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EBASCO SERVICES INCORPORATED

FINAL AIR MONITORING REPORT
VOLUME I

NEW BEDFORD HARBOR PILOT DREDGING AND DISPOSAL STUDY

NEW BEDFORD HARBOR FS TASK 26

JULY 1990

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EBASCO

REM III PROGRAM

REMEDIAL PLANNING ACTIVITIES AT SELECTED UNCONTROLLED HAZARDOUS SUBSTANCE DISPOSAL SITES

EPA CO

EBASCO SERV

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VOLUME I

NEW BEDFORD HARBOR
PILOT DREDGING AND
DISPOSAL STUDY

NEW BEDFORD HARBOR FS
TASK 26

JULY 1990

Prepared by:

Mark Hanson
Senior Scientist
Ebasco Services Incorporated

Reviewed by:

Laurence Labrie
Consulting Meteorologist
Ebasco Services Incorporated

Approved by:

Alan Fowler
Project Lead
Ebasco Services Incorporated

TABLE OF CONTENTS

NEW BEDFORD HARBOR
PILOT DREDGING AND DISPOSAL STUDY
AIR MONITORING PROGRAM

TABLE OF CONTENTS

VOLUME I

		Page
EXECUTIVE SUMMARY		ES-1
1.0	INTRODUCTION	1-1
1.1	SITE LOCATION AND HISTORY	1-1
1.2	BACKGROUND STUDIES	1-5
1.3	PILOT STUDY DESCRIPTION	1-6
1.4	PILOT STUDY AIR MONITORING PROGRAM	1-8
1.4.1	Program Development	1-8
1.4.2	Program Objectives	1-11
1.4.3	Program Description	1-11
1.5	REPORT ORGANIZATION	1-11
2.0	MONITORING PROGRAM DESCRIPTION	2-1
2.1	MONITORING SITE DESCRIPTIONS	2-1
2.1.1	Southwest Corner (SWC)	2-3
2.1.2	Southeast Corner (SEC)	2-3
2.1.3	Northeast Corner (NEC)	2-4
2.1.4	Northwest Corner (NWC)	2-4
2.1.5	Background Site (BG)	2-5
2.1.6	Odor and Volatile Organic Contaminant (VOC)	2-5
2.1.7	Meteorological Monitoring Site	2-6
2.1.8	Staging Site	2-7
2.2	MONITORING PROGRAM SCHEDULE	2-7
2.2.1	Pre-Dredging Sampling	2-7
2.2.2	Sampling during CDF and CAD Operations	2-7
2.2.3	Post-Dredging Sampling	2-8

3.0 MONITORING PROGRAM OPERATIONS SUMMARY 3-1
3.1 DATA RECOVERY RATES 3-1
3.2 MEASUREMENT AND OPERATIONS SUMMARY 3-3
3.2.1 PCB Measurements 3-3
3.2.1.1 System Description 3-3
3.2.1.2 Summary of Operating Procedures 3-3
3.2.1.3 Laboratory Analysis Summary 3-4
3.2.1.4 Reporting 3-5
3.2.2 Heavy Metals 3-6
3.2.2.1 System Description 3-6
3.2.2.2 Summary of Operating Procedures 3-6
3.2.2.3 Laboratory Analysis Summary 3-7
3.2.2.4 Reporting 3-9
3.2.3 Odor (H_2S) 3-9
3.2.3.1 System Description 3-9
3.2.3.2 Summary of Operating Procedures 3-10
3.2.4 Organic Vapor (OVA 128) 3-11
3.2.4.1 System Description 3-11
3.2.4.2 Summary of Operating Procedures 3-12
3.2.5 Organic Vapor (HNU PI-101) 3-13
3.2.5.1 System Description 3-13
3.2.5.2 Summary of Operating Procedures 3-14
3.2.6 Meteorological System 3-15
3.2.6.1 System Description 3-15
3.2.6.2 Summary of Operating Procedures 3-17

4.0 QUALITY ASSURANCE PROGRAM RESULTS 4-1
4.1 REFERENCE GUIDELINES 4-2
4.2 SAMPLER CALIBRATIONS 4-4
4.2.1 PUF Sampler Calibrations 4-4
4.2.1.1 Monthly Multipoint Calibrations 4-4
4.2.1.2 Daily Single Point Calibrations 4-5
4.2.2 HI-VOL Sampler Calibrations 4-5
4.2.3 Calibration Results 4-6
4.3 PRECISION RESULTS 4-6
4.4 FIELD AND LABORATORY BLANKS 4-9
4.4.1 Field Blanks 4-9
4.4.2 Laboratory Blanks 4-11
4.5 QUARTZ/GLASS FILTER COMPARISON 4-11

5.0 DATA VALIDATION RESULTS 5-1
5.1 REFERENCE GUIDELINES 5-2
5.2 GENERAL DATA VALIDATION RESULTS AND TRENDS 5-2
5.2.1 Aroclor Data 5-2
5.2.2 Metals Data 5-6
5.3 GENERAL PRECISION AND ACCURACY 5-8
5.4 LABORATORY IDENTIFICATION OF AROCLORS 5-9
5.5 FIELD AND LABORATORY BLANK RESULTS 5-10
5.5.1 Aroclor Data 5-10
5.5.2 Metals Data 5-10

6.0 PILOT STUDY RESULTS AND CONCLUSIONS 6-1
6.1 VOC AND H_2S RESULTS 6-1
6.2 METALS RESULTS AND EVALUATION 6-1
6.2.1 Results in Relation to Dredging Phases 6-5
6.2.2 Regulatory Limits (Metals) 6-7
6.2.3 Meteorological Influences (Metals) 6-8
6.3 PCB RESULTS AND EVALUATION 6-8
6.3.1 Results in Relation to Dredging Phases 6-10
6.3.1.1 Pre-Dredging Levels 6-10
6.3.1.2 Dredging Levels 6-15
6.3.1.3 Post-Dredging Levels 6-16
6.3.2 Decision Criteria and Regulatory Limits (PCB) 6-16
6.3.3 Meteorological Influences (PCB) 6-17
6.4 CONCLUSIONS 6-19
6.4.1 Metals Levels 6-19
6.4.2 PCB Levels 6-21

7.0 RECOMMENDATIONS 7-1

8.0 REFERENCES 8-1

APPENDIX A Quality Assurance
APPENDIX B Data Validation
APPENDIX C Data Tables
APPENDIX D Graphical Data Summaries

LIST OF TABLES

Table No.		Page
2-1	Dredging/Sampling Schedule	2-8
3-1	Data Recovery Summary	3-2
5-1	DV Parameters and Evaluation Criteria	5-3
6-1	Heavy Metals Concentration Summary (Pre-Dredge Sampling)	6-3
6-2	Heavy Metals Concentration Summary (During Dredge Sampling)	6-4
6-3	Heavy Metals Concentration Summary (Post-Dredge Sampling)	6-5
6-4	Average Heavy Metals Concentration and Proposed AALs	6-7
6-5	PCB Concentration Summary (Pre-Dredge Sampling)	6-11
6-6	PCB Concentration Summary (During Dredge Sampling)	6-12
6-7	PCB Concentration Summary (Post-Dredge Sampling)	6-13

LIST OF FIGURES

Figure No.		Page
1-1	Site Location Map	1-1
1-2	New Bedford Harbor Fishing Closure Areas	1-2
1-3	New Bedford Harbor and Area of Pilot Dredging and Disposal Study	1-7
1-4	Pilot Study Area	1-9
2-1	Location of Air Monitoring Stations and Meteorological tower	2-2
4-1	PCB Precision (SWC Total)	4-8
6-1	Metals Concentrations (SWC Primary)	6-6
6-2	PCB Concentrations (SWC Primary)	6-9
6-3	PCB Concentrations (All Sites Total)	6-14
6-4	PCB/Wind Direction (All Sites)	6-18
6-5	PCB/Wind Speed (All Sites)	6-20

VOLUME II

APPENDIX E	Site Photographs
APPENDIX F	Sampler Calibrations
APPENDIX G	Daily Wind Rose/Frequency Distribution

EXECUTIVE SUMMARY

The high levels and wide spread distribution of polychlorinated biphenyls (PCBs) found in the sediment and biota of New Bedford Harbor are currently being studied as part of the U.S. Environmental Protection Agency's (EPA) Superfund program. As part of these studies, EPA and the U.S. Army Corps of Engineers (Corps) conducted a pilot-scale demonstration project of dredging and disposal alternatives (Pilot Study). Included in the Pilot Study was an evaluation of three dredges (cutterhead, horizontal auger, and matchbox) and two sediment disposal techniques under actual operating conditions. Also included in the study was an environmental monitoring program designed to evaluate contaminant releases to the water and air. This report provides an overview of the Pilot Study, and presents the objectives, results, conclusions, and recommendations of the air quality monitoring program.

The Pilot Study air monitoring program consisted of ambient monitoring for PCBs, heavy metals, (cadmium, chromium and lead), odor (hydrogen-sulfide, H_2S) and volatile organic contaminants (VOCs). The monitoring was conducted prior to, during and following the dredging and disposal phases of the Pilot Study. Results from the PCB monitoring indicated that contaminant releases associated with pilot study activities were generally below existing ambient levels, and that the background levels generally appear to be influenced by meteorological conditions. In addition, the Pilot Study PCB release was primarily attributable to sediment disposal, due to the subaqueous nature of the hydraulic dredging techniques employed. The ambient levels of heavy metals, H_2S and VOCs measured during the study ranged from non-detect to only trace amounts. Of these contaminants, lead was measured at the highest level and frequency, but was well below any proposed or promulgated standard. In addition, these levels did not appear to be correlated to any of the dredging or disposal activities.

The recommendations of this report include a brief description of an ambient air quality monitoring program that could be used to support future sediment disposal activities and several engineering control measures that could be used to minimize PCB volatilization from a sediment disposal facility. These control measures ranged from simple operational procedures, such as conducting disposal activities during the winter months and increasing the depth of ponded water in the disposal facility, to extensive control measures, such as enclosed facilities. The degree to which control measures may be necessary for shoreline disposal of New Bedford Harbor sediment is primarily dependent on the level of PCB contamination. In general, PCB levels similar to the Pilot

Study (< 200 ppm PCB) may only require monitoring, however, the degree of control necessary for shoreline disposal of sediment with higher PCB levels may be established through further bench-scale testing.

1.0 INTRODUCTION

This report presents the results of an ambient air monitoring program conducted by Ebasco Services Incorporated (Ebasco). Ebasco served as part of the REM III team supporting a pilot-scale dredging and disposal study conducted by the U.S. Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers (Corps) at the New Bedford Superfund site. The Pilot Study was a site-specific field-scale test to determine if contaminated sediment could be effectively removed without causing unacceptable releases of contaminants to the environment.

