	227690	ADAK101	8/1/99 12:00	57	3	0.072	ug/kg	
					1999 Mean Value		0.27	ug/kg
	227727	BOIM02	7/1/00 12:00	58	5	0.0908	ug/kg	
	227728	BOIM03	7/1/00 12:00	58	8	0.182	ug/kg	
	227729	BOIM04	7/1/00 12:00	58	4	0.125	ug/kg	
	227736	BOIM01	7/1/00 12:00	58	6	1.9805	ug/kg	
					2000 Mean Value		0.59	ug/kg
	227771	BI01M1	6/13/01 12:00	58	2	0.04	ug/kg	
	227773	BI01M3	6/13/01 12:00	58	0	0.01*	ug/kg	
	227772	BI01M2	6/28/01 12:00	58	1	0.023	ug/kg	
					2001 Mean Value		0.024	ug/kg
	227812	BI02M1	6/14/02 12:00	58	1	0.0187	ug/kg	
	227813	BI02M2	6/14/02 12:00	58	1	0.0229	ug/kg	
	227814	BI02M3	6/14/02 12:00	58	2	0.0584	ug/kg	
	227815	BI02M4	6/14/02 12:00	58	2	0.0399	ug/kg	
					2002 Mean Value		0.035	ug/kg
	63044	63044	8/1/03 3:30	170	15	0.13282	ug/kg	
	63041	63041	8/1/03 4:45	170	20	0.19812	ug/kg	
	63043	63043	8/1/03 5:45	170	21	0.26783	ug/kg	
	63045	63045	8/1/03 7:00	170	18	0.20691	ug/kg	
	63042	63042	8/1/03 8:15	170	14	0.10789	ug/kg	
					2003 Mean Value		0.18	ug/kg
	<i>Rock Sole</i>	227819	BI-04	7/1/00 12:00	56	16	1.144	ug/kg
227823		BI-08	7/1/00 12:00	56	20	1.049	ug/kg	
					2000 Mean Value		1.10	ug/kg
63068		63068	8/2/03 1:40	170	24	0.31258	ug/kg	
63069		63069	8/2/03 1:41	170	28	0.35196	ug/kg	
63070		63070	8/2/03 1:42	170	27	0.31449	ug/kg	
63071		63071	8/2/03 1:43	170	27	0.34256	ug/kg	
63072		63072	8/2/03 1:44	170	21	0.27877	ug/kg	
					2003 Mean Value		0.320	ug/kg
<b>Kuluk Bay</b>								
<i>Blue Mussel</i>	227645	ADAK41	8/1/99 12:00	58	43	5.9268	ug/kg	
	227646	ADAK42	8/1/99 12:00	58	32	2.087	ug/kg	
	227647	ADAK43	8/1/99 12:00	58	33	2.273	ug/kg	
	227648	ADAK44	8/1/99 12:00	58	34	2.0626	ug/kg	
	227649	ADAK45	8/1/99 12:00	58	24	0.7515	ug/kg	

**Table A-3 (Continued)**  
**Summary of Adak Rock Sole and Blue Mussel Total PCBs for Samples**  
**Collected from Bay of Islands, Kuluk Bay, and Sweeper Cove, 1999 - 2003**