1.1 SITE LOCATION AND HISTORY

The New Bedford Harbor Superfund site is located approximately 55 miles south of Boston along the northwestern shore of Buzzard's Bay. The site consists of 18,000 acres of estuary, harbor and bay contaminated with polychlorinated biphenyl (PCB) and heavy metals (Figure 1-1). Studies conducted by EPA during the late 1970s discovered PCB contamination in the sediment over a widespread area and in several species of marine biota. The biota concentrations were in excess of the U.S. Food and Drug Administration (FDA) edible tissue tolerance limit of 2 parts per million (ppm). In addition to PCBs, other contaminants including lead, cadmium, chromium, copper, and polycyclic aromatic hydrocarbons (PAHs) have also been found in the sediment.

As a result of the widespread PCB contamination and the accumulation of PCB in marine biota, the Massachusetts Department of Public Health established three fishing closure areas in New Bedford Harbor in September 1979 (Figure 1-2). These closures are still in effect at the present time. Area I is closed to all fishing: finfish, shellfish, and lobsters. Area II is closed to the taking of lobsters and bottom-feeding finfish, such as eels, flounders, scup, and tautog. Area III is closed to lobstering only. Closure of the New Bedford Harbor and upper Buzzards Bay areas to lobstering has resulted in the loss of approximately 18,000 acres of productive lobstering ground.

In July 1982, the site was added to the EPA Superfund National Priorities List (NPL) making it eligible for federal funds to further investigate the nature and extent of contamination and evaluate potential clean-up alternatives for the site.

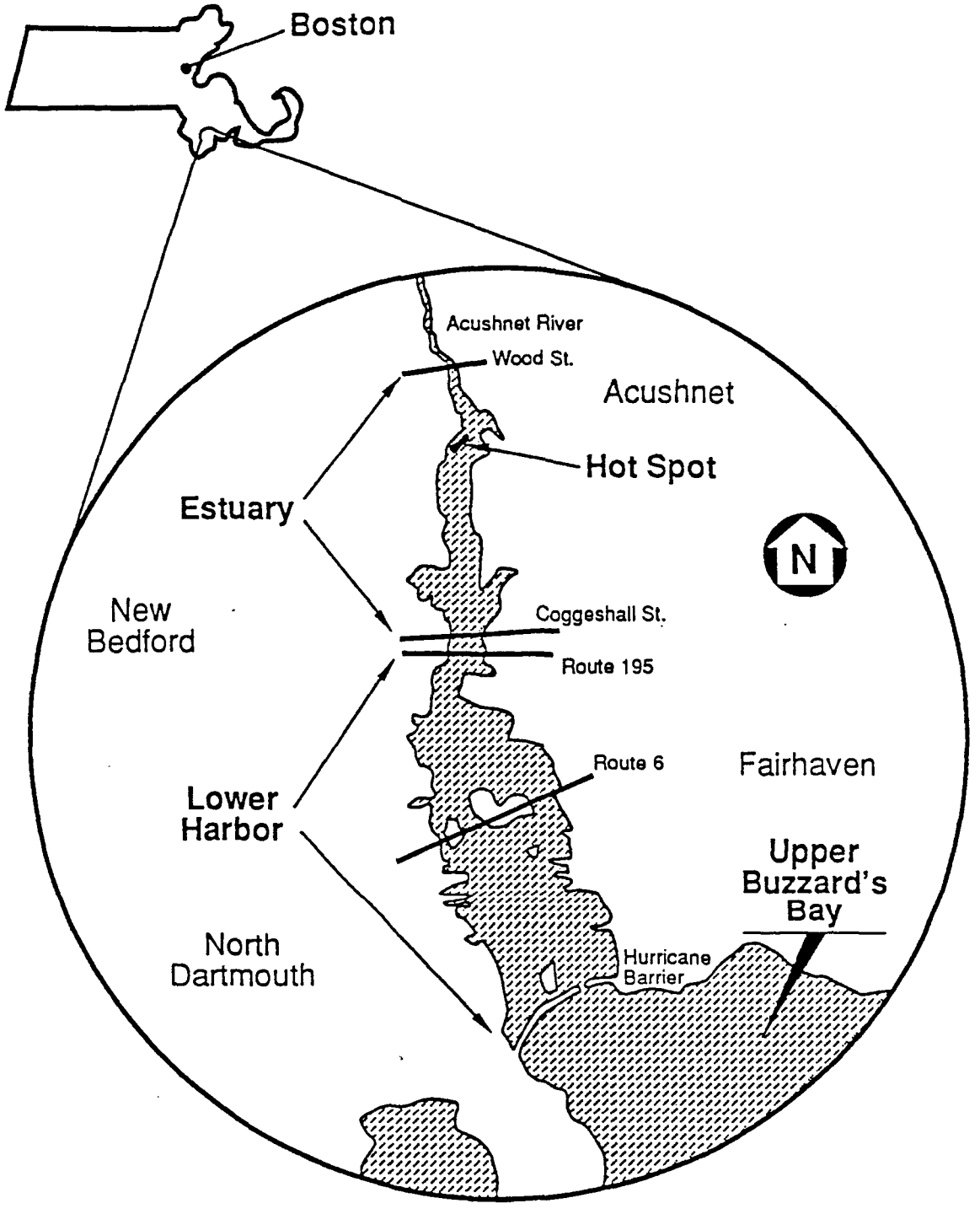


FIGURE 1-1
Site Location Map

Source: EPA, 1989

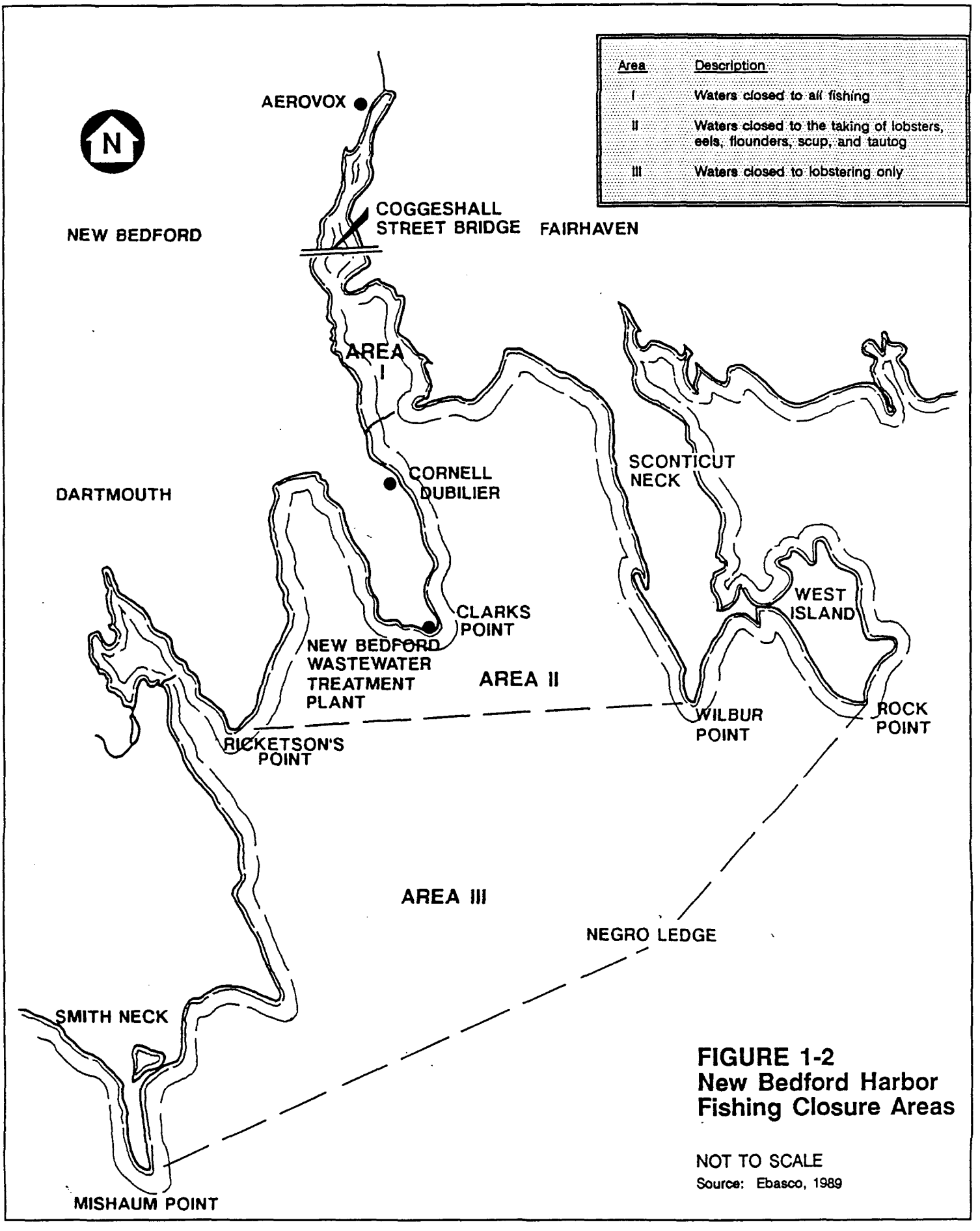


FIGURE 1-2
New Bedford Harbor Fishing Closure Areas

NOT TO SCALE
Source: Ebasco, 1989

For the purpose of conducting site studies, the site was divided into three geographical areas: the Hot Spot area, the Acushnet River Estuary and the Lower Harbor/Upper Buzzards Bay. The Hot Spot is an approximate 5-acre area located along the western bank of the Acushnet River Estuary. PCB concentrations in the Hot Spot Area range from 4,000 ppm to over 200,000 ppm. In 1989, the Hot Spot was designated as a separate operable unit. A Record of Decision (ROD) was signed on April 6, 1990 by the EPA Region I Regional Administrator documenting the rationale and selection of the preferred remedial measures for the Hot Spot area. The remedial measures included the dredging and treatment of approximately 10,000 cubic yards of PCB contaminated sediment from this 5-acre area.

The remainder of the site, the Estuary and Lower Harbor/Bay areas, are being addressed as a second operable unit. The Acushnet River Estuary is an area of approximately 230 acres (excluding the Hot Spot area), extending from the Wood Street Bridge to the north, to the Coggeshall Street Bridge to the south. Sediment PCB concentrations in this area (excluding the Hot Spot area) range from below detection to approximately 4,000 ppm. The Lower Harbor area consists of approximately 750 acres extending from the Hurricane Barrier, north to the Coggeshall Street Bridge. Sediment PCB concentrations range from below detection to over 100 ppm. The Upper Buzzards Bay portion of the site area extends from the Hurricane Barrier to the southern boundary of Fishing Closure Area III, an area of approximately 17,000 acres. Sediment PCB concentrations in this area range from below detection up to 100 ppm in localized areas along the New Bedford shoreline near combined sewer and stormwater outfalls. Additional information on site history and the nature and extent of contamination can be found in the Hot Spot Feasibility Study (Ebasco, 1989).

In 1984, a Feasibility Study (FS) was conducted for EPA by the NUS Corporation. This FS presented five remedial clean-up alternatives for the Estuary portion of the site, four of which involved dredging activities to remove or isolate the contaminated sediments. During the public comment period, comments from the general public, the Potentially Responsible Parties (PRPs) and other governmental agencies raised concerns regarding the adequacy of available dredging techniques. These concerns included sediment/contaminant migration and the potential release of leachate from unlined shoreline disposal facilities. To address these questions, EPA sought assistance from the Corps of Engineers. This assistance included performing a number of pre-design studies to address the concerns and to develop a conceptual dredging and disposal

alternative for the Estuary portion of the site. This Engineering Feasibility Study (EFS) was later expanded to a pilot-scale demonstration of dredging and dredge material disposal.

In 1986, EPA developed a scope for the REM III team to prepare an Overall FS that would address all three site areas and would integrate the results of the Corps' EFS. This Overall FS was later separated into two FS reports, one for each operable unit and the scope was modified to include the integration of the pilot study results into both reports. The results of the air monitoring program described herein are also being incorporated into the second operable unit FS.

1.2 BACKGROUND STUDIES

Over the past 10 years, several studies have been conducted to evaluate or estimate ambient air conditions at the New Bedford site. These studies have included both air monitoring and emission source modeling. The monitoring programs have included an area wide program and several smaller programs designed to evaluate specific source areas within the site.

In 1982, an area wide air monitoring program was conducted to assess the ambient levels of PCB, trace metals and other organics within the greater New Bedford area (GCA, 1984). This comprehensive effort included monitoring stations located in New Bedford, Acushnet and Fairhaven. The monitoring locations were selected to provide ambient levels from both known and potential source areas and urban background levels. The results of the PCB monitoring indicated high levels for several of the known source areas, including the northern end of the Estuary. In fact, two of the sampling stations located downwind of the Hot Spot area experienced average PCB concentrations of 69 ng/m^3 and 88 ng/m^3. The study also reported average ambient PCB levels for the background stations ranging from 3.7 ng/m^3 to 16 ng/m^3. This study recommended that a more detailed monitoring program for the northern portion of the estuary was required to further investigate the role of tidal influence on PCB emissions and to evaluate potential temporal changes.

In 1985, an air monitoring program was conducted to further investigate contaminant emissions from the highly contaminated sediments in the mudflat area adjacent to the Hot Spot (NUS, 1987). The objective of this study was to examine the potential role of tidal influence on releases of PCB and trace metals from this area. The program consisted of four sampling

locations along the shoreline of the estuary and one background location away from the site. The measured PCB values ranged from a low of 7 ng/m^3 at the background location to a high of 471 ng/m^3 at the sampling site directly east of the Hot Spot area. The latter sampling location was downwind of the mudflat area for a portion of each sampling period and consistently experienced the highest ambient PCB levels of all the locations. The results of seven samples taken at this location during periods of high and low tide indicated that PCB concentrations increased during periods of low tide.

The results of the GCA and NUS programs produced similar findings in that the highest ambient PCB levels were associated with locations adjacent to highly contaminated sediment in the northern portion of the estuary, locations adjacent to manufacturing facilities that used PCB and areas used for industrial waste disposal. In addition, the results of both monitoring programs indicated that ambient inorganic levels, with the exception of lead, were extremely low. However, even the highest lead levels were well below the National Ambient Air Quality Standard (NAAQS) of 1.5 μg/m^3 (standard for quarterly average).

As a supplement to the monitoring data, several PCB emission modeling studies have been conducted for the site. These studies have included source strength estimates for sediment exposed to the atmosphere and for transfer from sediment through the overlying water column (EPA, 1987a and Thibodeaux, 1989). Both of these modeling studies reached similar conclusions that volatilization may be a significant fate mechanism for PCB and that the highest emission potential was associated with wet sediment directly exposed to the atmosphere. In addition, results from a bench-scale test conducted by the Corps support this hypothesis. This test was conducted on New Harbor sediment using a specially designed flux chamber to measure emission rates (Brannon, 1989).

1.3 PILOT STUDY DESCRIPTION

A Pilot Study was conducted to evaluate dredging and disposal of contaminated sediment at the New Bedford site under actual conditions. The major factors evaluated were effectiveness in contaminant removal and contaminant release migration. The Pilot Study was conducted along the western shore of the Acushnet River Estuary, just north of the Coggeshall Street bridge (Figure 1-3). Three types of dredges and two disposal techniques were evaluated during the course of the study. A total of 10,000 cubic yards of sediment, including 2,900 cubic yards of

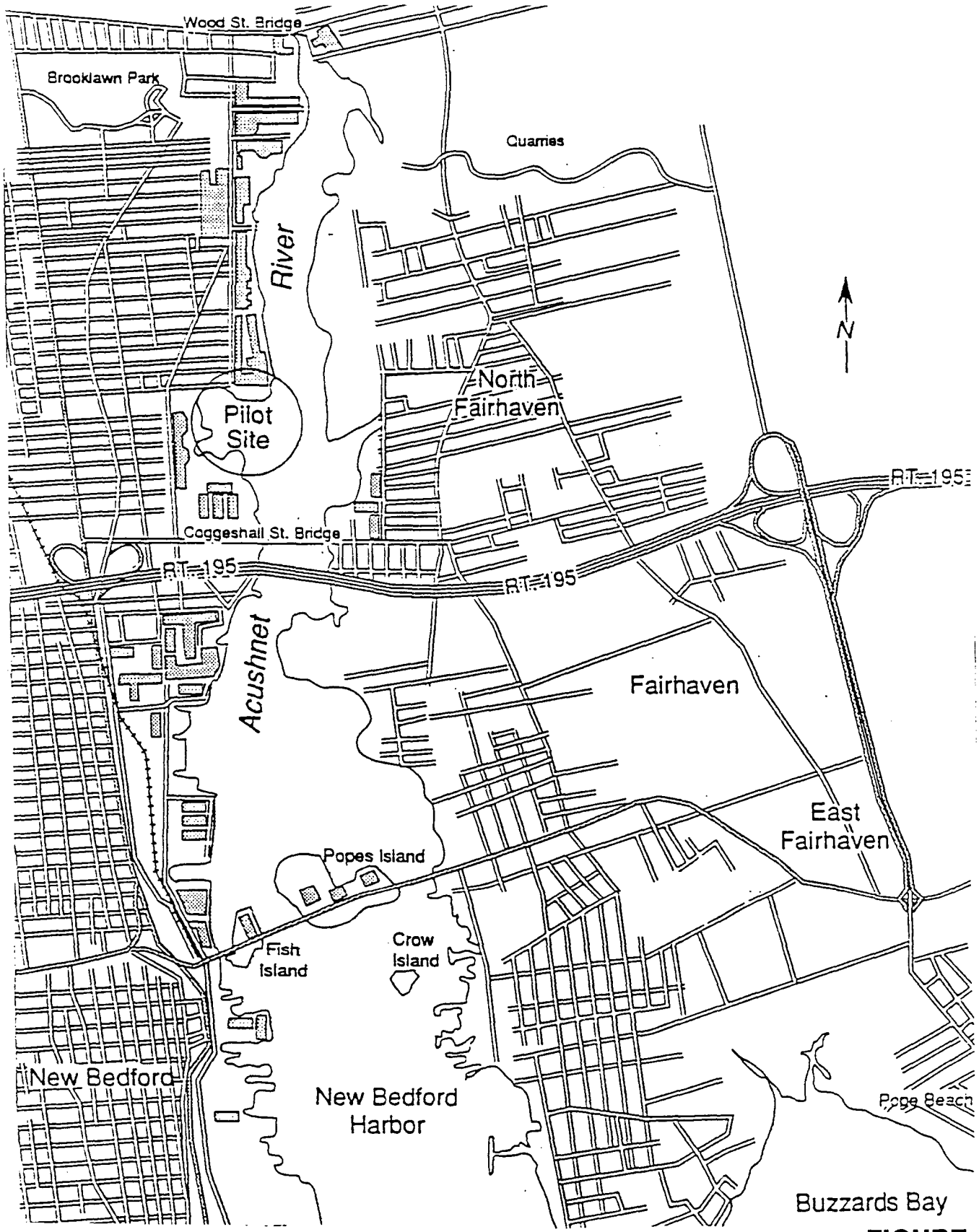


FIGURE 1-3
New Bedford Harbor and Area of Pilot Dredging and Disposal Study

Source: USACE, 1989

contaminated sediment were removed using a cutterhead, horizontal auger and Matchbox dredge. The sediment was dredged from the cove area bounded by Sawyer Street, Coffin Avenue, and Belleville Avenue. The PCB levels for the top 2 feet of the cove sediment generally ranged from 100 to 200 ppm, with higher concentrations measured in the 0 to 6 inch horizon. The PCB measurements for this surficial layer ranged from 149 to 585 ppm. The dredged sediment was then transported via hydraulic pipeline and placed in a sediment disposal facility. The first sediment disposal facility used was a Confined Disposal Facility (CDF) constructed on the New Bedford shoreline. The contaminated dredge material was placed in the CDF in two layers, first the contaminated sediment, and then a layer of clean sediment as a cap. The second disposal method employed was an innovative application of a subaqueous disposal technique called a Contained Aquatic Disposal (CAD). The entire CAD disposal process is conducted underwater and results in a layer of clean sediment covering the contaminated sediment while maintaining the original bathymetry. Figure 1-4 presents a detailed layout of the entire Pilot Study area including the CDF, the cove used for dredging and CAD disposal, and the air monitoring stations. The figure also presents the special relationship between the Pilot Study area and the surrounding industrial and residential communities.

A major component of the Pilot Study was an environmental monitoring program designed to assist in the evaluation of the dredging and disposal operations and to ensure that protection to public health and the environment over existing conditions. Both air and water quality monitoring were conducted during the Pilot Study with the water quality monitoring conducted by EPA and the Corps. The results of the water quality monitoring and an overall presentation of the Pilot Study are presented in a report prepared by the Corps (USACE, 1989).