Embayment	Sample Number	Company Sample ID	Approximate Sample Date	Number of Analytes Tested	Number of Analytes Detected	Sum of Detected Analytes	Units (wet weight)
	227650	ADAK46	8/1/99 12:00	58	17	0.553	ug/kg
	227666	ADAK66	8/1/99 12:00	58	21	1.482	ug/kg
	227667	ADAK70	8/1/99 12:00	58	39	7.418	ug/kg
	227689	ADAK67	8/1/99 12:00	57	44	14.105	ug/kg
				1999 Mean Value		4.07	ug/kg
	227693	AM03	7/1/00 12:00	58	37	3.682	ug/kg
	227694	AM04	7/1/00 12:00	58	39	4.302	ug/kg
	227695	AM05	7/1/00 12:00	58	30	1.3022	ug/kg
	227696	AM06	7/1/00 12:00	58	24	0.7893	ug/kg
	227697	AM07	7/1/00 12:00	58	18	0.407	ug/kg
	227700	AM23	7/1/00 12:00	58	26	1.672	ug/kg
	227713	AM01	7/1/00 12:00	58	46	11.687	ug/kg
	227714	AM02	7/1/00 12:00	58	45	12.119	ug/kg
	227717	AM24	7/1/00 12:00	58	29	2.8227	ug/kg
				2000 Mean Value		4.31	ug/kg
	227761	A01M23	6/2/01 12:00	58	14	2.2744	ug/kg
	227762	A01M24	6/2/01 12:00	58	24	9.4825	ug/kg
	227739	A01M01	6/3/01 12:00	58	45	45.415	ug/kg
	227741	A01M03	6/3/01 12:00	58	32	11.319	ug/kg
	227744	A01M06	6/3/01 12:00	58	13	1.556	ug/kg
	227740	A01M02	6/4/01 12:00	58	41	50.671	ug/kg
	227742	A01M04	6/4/01 12:00	58	37	17.036	ug/kg
	227743	A01M05	6/4/01 12:00	58	37	10.013	ug/kg
	227745	A01M07	6/4/01 12:00	58	16	0.9896	ug/kg
				2001 Mean Value		16.5	ug/kg
	227780	A02M02	6/11/02 12:00	58	36	16.7581	ug/kg
	227781	A02M03	6/11/02 12:00	58	22	4.4013	ug/kg
	227782	A02M04	6/11/02 12:00	58	31	7.6869	ug/kg
	227783	A02M05	6/26/02 12:00	58	30	4.5863	ug/kg
	227784	A02M06	6/26/02 12:00	58	23	1.3087	ug/kg
	227785	A02M07	6/26/02 12:00	58	24	1.2702	ug/kg
	227801	A02M23	6/26/02 12:00	58	17	1.689	ug/kg
	227802	A02M24	6/26/02 12:00	58	22	4.8072	ug/kg
	227779	A02M01	8/28/02 12:00	58	41	30.4294	ug/kg
				2002 Mean Value		8.10	ug/kg
	63054	63054	8/4/03 1:30	168	80	9.76173	ug/kg
	63055	63055	8/4/03 4:57	170	92	20.98219	ug/kg
	63056	63056	8/4/03 5:26	170	81	9.05703	ug/kg
	63052	63052	8/4/03 11:59	170	87	18.4788	ug/kg
	63053	63053	8/4/03 12:45	170	64	3.72398	ug/kg

**Table A-3 (Continued)**  
**Summary of Adak Rock Sole and Blue Mussel Total PCBs for Samples**  
**Collected from Bay of Islands, Kuluk Bay, and Sweeper Cove, 1999 - 2003**

<b>Embayment</b>	<b>Sample Number</b>	<b>Company Sample ID</b>	<b>Approximate Sample Date</b>	<b>Number of Analytes Tested</b>	<b>Number of Analytes Detected</b>	<b>Sum of Detected Analytes</b>	<b>Units (wet weight)</b>
<b>Rock Sole</b>				2003 Mean Value		12.4	ug/kg
	227830	AD-01	7/1/00 12:00	56	44	2.5259	ug/kg
	227837	AD-08	7/1/00 12:00	56	45	3.2832	ug/kg
	227840	AD-11	7/1/00 12:00	56	45	9.2116	ug/kg
				2000 Mean Value		5.01	ug/kg
	227580	MSL01AK	8/29/01 12:00	58	40	14.5812	ug/kg
	227582	MSL01AZ	8/31/01 12:00	58	12	0.9281	ug/kg
				2001 Mean Value		7.75	ug/kg
	227608	MSL02AK	6/24/02 12:00	58	29	8.407	ug/kg
	227610	MSL02AZ	6/24/02 12:00	58	23	1.475	ug/kg
				2002 Mean Value		4.94	ug/kg
	63057	63057	7/30/03 5:10	170	85	8.88436	ug/kg
	63060	63060	7/30/03 5:11	170	99	21.04366	ug/kg
	63061	63061	7/30/03 5:12	170	88	10.75529	ug/kg
	63059	63059	7/30/03 5:13	170	94	10.43126	ug/kg
	63058	63058	7/30/03 5:14	170	96	16.48437	ug/kg
				2003 Mean Value		13.5	ug/kg
<b>Sweeper Cove</b>							
<b>Blue Mussel</b>	227668	ADAK73	8/1/99 12:00	58	40	9.658	ug/kg
	227669	ADAK74	8/1/99 12:00	58	46	35.662	ug/kg
	227670	ADAK77	8/1/99 12:00	58	47	35.177	ug/kg
	227671	ADAK78	8/1/99 12:00	58	51	33.667	ug/kg
	227672	ADAK81	8/1/99 12:00	58	43	11.549	ug/kg
	227674	ADAK83	8/1/99 12:00	58	51	89.88	ug/kg
	227675	ADAK75	8/1/99 12:00	58	47	35.133	ug/kg
	227676	ADAK76	8/1/99 12:00	58	50	96.979	ug/kg
				1999 Mean Value		43.5	ug/kg
	227715	AM25	7/1/00 12:00	57	35	5.2217	ug/kg
	227716	AM31	7/1/00 12:00	58	44	15.3666	ug/kg
	227718	AM27	7/1/00 12:00	58	36	8.761	ug/kg
	227719	AM28	7/1/00 12:00	58	47	345.475	ug/kg
	227720	AM29	7/1/00 12:00	58	46	26.417	ug/kg
	227721	AM30	7/1/00 12:00	58	44	14.389	ug/kg
	227734	AM26	7/1/00 12:00	58	44	10.371	ug/kg
				2000 Mean Value		60.9	ug/kg
	227763	A01M25	6/1/01 12:00	58	24	7.1856	ug/kg
	227764	A01M26	6/1/01 12:00	58	28	12.653	ug/kg
	227765	A01M27	6/1/01 12:00	58	31	15.856	ug/kg
227766	A01M28	6/1/01 12:00	58	34	57.685	ug/kg	
227767	A01M29	6/1/01 12:00	58	35	26.76	ug/kg	