1.4 PILOT STUDY AIR MONITORING PROGRAM

1.4.1 Program Development

The findings of the ambient monitoring programs and the emissions modeling/bench-scale studies were significant in light of the proposed Pilot Study activities where contaminated sediment was going to be placed in a shoreline facility. Although the PCB concentrations within the Pilot Study cove were relatively low, and the surface area of the CDF was relatively small, EPA and the Corps believed it was important to evaluate whether or not dredging and disposal activities might adversely impact air quality. In addition, the Pilot Study provided a unique

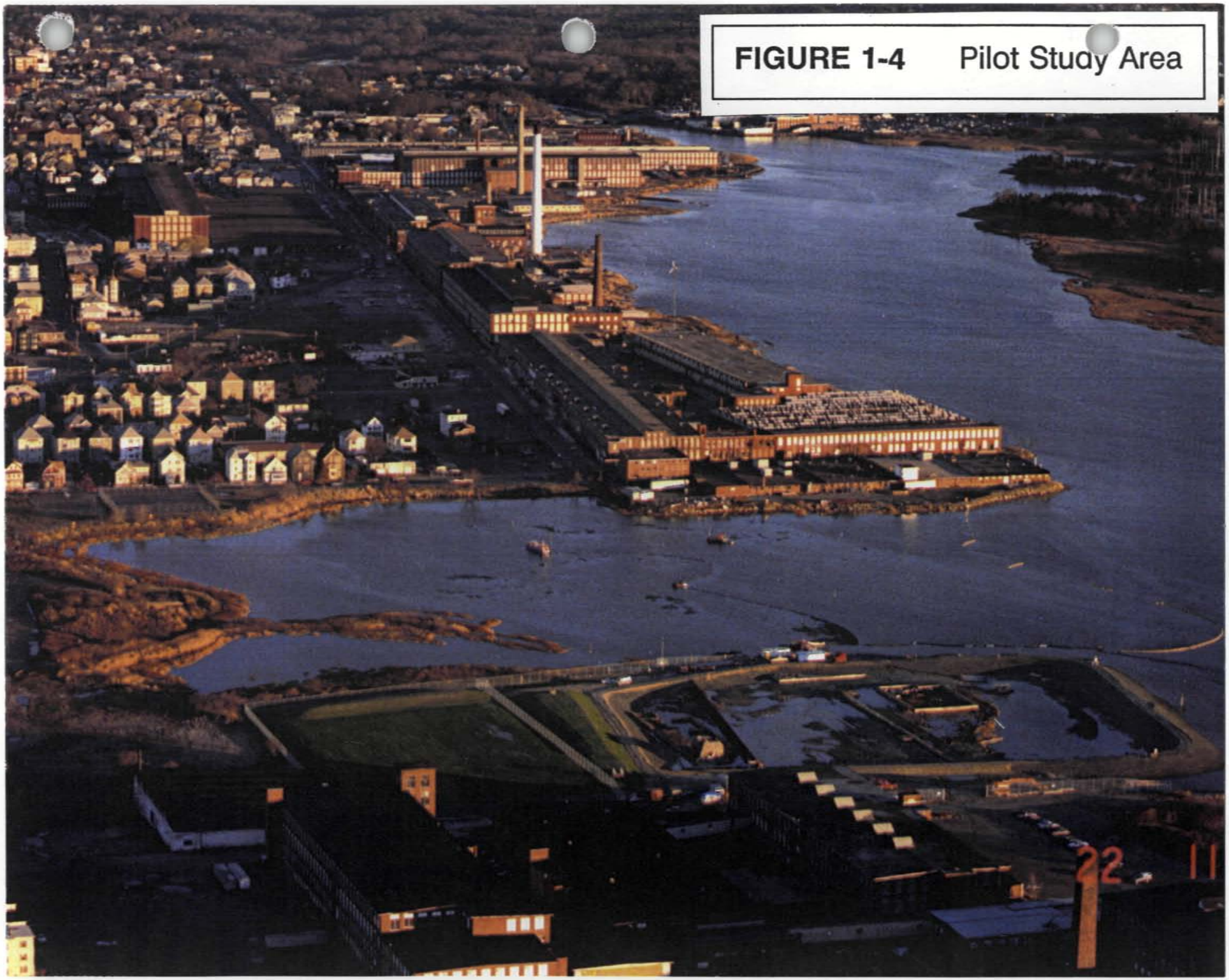


FIGURE 1-4 Pilot Study Area

opportunity to obtain site specific air quality data during actual field conditions that could be useful in the design process if dredging was selected as part of a remedial action for the New Bedford site.

During the initial scoping of the program, concerns were raised that contaminant releases during the Pilot Study could potentially impact worker safety and the surrounding residential community. To address these issues, the program was designed to obtain the monitoring results in a mode that was as close to real-time as possible. In addition, risk-based Decision Criteria were developed to assist EPA and the Corps in evaluating the daily operations. The risk-based approach was used to develop criteria because the ambient PCB levels in New Bedford posed a potential risk under existing conditions. In addition, the ambient levels also exceeded a proposed Commonwealth of Massachusetts Allowable Ambient Limit (AAL) for an annual average of 0.5 ng/m^3 (DEP, 1989). The concept of developing criteria based on existing conditions was similar to the approach used in developing Decision Criteria for the water quality monitoring program.

In an attempt to develop a background PCB level for the New Bedford site, Ebasco reviewed the results reported in previous monitoring studies (GCA, 1984 and NUS, 1987). These studies reported a wide range of values for a number of sites and were not able to resolve spatial and temporal variabilities. However, upon review of the data, the background concentration of 10 ng/m^3 suggested by NUS appeared to be reasonable. Although monitoring was conducted during the pre-dredging phase in an attempt to establish site-specific background levels, a default value of 10 ng/m^3 was selected for the development of Decision Criteria because the amount of data required to resolve the temporal variabilities associated with the three seasons that the Pilot Study spanned did not exist.

Under assumed background condition of 10 ng/m^3, the excess lifetime cancer risk is approximately 10^{-5} (Ebasco, 1989). This risk estimate was calculated using a conservative exposure scenario of 24 hours per day for 70 years. The intent of the Decision Criteria was to develop an ambient PCB concentration that would not significantly increase the risk above existing conditions during the dredging and disposal portion of the study (Ebasco, 1987). To be conservative, a risk level of 10^{-6} was selected to calculate the criteria value. The corresponding PCB concentration was 64 ng/m^3 <u>as an average value</u> for the period of dredging and disposal activities. This value reflected the acceptable daily average PCB concentrations

above background conditions for the estimated 3-month duration of these activities. The maximum daily value for any individual day was 10 $\mu g/m^3$ based on the 10-day Health Advisory (HA) developed by EPA for protection against the non-carcinogenic effects of PCB.

1.4.2 Program Objectives

The primary objectives of the air monitoring program were twofold. The first objective was to ensure that the activities were not causing significant releases above background conditions that could impact work safety or the surrounding residential areas. The second objective was to monitor ambient contaminant levels prior to, during and after the dredging and disposal portions of the Pilot Study. This information was gathered to assist EPA and the Corps in directing daily operations of the Pilot Study to minimize airborne contaminant releases. A secondary objective was to gather pre-design data to assist in the design process if a similar remedial action was selected for the New Bedford site.

1.4.3 Program Description

The air monitoring program consisted of ambient monitoring conducted at five sites within the Pilot Study area. The contaminants measured during the monitoring program included: PCBs (aroclors 1016, 1242, 1248, and 1254), trace metals (Cd, Cr, and Pb), odor (hydrogen-sulfide, H_2S), and volatile organic contaminants (VOC). While H_2S and VOC measurements were conducted in a real-time mode, PCB and metals measurements were available on a verbal basis within 24 hours after the laboratory received the samples. This resulted in a turn-around time of approximately 48 hours for the PCB samples and 7 days for the trace metals samples. In support of the air sampling effort, a meteorological station, including a 10-meter tower, was employed at the site to assess localized meteorological conditions.

1.5 REPORT ORGANIZATION

The report is organized in two volumes with Volume I containing sections 1 through 6 and four appendices. These appendices include Quality Assurance (QA), Data Validation and tabular/graphical summaries of the data. Volume II contains three appendices that include detailed photographs of monitoring station locations, sampler calibration records and daily wind roses.

Section 1 of the report contains a brief discussion on site location, history and background along with a general description of the Pilot Study and an overview of the air monitoring program. Detailed descriptions of the monitoring site locations and the sampling program schedule are provided in Section 2. Section 3 presents the design and operation of the monitoring equipment for the following sampling program components: PCB, metals, VOC, H_2S, and meteorology. Section 4 presents the QA requirements of the program and a discussion of the results. The results of Data Validation for both the PCB and the metals is discussed in Section 5. The results of the contaminant levels measured during the program are summarized in Section 6. An overall summary and recommendations for air monitoring activities that may be required in support of future dredging and disposal activities are presented in Section 7.

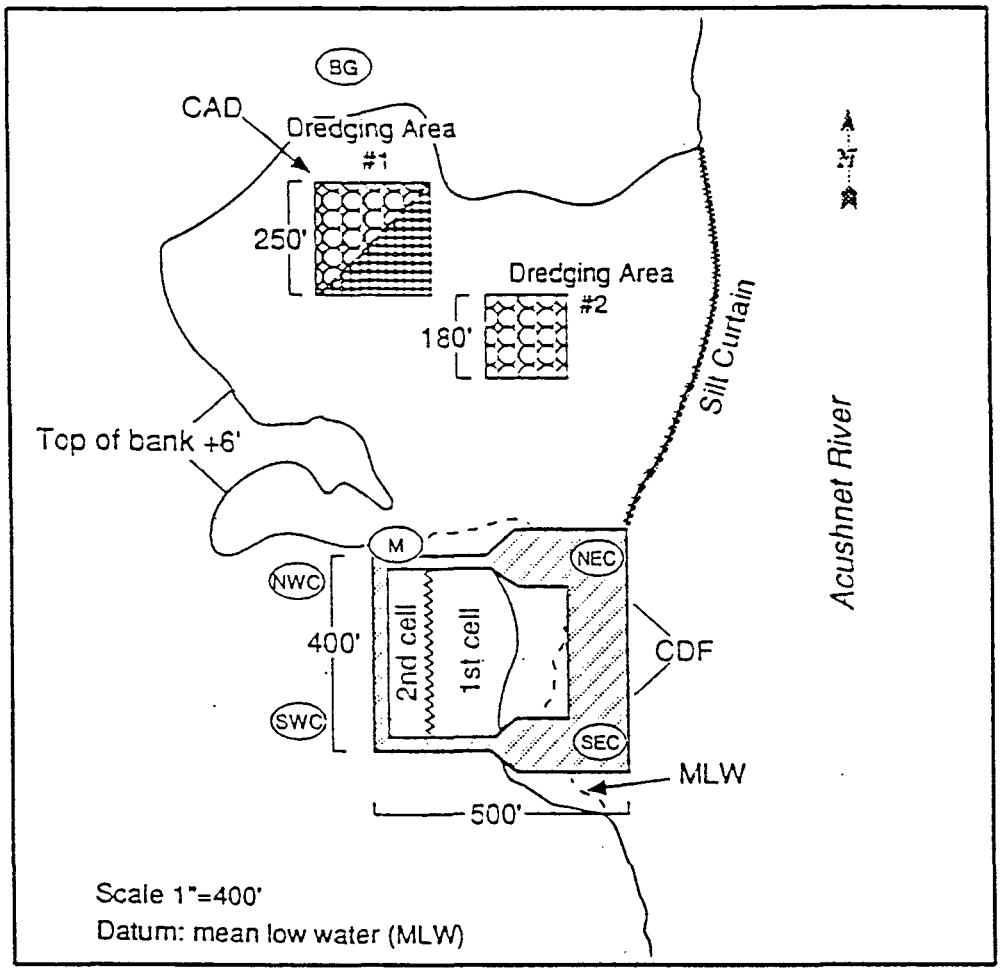
2.0 MONITORING PROGRAM DESCRIPTION

2.1 MONITORING SITE DESCRIPTIONS

In order to assess PCB and heavy metal emissions, six Polyurathane Foam Samplers (PUF) and two High Volume (HI-VOL) samplers were located at five sites. A schematic of the Pilot Study area depicting the locations of key components is provided in Figure 2-1. These components include the dredging and disposal areas along with the air monitoring and meteorological stations. The monitoring station located on the southwest corner of the CDF included collocated PUF and HI-VOL samplers to collect data simultaneously in order to demonstrate data precision. A single PUF sampler was installed at each of the other four sites.

Though local climatology of the area indicated winds with predominant northwest through southwest components, there were a number of other climatological and geographical variables which made the site selection process difficult based on historical meteorological data. Since the study was performed from November 1988, through April 1989, three seasonal weather patterns influenced wind conditions during the sampling period. Additionally, the influence of varied wind conditions due to "sea-breeze" effects further complicated siting the samplers. The emphasis in selecting sampling sites was therefore placed on locating the sites such that samplers were upwind and downwind of the expected sources of contamination for virtually any wind direction. In addition, consideration was given to the requirements for AC power, security, and site access (Ebasco, 1988).

For the monitoring sites adjacent to the CDF, the fence surrounding the study site provided the needed security for uninterrupted data recovery. Each sampler was mounted on a 4x4x4-foot weighted platform. Each site was wired to a central power transformer using 10- and 12-gauge cable to avoid power loss over the length of cable required to reach the locations. This cable was buried to avoid high traffic areas and utilized lock connectors at each site. No power fluctuation was noted during the operation of the samplers and there was only one incident where the cable was damaged by vehicular traffic. The individual PCB and heavy metal sampling sites are described in the following sections. As a supplement to Figures 1-4 and 2-1, detailed photographs illustrating the monitoring site locations are contained in Appendix E.



SWC - Southwest corner
NWC - Northwest corner
NEC - Northeast corner
SEC - Southeast corner
BG - Background
M - Meteorological Tower

FIGURE 2-1
Location of Air Monitoring Stations and Meteorological Tower

Source: USACE, 1989

2.1.1 Southwest Corner (SWC)

The SWC site was located on a grass-covered hill off the southwest corner of the CDF. This site was designated as a PCB sampling site, as well as the only heavy metal sampling location. Since this was the only site to be collecting both PCB and heavy metal data, it was also designated as the collocated sampler site. Therefore the SWC location was equipped with two PUF samplers and two HI-VOL samplers providing duplicate data collection. This information was used to assess the precision of the sampler's operation and sampling protocol. The principles behind determining data precision and a summary of the results are provided in Sections 4 and 6.

The sampling location was 30 feet from the southwest corner of the CDF, and, because the samplers were mounted on a hill, the sampler inlets were approximately 25 feet above the surface of the CDF. The SWC location was approximately 50 feet north of the site staging area, and 80 feet north of Sawyer Street. To the west of the site was an athletic field, and to the north was grass-covered ground and the dirt road which circled the CDF. The NWC site was also installed on the same hill and was approximately 350 feet north of the SWC site. The SEC site was 500 feet to the east. Since the SWC site was installed back from the CDF in an area with grass cover there was little to no impact of fugitive emissions from the staging area, dirt road, or from Sawyer Street.

This location was selected to assess contaminant transport on days with east-northeast winds toward the athletic field, nearby factories, and residential areas. This station was selected for heavy metal samplers because it was in the direction from the CDF where dust-borne contaminants would be transported to the nearest population area. Though PCB in a vapor phase would travel longer distances, particulate-bound metals will dissipate quickly because of gravitational settling. Therefore it is important to assess heavy metals where it would have impact on the closest neighborhoods. The residential areas closest to the CDF were approximately two blocks away.

2.1.2 Southeast Corner (SEC)

The SEC site was equipped with one PUF sampler located on the berm which separated the CDF from the Acushnet River. The sampling location was on the southeast corner of the CDF, and was set approximately 18 feet above the surface of the CDF. The SEC location was approximately 50 feet north of the Sawyer Street dead end and 20 feet west of Acushnet River. The site was just off

the dirt road which circles the CDF, and was approximately 350 feet south of the NEC site and 500 feet west of the SWC site. The SEC site was the highest impacted location during the dredging phase of this study.

This location was selected to assess contaminant transport on days with southwesterly winds, which are climatologically favored in the New Bedford area. This station allowed for the assessment of PCB releases toward the town of Fairhaven and other locations along the river. Since this site was directly on the river, there were little or no localized population areas, the closest being on the eastern side of the river.

2.1.3 Northeast Corner (NEC)

The NEC site was equipped with one PUF sampler located on the berm which separated the CDF from the Acushnet River. The sampling location was on the northeast corner of the CDF, and was set over 18 feet above the surface of the CDF. The NEC location was approximately 600 feet southeast of the dredging sites in the cove and 20 feet west of Acushnet River. This site was approximately 75 feet from the diffuser at the end of the dredge line, where the sediment was pumped into the CDF. The site was just off the road which circles the CDF and was approximately 350 feet north of the SEC site and 500 feet east of the NWC site. The NEC site was the second highest impacted site during the dredging phase of the study.

This location was selected to assess contaminant transport on days with southerly winds, which were in the direction of residential and light-industrial areas to the north of the site and across the river.

2.1.4 Northwest Corner (NWC)

The NWC site was equipped with one PUF sampler located on the grass-covered hill to the west of the CDF. The sampling location was 30 feet from the northwest corner of the CDF, and was set over 25 feet above the surface of the CDF. The NWC location was approximately 600 feet southwest of the dredging locations in the cove and backed up to the athletic field on the west. The site was 20 feet off the road which circles the CDF and was approximately 350 feet north of the SWC site and 500 feet west of the NEC site.

This location was selected to assess contaminant transport on days with southeasterly winds, which were in the direction of residential areas and a playground approximately two blocks to the north. This site location measured conditions in the direction of the most direct transport sector to the residential receptors from the study area.

2.1.5 Background (BG)

This site was located on the opposite side of the cove from the CDF area, adjacent to the dredging locations. The sampler was set up in a fenced-in area owned by the New Bedford Sewage Treatment District on Coffin Avenue. The sampling location was 1000 feet north of the CDF and 300 feet north of the dredging site. The residential area and playground described in the NWC description are located 300 feet to the west of the site. A parking lot was just to the north and a clothes factory complex began 75 feet to the east, stretching northeast from the BG site.

This location was selected to assess potential PCB emissions from the dredging and CAD disposal activities. Additionally, this site was used to obtain data during non-dredging periods where PCB emissions could be attributed to sources not associated with pilot study activities. These potential sources include mudflat areas and surface water.

2.1.6 Odor and Volatile Organic Contaminant (VOC)

Real-time odor (H_2S) and VOC screening were completed on days when particulate and PCB sampling was scheduled. During the daily setups of the HI-VOL and PUF samplers, and at least five more times during the 24-hour sampling period that followed, odor and VOC levels were measured at each of the five sampling locations. These sampling sequences were in correlation with routine flow checks of the samplers which typically began at 0900 every sample day. The last daily check occurred at approximately 1600, then began again the following day at 0600. The last reading was at the sample shut-down at 0900 of the second day. The intent of the sample locations was to obtain data in response to all wind conditions. In addition, hand-held meters were used to continuously monitor ambient conditions while in transit between the designated sampling locations.

A Gastech GX-4000 Combustible Gas Meter was used to measure H_2S during odor checks. A Foxboro Century 128 flame ionization Organic Vapor Analyzer (OVA) was used to measure total VOC including methane. An HNU brand PI-101 Photoionization Detector (PID), which is blind

to methane, was used to measure VOC excluding methane. More detailed information on the instrumentation is provided in Section 3.0.

If instantaneous non-methane organic vapor levels in excess of 10 ppm over the background were measured, a more intensive Volatile Organic Priority Pollutant (VOPP) sampling program would have been implemented to quantify the pollutants. The VOPP sampling would have employed low flow Gillian pumps in up and downwind locations relative to the dredging and disposal activities. The pumps were designed to utilize quad manifolds so that tenex and charcoal sorbent traps could be sampled on the one pump and therefore both the lighter and heavier compounds of concern could be effectively monitored. VOPP sampling would have commenced with the survey meter violation and terminated at the end of the work day. However, this sampling was never required during the course of the Pilot Study.

2.1.7 Meteorological Monitoring Site

Because of the concerns previously mentioned over the use of regional meteorological data to assess emissions over the dredging and disposal areas, an on-site meteorological station was installed in the area between the cove and the CDF. The station was established to evaluate potential contaminant transport and conditions conducive to particulate release. By installing the site directly at the CDF, it was possible to measure conditions as they existed in the area of concern, thereby enhancing the accuracy of the database.

A 10-meter meteorological tower was installed and equipped with instrumentation to monitor wind speed, wind direction, sigma theta, temperature, solar radiation, soil temperature, and precipitation. All data except precipitation was collected and stored using a Cambell Scientific data logger onto magnetic cassette tapes. The data was processed and validated on a bi-weekly basis. Meteorological data was also monitored on strip chart as a back-up data device to ensure two complete and accurate databases. The data logger, strip chart recorder, and instrument signal processors were installed at the base of the tower in an environmentally-secured cabinet. Precipitation was measured using a manual rain gauge. Precipitation readings were taken during the site visits and documented on the data sheets. All meteorological data was reviewed several times each sampling day to ensure that the system was monitoring conditions accurately. Barometric pressure conditions were also measured at the beginning and end of each sampling day (24-hour period).

2.1.8 Staging Site

A trailor was located on-site to allow for sample preparation, meter calibration and data coordination. All sampling media, as well as site documentation and calibration standards, were stored at this location. All sampling media were stored in sealed containers prior to and after sampling to avoid contamination of exposed PUF samples.

2.2 MONITORING PROGRAM SCHEDULE

The air quality monitoring program was segmented into three distinct phases as outlined below. Each phase was conducted in relation to Pilot Study activities, to identify conditions prior to dredging, during the dredging period, and after dredging and site activities had been completed.

2.2.1 Pre-Dredging Sampling

The pre-dredging phase of the air sampling program began on November 7, 1988 and ended with the first day of dredging on November 19, 1988. From November 7 through November 12, 1988, the only site which was in operation was SWC. The other three CDF sites and the meteorological station went on-line on November 13, 1988. The BG site did not go on-line until December 28, 1988. The intent of this pre-dredging sampling period was to assess existing ambient conditions of PCB and heavy metals before the pilot study activities were initiated. A total of 12 days were sampled at the SWC site. All other sites, including the meteorological site were on-line for six of the days during the pre-dredging period. VOC and odor conditions were also monitored over the entire 12-day period.

The data was evaluated before the dredging period began in order to identify any significant existing sources of particulates or PCB which could have contributed to the levels measured during the dredging project.

2.2.2 Sampling During CDF/CAD Operations

Dredging began on November 19, 1988 and ended on January 21, 1989. During this period samples were collected at every location (except for the BG site which went on-line December 28) every day that dredging activities were initiated. This sampling schedule was responsive to the scheduling and

performance of the dredging equipment and tidal changes, therefore the schedule was, at times, continuous for seven days a week, while other weeks were more sporadic. Any time where dredging was initiated, even for a brief period, samples were collected. A total of 37 sample days were monitored during the various phases of dredging and disposal to evaluate the impact of these activities on ambient air quality.