**Table A-3 (Continued)**  
**Summary of Adak Rock Sole and Blue Mussel Total PCBs for Samples**  
**Collected from Bay of Islands, Kuluk Bay, and Sweeper Cove, 1999 - 2003**

<b>Embayment</b>	<b>Sample Number</b>	<b>Company Sample ID</b>	<b>Approximate Sample Date</b>	<b>Number of Analytes Tested</b>	<b>Number of Analytes Detected</b>	<b>Sum of Detected Analytes</b>	<b>Units (wet weight)</b>	
	227768	A01M30	6/1/01 12:00	58	36	28.5	ug/kg	
	227769	A01M31	6/1/01 12:00	58	32	22.305	ug/kg	
				2001 Mean Value		24.4	ug/kg	
	227806	A02M28	6/11/02 12:00	58	32	97.9852	ug/kg	
	227807	A02M29	6/11/02 12:00	58	32	23.7119	ug/kg	
	227808	A02M30	6/11/02 12:00	58	32	14.1939	ug/kg	
	227809	A02M31	6/11/02 12:00	58	27	10.1487	ug/kg	
	227803	A02M25	6/26/02 12:00	58	24	5.5005	ug/kg	
	227804	A02M26	6/26/02 12:00	58	24	9.025	ug/kg	
	227805	A02M27	6/26/02 12:00	58	30	19.2058	ug/kg	
				2002 Mean Value		25.7	ug/kg	
	63046	63046	8/4/03 10:05	170	99	39.29333	ug/kg	
	63047	63047	8/4/03 10:15	170	97	45.46991	ug/kg	
	63051	63051	8/4/03 10:15	170	98	38.43331	ug/kg	
	63048	63048	8/4/03 10:20	170	91	22.74729	ug/kg	
	63049	63049	8/4/03 10:45	170	86	15.15741	ug/kg	
	63050	63050	8/4/03 11:15	170	97	43.60771	ug/kg	
				2003 Mean Value		34.1	ug/kg	
	<b>Rock Sole</b>	227848	AD-19	7/1/00 12:00	56	46	31.083	ug/kg
		227849	AD-23	7/1/00 12:00	56	48	81.397	ug/kg
				2000 Mean Value		56.2	ug/kg	
227579		MSL01AI	6/18/01 12:00	58	41	79.3739	ug/kg	
227581		MSL01AO	8/31/01 12:00	58	41	44.6441	ug/kg	
				2001 Mean Value		62.0	ug/kg	
227607		MSL02AI	6/24/02 12:00	58	41	119.56	ug/kg	
227609		MSL02AO	6/24/02 12:00	58	43	55.527	ug/kg	
				2002 Mean Value		87.5	ug/kg	
63062		63062	7/31/03 3:20	170	112	132.49989	ug/kg	
63067		63067	7/31/03 3:20	170	110	78.61105	ug/kg	
63063		63063	7/31/03 3:21	170	104	73.35265	ug/kg	
63064		63064	7/31/03 3:22	170	110	113.38977	ug/kg	
63065		63065	7/31/03 3:23	170	104	79.50977	ug/kg	
63066		63066	7/31/03 3:24	170	111	98.82073	ug/kg	
			2003 Mean Value		96.0	ug/kg		

\* Even though no PCBs were detected, the detection limit of 0.01 ug/kg was used to calculate the mean.

**Table A-4**  
**Estimated Maximum Aroclor 1254 Concentrations in Rock Sole in**  
**Kuluk Bay and Aroclor 1260 in Blue Mussel and Rock Sole in Sweeper Cove**

<b>Embayment</b>	<b>Tissue Type</b>	<b>Year Sampled</b>	<b>Estimated Aroclor 1254 Equivalent Concentration (ug/kg)</b>	<b>Estimated Aroclor 1260 Equivalent Concentration (ug/kg)</b>	<b>RBAL (ug/kg)</b>	<b>Aroclor Concentration Exceeds RBAL?</b>
Kuluk Bay	Rock Sole	2003	0.758	NA	6.5	No
Sweeper Cove	Blue Mussel	2003	NA	0.373	31	No
	Rock Sole	2003	NA	8.75	6.5	Yes