Specific attention as to which of the sampling locations were being impacted in reference to the meteorological conditions was of particular interest. Increases and decreases in the PCB and heavy metals concentrations were monitored as dredging scenarios changed or meteorological conditions varied. VOC and odor levels were also monitoring during this period. The periods of sampling and the number of samples collected during each phase of CDF and CAD operations are summarized in Table 2-1.

TABLE 2-1

DREDGING/SAMPLING SCHEDULE

Dates	Dredging Activity	No. of Sample Days
Nov. 7 - Nov. 19	Pre-Dredging Sampling	12
Nov. 19 - Dec. 19	CDF Contaminated Material	24
Dec. 20 - Jan. 4	CDF Clean Material	4
Jan. 7 - Jan. 20	CAD Contaminated Material	9
Jan. 25 - Feb. 11	CAD Clean Material	0
Apr. 3 - Apr. 28	Post-Dredging Sampling	16

2.2.3 Post-Dredging Sampling

The post-dredging monitoring was initiated following the completion of CDF and CAD operations. In order to allow the cap material to settle and for all other take-down activities to be completed, post-dredging sampling did not begin until April 3, 1989. This allowed the site to revert back to the conditions prior to the dredging activities and to allow all other influences to be removed from the site, so that samples were not affected by vehicular traffic or other dismantling operations. The post-sampling effort was completed by April 28, 1989.

During the post-dredging sampling sequence, all sampling sites including the meteorological station were in operation. VOC and odor monitoring was curtailed because of the insignificant levels measured during the pre-dredging and dredging activities. Each sampler operated for 16 days during this period.

The data collected during this monitoring sequence was compared to that collected during the pre-dredging program to ensure that ambient levels had returned to those conditions expected for the area and time of year, in order to evaluate the efficiency of the CDF and CAD caps. If PCB and heavy metal conditions remained elevated and were found to be related to site modifications created by Pilot Study activities, further steps would have been implemented to mitigate the emissions.

Primarily because of the extreme difference in meteorological conditions observed during the post-dredging sequences as compared to the pre-dredging sampling period, the data collected in April did not completely return to the levels observed in November, although they did drop significantly for the monitoring sites adjacent to the CDF. The BG site became the producer of the highest PCB concentrations during this post-dredging effort, which could indicate that the levels measured are more reflective of existing conditions found in the New Bedford area during this time of year. Further analysis of this data for all three phases is presented in Section 6.0 of this document.

3

3.0 MONITORING PROGRAM OPERATIONS SUMMARY

This section summarizes the air quality data collection aspects of the New Bedford Harbor monitoring program. This includes:

- Key operations information regarding the data collection techniques and data reporting protocols for each parameter measured, and

- descriptions of any notable operational problems that were encountered that may warrant consideration in implementing and operating similar sites in the future

3.1 DATA RECOVERY RATES

The final data recovery rates for each measured parameter are listed in Table 3-1. The recovery rates were computed based on the total number of sample days during the entire pilot study. These percentages represent the data collected relative to the actual amount that could have been collected, based on the planned sampling schedule. Reasons for invalidating PCB and heavy metal samples included mishandling, contamination, and data outliers (data which are statistically outside limits of probability). Six samples were removed from the database for the following reasons:

1. Sample damaged in handling.
   Date: 11/16/88
   Site: SWC/HI-VOL
   Sample #: 210

2. Sampler blew over in high winds damaging mounting bracket for the PUF cartridge.
   Date: 11/21/88 & 11/22/88
   Site: NWC/PUF
   Sample #: 208/NO RUN

3. Sample damaged in handling.
   Date: 12/3/88
   Site: SWC/PUF
   Sample #: 147

4. Workmen disconnected power to the site.
   Date: 12/3/88
   Site: SEC/PUF
   Sample #: 418

TABLE 3-1

Data Recovery Summary

Site	Total # of Sample Days Scheduled				Total # of Sample Days Collected				Percent Recovery			
	Pre	Dredge	Post	Total	Pre	Dredge	Post	Total	Pre	Dredge	Post	Total
SWC (PCB)	12	37	16	65	12	36	16	64	100%	97%	100%	98%
SWC (Colo/PCB)	12	37	16	65	12	36	16	64	100%	97%	100%	98%
SWC (Metals)	12	37	16	65	12	35	16	63	100%	95%	100%	97%
SWC (Colo/Metals)	12	37	16	65	12	37	16	65	100%	100%	100%	100%
SEC (PCB)	6	37	16	59	6	36	16	58	100%	97%	100%	98%
NWC (PCB)	6	37	16	59	6	35	16	57	100%	95%	100%	97%
NEC (PCB)	6	37	16	59	6	35	16	59	100&	95%	100%	97%
BG (PCB)	–	12	16	28	–	11	15	26	–	92%	94%	93%
Wind Direction	5	67	27	99	3	63	27	93	60%	94%	100%	94%
Wind Speed	5	67	27	99	3	63	27	93	60%	94%	100%	94%
Air Temperature	5	67	27	99	3	63	27	93	60%	94%	100%	94%
Soil Temperature	5	67	27	99	3	63	27	93	60%	94%	100%	94%
Solar Radiation	5	67	27	99	3	63	27	93	60%	94%	100%	94%
Precipitation	5	67	27	99	5	67	27	99	100%	100%	100%	100%

5. Damaged during laboratory preparation.
   Date: 1/19/89
   Site: BG/PUF
   Sample #: 511

6. Circuit breaker tripped due to heavy rain.
   Date: 4/6/89
   Site: BG/PUF
   Sample #: 516

Accounting for the above data losses, the data recovery rates for the program were generally between 94 and 100 percent.

3.2 MEASUREMENT AND OPERATIONS SUMMARY

This section provides documentation on the operation of each sampling system, including the measurement and the data reduction methods for each parameter.

3.2.1 PCB Measurements

3.2.1.1 System Description

PCBs were measured using a General Metal Works (GMW) Model PS-1 Polyurethane Foam Sampler (PUF). The detection limit for the PUF sampler over a 24-hour sampling period is less than 1 ng/m^3. The PUF sampler was a modified HI-VOL sampler with two types of sampling media in series. Air is first drawn through a quartz filter and then through a polyurethane foam absorbent cartridge. Ambient air was sampled at a rate of 200 to 280 ℓ/min, with the air flow through the sampling system monitored by a Venturi/Magnehelic assembly. A 4-inch circular quartz filter mounted across the top of the PUF plug so that sampled air passed through the filter before it is collected on the plug. This filter prevents larger particles from impacting the plug, thus lowering the plug's collection efficiency. The PUF absorbent was a polyether-type polyurethane foam (Density No. 3014 or 0.0225 g/cm^3). The PUF inserts were 6-cm diameter cylindrical plugs cut from 3-inch sheet stock and fit with slight compression in the glass cartridges, supported by a wire screen. The glass cartridge was inserted into an enclosed portion of an aluminum mounting unit.

Aluminum cartridges served as protective containers for the sample media, and were installed onto a socket located in the PUF sampling well. Samples were kept in the cartridges to prevent contamination. At the completion of the sample run, these cartridges were maintained in an upright position until the sample media were removed to ensure no loss of a sample.

3.2.1.2 Summary of Operating Procedures

The PUF samplers were essentially operated continuously throughout the pre-dredging and dredging phases of the study. Samples were reset between the hours of 0800 and 1000 of every sample day and ran for 24 hours. No timers were used to start and stop samplers since the conclusion of one sample day was the beginning of the next one. Routine flow checks were conducted throughout the

course of the sampling events (typically five or six checks per sample day). Single point flow checks were done at the beginning and end of each sample run to ensure appropriate flow was being maintained. Multipoint flow calibrations were completed on a monthly basis and after any sampler maintenance. Sample cartridges were changed out at the staging trailer. The exposed cartridges and filters were handled using polyester gloves and were immediately packaged, labeled, and stored in a cooler containing blue ice. All samples were transported to the laboratories using an overnight delivery service. Verbal laboratory results were received within 72 hours of the sample collection day. Hard copy results followed within seven days.

3.2.1.3 Laboratory Analysis Summary

PCB concentrations were determined through laboratory analysis of collected PUF plugs and 4-inch quartz particulate filters. Tables C-6 through C-11 in Appendix C of this volume list concentrations as they were detected on the PUFs and filters, respectively. Tables C-3 through C-5 list PUF and filter concentrations per aroclor by site for the entire testing period.

The mass of the individual aroclors on each analyzed sample was divided by the sampled air volume for that filter/plug combination to obtain the actual ambient concentration value in $\mu g/m^3$. PCB concentrations were reported to the nearest 0.0001 $\mu g/m^3$.

The analysis and extraction of the PUF plugs and the quartz filters were conducted in accorance with EPA guidance (EPA, 1982 and EPA 1984). The following is a brief description of the laboratory procedures in the preparation and extraction of PCB data from the PUF plugs and quartz filters.

Preparation of the PUF Cartridges

Prior to being used in the field, the PUF cartridges were cleaned in the laboratory. This initial cleaning was completed in a Soxhlet extractor using acetone for 24 hours, at approximately 4 cycles per hour. When the cartridges were reused, a 5 percent diethyl-ether in n-hexane solution was used as the cleaning solvent. The extracted PUF was then placed in a vacuum oven connected to a water aspirator and dried at room temperature for four hours. The PUF was placed into the glass sampling cartridges while using polyester gloves. The cartridge was then wrapped with hexane-rinsed aluminum foil and shipped to the field.

Sample Preparation

All samples were extracted within 72 hours of collection. The PUF cartridges were removed from the zip-locked storage bags and the hexane-washed aluminum foil using gloved hands. The cartridges were then placed in a 500-mℓ Soxhlet extractor for 24 hours at 4 cycles/hour with 5 percent diethyl ether in hexane. The quartz filters were placed in a 250 mℓ Kuderna-Danish concentrator, as defined in EPA Method 608, using a water bath. All samples were maintained at a temperature of less than 50°F during the analysis phase.

Sample Analysis (Gas Chromatograph Procedures)

EPA Method 608 summarizes the recommended procedures and operating conditions for the gas chromatographic (GC) analysis. The daily calibration and specific quality assurance procedures were met for the analysis of each batch of filters to ensure data accuracy. Using a solvent-flush technique, 2 to 5 $\mu\ell$ of the sample extract were injected into the GC. The volume of the injected extract was recorded to the nearest 0.05 $\mu\ell$, along with the total extract volume and the resulting peak size in area or peak height in units. The width of the retention time window used to make identifications was based upon measurements of actual retention time variations of standards over the course of a day.

To measure more than one aroclor, the procedure described in Webb and McCall (1973) was used to identify and quantify the aroclor. The Method Detection Limit (MDL) is defined as the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the value is above zero. The detection limit specified for this program, for the PUF plug and the quartz filter was 65 μg per PUF or filter.

3.2.1.4 Reporting

During daily operations "daily data sheets" were maintained by the field technician. These sheets allowed the documentation of observed sampler flow rates, meteorological conditions, and the results from the VOC and H_2S meter observations. The sheets were updated each time the sites were visited, up to six times over a sampling period. The information documented on these sheets was then key-punched into computerized spread sheets at the end of each sampling week.

Data on the daily data sheets was used to calculate both the total flow rate at standard conditions over the 24-hour sampling period, as well as calculated flow rate conditions as they were observed during each of the site visits. When sample analysis results were received from the laboratories, the reported PCB weights were entered onto these forms and final PCB concentrations were calculated by dividing the reported weight by the total volume of air that passed through the filter at standard conditions.

3.2.2 Heavy Metals

3.2.2.1 System Description

Heavy metals were measured using a Staplex, Air Sampler Division HI-VOL sampler Model TFIA. The minimum detectable particle size for this sampler was 0.01 microns. Air flow through the sampling system was controlled using a Kurz Instrument Model 310 flow controller which maintained a continuous sample flow rate of 40 ACFM throughout the sampling period. The flow rate was measured using a rotometer incorporated as part of the motor housing.

The 8x10-inch quartz filters used for this monitoring program were Model General Metal Works (GMW) Model GQMA Micro-Quartz filters which met all EPA specified criteria for quartz sampling media. The sampling filters were loaded in the staging trailer and transferred to the site in aluminum cartridges to avoid contamination or damage to the filter.

3.2.2.2 Summary of Operating Procedures

The HI-VOL samplers were essentially operated continuously throughout the pre-dredging and dredging phases of the study. Samples were set and removed between the hours of 0800 and 1000 of every sample day and ran for 24 hours. No timers were used to start and stop samplers since the conclusion of one sample day was the beginning of the next one. Routine flow checks were completed throughout the course of the sampling period, (typically five or six checks per sample day). Single point flow checks were done at the beginning and end of each sample run to ensure appropriate flow was being maintained. Multipoint flow calibrations were completed on a monthly basis and after any sampler maintenance. Sample filters were changed out at the staging trailer. The exposed filters were immediately packaged, labeled, and stored in small shipping containers until they were transferred to the laboratory. Samples were transferred to the laboratory after

every five sample days. Hard-copy data results from the laboratory followed within 14 days of sample submittal.

The procedures and standards implemented for the collection of heavy metal data were based on the manufacturer's specifications and in the Code of Federal Regulations (CFR) 40, Part 50, Appendix G, "Reference Method For the Determination of Lead in Suspended Particulate Matter Collected From Ambient Air," July 31, 1987.

3.2.2.3 Laboratory Analysis Summary

Metal concentrations were determined through laboratory analysis of the quartz particulate filters for cadmium, chromium, and lead. The mass of each metal was divided by the sampled air volume for that filter to obtain the ambient concentration value in $\mu g/m^3$. Metal concentrations were reported to the nearest 0.0001 $\mu g/m^3$.

The analysis and extraction methods for the quartz filters were specified in the following EPA documents:

- CFR 40, Part 50, Appendix G, "Reference Method for the Determination of Lead in Suspended Particulate Matter Collected From Ambient Air," July 31, 1987.
- USEPA Contract Laboratory Program, Statement of Work, Multi-Media/Multi-Concentration: SOW No. 787, December 1987. Section IV; Part A (Method 200.7): "Inductively Coupled Plasma-Atomic Emission Spectrometry Method," and Part B (Method 239.2): "Atomic Absorption Methods, Furnace Technique", (EPA, 1987b).

The following is a brief description of the laboratory procedures in the preparation and extraction of data from the filters.

Sample Preparation

Sample filters were cut into two 5" x 8" strips.

- Lead (Hot Extraction Procedure): The filter strips were folded and the lead sample extracted using 15 mℓ of 3 M HNO_3. The beaker was covered with a watch glass. The acid and filter were then boiled for 30 minutes. The extract and rinsings were diluted to 40 mℓ

using deionized water and allowed to set for 30 more minutes to allow the HNO_3 to diffuse into the rinse water. The water was then decanted into a volumetric flask. The filter and the beaker were rinsed and added to the flask until the volume in the flask equaled 80 mℓ. The solution was mixed and allowed to set for one hour before analysis of sample. The sample resulted in 0.45 M HNO_3.

- Cadmium and Chromium (Ultrasonic Extraction Procedure): The filter strips were folded and the cadmium and chromium sample extracted using 15 mℓ of a HNO3/HCL solution. The beaker was covered with parafilm. The solution and filter were then placed in an ultrsonication bath for 30 minutes. The parafilm and the beaker were rinsed with deionized water. Twenty (20) mℓ of deionized water was then added and the solution was allowed to set for 30 minutes to allow the HNO_3/HCL solution to diffuse into the rinse water. The water was decanted off into a volumetric flask. The filter and the beaker were rinsed and added to the flask until the volume in the flask equaled 80 mℓ. The solution was mixed and allowed to set for one hour before sample analysis. The sample resulted in 0.40 M HNO_3 and X M HCL.

Sample Analysis

- Atomic Absorption (Furnace Technique): Method 239.2 in SOW No. 787 (EPA, 1987a) summarizes the recommended operating procedures and conditions for the Atomic Absorption (AA) system. This method was used to determine lead concentrations. The daily calibration and specific quality assurance procedures were met for the analysis of each batch of filters to ensure data accuracy. The drying time of the sample was 30 seconds at 125°C. The ashing time and temperature was 30 seconds at 500°C. The atomizing temperature was 270°C for 10 seconds. The purge gas used was Argon. The monochromater wavelength was set at 283.3 nm. All other operating parameters were based on the manufacturer's specifications. The reported detection limit for lead for this procedure was 0.005 mg.

- Inductively Coupled Plasma-Atomic Emission Spectrometry: Method 200.7 in SOW No. 787 summarizes the recommended operating procedures and conditions for the inductively coupled plasma-atomic emission spectrograph (ICAP). This method was used to determine cadmium and chromium concentrations from the collected filters. The daily calibration and

specific quality assurance procedures were met for the analysis of each batch of filters to ensure data accuracy. The monochrometer wavelength was set at 226.502 nm for cadmium and 267.716 nm for chromium. All other operating parameters were based on the manufacturer specifications. The reported detection limit for cadmium and chromium using the ICAP method was 0.004 mg.

3.2.2.4 Reporting

During sampling operations, daily data sheets were maintained. These sheets allowed the documentation of observed sampler flow rates, meteorological conditions, and the results from the VOC and H_2S meter observations. The sheets were updated each time the sites were visited, up to six times over a sampling period. The information documented on these sheets was then key-punched into duplicated computerized spread sheets at the end of each sampling week.

The data recorded on these forms was used to calculate both the total flow rate at standard conditions over the 24-hour sampling period as well as flow rate conditions as they were observed during each of the site visits. The metal weights provided by the laboratories were also entered onto these forms and a final metal concentration was calculated by dividing the weight by the total volume of air through the filter at standard conditions.

3.2.3 Odor (H_2S)

3.2.3.1 System Description

H_2S was measured using a Gastech Inc. combustible gas meter Model GX-4000 "Four-Runner". This instrument is a battery powered portable meter that can detect and indicate concentrations of combustible gas, carbon monoxide, hydrogen sulfide, and oxygen. The instrument has the capability to initiate an audible and visible alarm when H_2S conditions exceeded 10 ppm. Air is drawn into the system continuously by a built-in pump, and analyzed by means of parameter-specific electrochemical cells. The response from these cells are amplified through solid-state circuitry and converted to engineering units. The H_2S sampling range was 0 to 125 ppm.

3.2.3.2 Summary of Operating Procedures

Testing Procedures

During the setting up and retrieval of the PUF samples and during each flow check over the sampling period, H_2S levels were monitored at each of the sampling locations around the CDF. Upon arrival at the sampling site, the technician placed the meter on the platform and allowed the system to stabilize while other tasks were completed. The probe was positioned to ensure unobstructed sampling of ambient air in the vicinity of the site. The observed conditions were documented along with the date and time of the reading on the daily data sheet. The information from the sheets was keypunched into a computerized version of the data sheet once per week at which time daily averages were computed as an indication of mean background conditions during dredging activities.

The Four Runner was allowed to continue sampling between sampling sites in order to note emissions in the vicinity of dredging activities and work places around the site to ensure a complete evaluation of odor conditions of the study site. Any elevated conditions observed while traveling between test sites were noted on the data sheets and the site log.

Calibrations

At the beginning and end of each sampling sequence all hand held monitoring devices were calibrated as specified in the manufacturer's operating manual. Since the instrument is microprocessor controlled, the zero of the H_2S circuits were set automatically. This function was initialized each time the system is turned on. Manual adjustments were provided for span accuracy in reference to a known concentration of a certified test gas.

Span calibrations were completed on the Four Runner at the beginning and end of each sampling sequence. Test H_2/N_2 gas at a concentration of 13.5 ppm was allowed to flow into the sampling probe tip at a slight positive pressure until a stable response was displayed. If the reading did not correspond to the test gas concentration the H_2S potentiometer was adjusted until the correct concentration was observed. After adjustment, the instrument was turned off and on to recheck zero and the probe was exposed to the test gas again. These steps were repeated until the correct response was observed.

At the beginning of each round of site visits, the zero was checked to ensure appropriate calibration of the meter.

Maintenance

A new H_2S sensor was installed into the Four Runner at the beginning of the study and operated without problems throughout the program. Batteries were replaced every thirty days to ensure appropriate operation of the system. The charcoal filter was also replaced every thirty days to prevent contamination of the system.

3.2.4 Organic Vapor (OVA 128)

3.2.4.1 System Description

Organic vapors were monitored using two separate testing devices. The Foxboro Company Model OVA 128 Organic Vapor Analyzer was used to monitor organic vapors, including methane, as it occurred around the study area. An HNU Model PI-101 Photoionization Analyzer was used to measure organic vapors excluding methane. The difference between the total organic vapor concentrations measured by the two units was used as a means of estimating methane levels in ambient air at the site.

The OVA is a battery powered, flame ionization detector. As with the Four Runner it has the capability to initiate an audible and visible alarm when organic vapors are detected which exceeded a predetermined alarm limit. A continuous sample of ambient air is drawn into the system through the probe and transmitted into the detection chamber at a flow rate of 1.5 liters per minute. The minimum detection limit (methane) is 0.2 ppm. The accuracy of system is 10 percent of the individual full scale.

In this study the OVA was set to monitor conditions in the 0 to 10 ppm range to achieve sensitivity necessary for levels observed in this study. The alarm limit was set at 9 ppm.

3.2.4.2 Summary of Operating Procedures

Testing Procedures

During the set-up and retrieval of the PUF samples and during each flow check over the sampling period, VOC levels were monitored at each of the sampling locations around the CDF. Upon arrival at the sampling site the technician set the meter on the platforms and allowed the system to stabilize while other tasks were completed. The probe was positioned so as to ensure unobstructed sampling in the vicinity of the site. The observed concentration was documented along with the date and time of the reading at the bottom of the daily data sheet. The information from the sheets was key-punched into a computerized version of the data sheet once a week, at which time daily averages were computed as an indication of mean background concentrations during dredging activities.

The OVA was allowed to continue sampling between sampling sites in order to note emissions in the vicinity of dredging activities and work places to ensure a complete evaluation of VOC conditions around the study site. Any elevated conditions observed while traveling between test sites were noted on the data sheets and site log.

Because of the cold temperatures during most of the study and the length of time it took the OVA to stabilize from a cold start, the OVA was allowed to operate continuously outside of the staging trailer over a sample day to ensure stability during site visits. Routine checks of organic vapor levels were made in the staging area to monitor conditions in the work centers.

Calibrations

At the beginning and end of each sampling sequence, all hand-held monitoring devices were calibrated as specified in the manufacturers operating manual. Unlike the Four Runner, the OVA had to be calibrated for zero and span values using certified reference standards.

To ensure an accurate zero calibration, a certified zero air standard was used to supply clean air to the system while in a normal operating mode and with the calibration switch set at X10 and the GAS select control set to 300, using the *Calibrate Adjust* to set the meter reading to zero. After an accurate zero value was obtained, a 100 ppm of CH_4/Air gas standard was introduced into the

system and the R-32 trimpot was adjusted so that the meter reading corresponded to the known concentration. The hydrogen gas supply was shut down putting out the flame. With the *Calibrate Switch* in X10 position the meter was adjusted using the *Calibrate Adjust* knob so that the meter displayed 4 ppm. The *Calibrate Switch* was changed to the X1 position and using the R-31 trimpot was adjusted so that the meter displayed 4 ppm. The *Calibrate Switch* was turned back to X10 position and, using the *Calibrate Adjust* knob, the meter was set to display 40 ppm. The *Calibrate Switch* was changed to the X100 position and, using the R-33 trimpot, the meter was adjusted to read 40 ppm. The *Calibrate Switch* was then returned to the zero mode and the meter zero was adjusted.

Prior to each site visit sequence the zero value is adjusted to compensate for mechanical drift in the system.

Maintenance

The primary and secondary line filters were cleaned after two weeks of operation. Hydrogen supplies were replenished on-site as necessary.

3.2.5 Organic Vapor (HNU PI-101)

3.2.5.1 System Description

Organic vapors were monitored using two separate testing devices. The Foxboro Company Model OVA 128 Organic Vapor Analyzer was used to monitor organic vapor including methane as it occurred around the study area. An HNU Model PI-101 Photoionization Analyzer was used to measure organic vapors excluding methane. The measured difference between the two units could be interpreted as estimates of methane levels at the site.

The HNU is a battery powered, photo-ionizer detector. The unit consists of a Readout/Control Assembly and a 11.7 ev UV Sensor/Probe. This UV source allows the instrument to detect chemical species expected in the study area. The operating range is 0.1 to 2000 ppm with a sensitivity of 0 to 2 ppm. The operating range selected during this study was 0 to 20 ppm. A continuous sample of ambient air is drawn into the system through the probe and transmitted into the detection chamber.

3.2.5.2 Summary of Operating Procedures

Testing Procedures

During the setting up and retrieval of the PUF samples and during each flow check over the sampling period, VOC levels were monitored at each of the sampling locations around the CDF. Upon arrival at the sampling site, the technician set the meter on the platform and allowed the system to stabilize while other tasks were completed. The probe was positioned so as to ensure unobstructed sampling in the vicinity of that site. The observed concentration was documented along with the date and time of the reading at the bottom of the daily data sheet. The information from the sheets was keypunched into a computerized work sheet once a week, at which time daily averages were computed as an indication of mean background conditions during dredging activities.

The HNU was allowed to continue sampling between sampling sites in order to note emissions in the vicinity of dredging activities and work places to ensure a complete evaluation of VOC conditions around the study site. Any elevated conditions observed while traveling between test sites were noted on the data sheets and site log.

In order to control zero drift in the system, electronic zero checks were completed at each sampling site prior to taking readings. After any zero adjustment the system was allowed to stabilize for five minutes before any levels were monitored.

Calibrations

At the beginning and end of each sampling sequence, all hand-held monitoring devices were calibrated as specified in the manufacturers operating manual.

To ensure accurate responses, electronic zero checks were completed at the beginning and end of each sampling day in coordination with the span calibration and at each sampling site. This was completed by turning the *Function Switch* to "Standby" which switched the system into a zero mode. If zero response had drifted, it was reset using the *Zero* potentiometer. Primary calibration of the HNU was accomplished in the factory. The calibration standard used was benzene and the span potentiometer reading was set at 9.8. Very little drift from this set point was observed throughout the study.

As with the other instruments, span calibration on the HNU was completed by introducing a gas standard of a known concentration to the meter through the sampling probe. The probe of the HNU was attached to a cylinder of benzene and the gas was allowed to flow into the system at a very low flow rate to avoid pressurizing the system. The *Span* potentiometer was used to adjust the meter when the response differed from the known concentration of the test gas. The calibration gas concentration was 64 ppm.

Maintenance

The UV light source window was cleaned once per week throughout the sampling program. This schedule was modified when damp weather conditions caused the window to cloud resulting in calibration deviations of more than 5 percent.

A summary of daily HNU and OVA levels observed over the pilot study can be found in Tables C-1 and C-2 of Appendix C in this volume.

3.2.6 Meteorological System

3.2.6.1 System Description

All meteorological data except precipitation was collected using a Climatronics Corp. Electronic Weather Station. The processed 0-1 Vdc output signals from the sensors were input into a Cambell Scientific 21X Data Logger system where the data was recorded as 15-minute averages. Both vector and scalor wind directions were computed, as well as standard deviation of the wind direction fluctuations about the mean (i.e., sigma theta).

The sensor range for each system was as follows:

Wind Direction	0.0° to 540.0°
Wind Speed	0.0 to 100.0 mph
Air Temperature	-40.0° to 60.0° F
Soil Temperature	0.0° to 100.0°F
Solar Radiation	0.0 to 2.0 Llys/min

The sensors were mounted at the top of a 10-meter tower and were connected to the signal translator mainframe and strip chart recorder mounted at the base of the tower. The recorder was a Rustrak Model 100586-1 multiplexing, pressure-sensitive recorder. All meteorological parameters were measured on this recorder using a 6-parameter dashing circuit. The recorder and the signal conditioners were housed in an environmentally-secure cabinet.

The wind sensors were mounted at the ends of a 14-inch crossarm. This crossarm was affixed to the top of a 3-foot mast. The solar pyranometer and the non-aspirated temperature sensor were also mounted to this mast, allowing for unobstructed exposure to the meteorological conditions as they existed at the study site.

The soil temperature thermister was buried 6 inches below the surface at a location 10 feet from the tower. The probe was free of any shadowing effects by localized structures.

The Cambell data logger was programmed to receive and process data consistent with the requirements of this monitoring program. Instantaneous voltage values, time, date (julian and calendar) and 15-minute averages could be called up and displayed on the LCD found on the front of the Cambell. Data from the Cambell was transferred and stored on a cassette tape at the end of each data collection hour. The cassette recorder was also mounted in the cabinet with the Cambell and received data using an RS-232 port. Data tapes were able to hold up to 30 days of meteorological data. At the onset of colder weather, a light bulb was mounted in the cabinet with the Cambell and the cassette recorder to maintain a temperature around 50°F in order to ensure proper operation of the recorder.

Precipitation data was collected using a manual precipitation gauge. The gauge was mounted approximately 10 feet from the tower on a stand 2 feet above the ground. Precipitation measurements were taken by the technician during the daily sample checks. The gauge was cleared after each observation. These observations were documented on the daily data sheets.

3.2.6.2 Summary of Operating Procedures

Operating Procedures

The meteorological system operated continuously, beginning on November 14, 1988 through January 21, 1989. It was shut down during the time between the dredging phase of the study and the start-up of the post-dredgeing phase of the study. Sampling was restarted again on the first sampling day of the post dredging test period and operated continuously until sampling was completed.

To insure that the data being collected at the meteorological site was accurate and archived correctly, the parameters were inspected during every site visit cycle (up to six times in a sampling day). The observations made during the field checks were documented on the daily data sheets along with the date and time they were observed. The observed reading on the various parameters were assessed as to their representativeness of current meteorological conditions noted by the technician. The technician also compared values recorded on the Cambell data logger and the strip chart trace to ensure good correlation between the parameters.

During these meteorological inspections, the technician would note the accuracy of the data logger and recorded time and date and correct weather media when a discrepancy greater than 15 minutes was observed. Strip charts were time-marked during these inspections to identify the inspection time. Cassette tapes were checked for the proper recording of data and the amount of room on the data tape. In order to ensure that there would be no data loss because of a recorder malfunction or a data tape filling up, data tapes were changed every two weeks. Particularly during colder weather, both data and tower mechanisms were closely inspected for proper operation and wear.

Calibrations

At the beginning and end of the pre-dredging and dredging phases of the study and at the beginning and end of the post-dredging phase of the study, full field calibrations were completed on the meteorological instrumentation. These calibrations included:

- Wind Direction - Bearings were checked on the wind vane system. Vane alignment was checked to ensure accuracy of sensor readings. This included aligning the vane to pre-determined points in the vicinity of the tower site. These reference points at the study site included two radio towers to the south of the site; a church to the west of the site; and a factory smoke stack to the north of the site. Each of the reference locations were defined on a topographic map of the area and the angle from the site (corrected to Magnetic North) computed, along with a point which was 180° and 360° from that point. This allowed each point to be tested against a tip of vane reading, a tail of vane reading and a point in the 540° range. The accuracy of this vane alignment check was required to be ±5°.

- Wind Speed - The wind speed cup system was checked for damage and bearing operation.

- Temperature (Air and Soil) - Temperature probes were immersed in ice and water baths along with a certified thermometer. The system responses were compared against the temperatures indicated on the thermometer. The accuracy of these temperature baths should be ±2.0°F.

- Solar Radiation - As with the wind speed system, the most accurate way to test the accuracy of the solar radiation system is under laboratory conditions.

Electrical calibrations were completed before each field calibration and once per week during the sampling period. These calibrations indicated the accuracy of the signal translation system. These tests also assisted in evaluating the signal conditions, and defined any shorts or excessive noise in the signal which would affect the accuracy of the data measured. These tests were initiated at the mainframe test panel. Any test responses which were not equal to that expected were corrected by adjusting potentiometers located on the translator boards. Each test included a zero or low end response and a full scale or high end response. Responses from both the field test and the translator calibrations were measured in voltages, chart units, and engineering units to ensure correlation between the data modes.

Reporting

Data tapes were returned to Ebasco's Boston office every two weeks where the data was transferred to computer disks for analysis and reporting. Daily averages were computed between days 1 and 2

to correlate with sampling periods. As part of the quality assurance program, 10 percent of the computer-based data were compared with values recorded from the strip chart during site checks.

4

4.0 QUALITY ASSURANCE PROGRAM RESULTS

A quality assurance program was implemented to ensure that collected data was accurate and precise, in order to effectively characterize both magnitude and variations in ambient conditions at the site. Complete documentation of the results of routine operations and quality assurance aspects of the program, including all log notes, calibration forms, certifications, etc., are on file and will be retained for a minimum of five years. Key elements of the routine field quality assurance program included:

- Routine site visits to each sampling site over a sample day to check sampler flow rates, operation and sample conditions, noting any ambient conditions which could affect the accuracy or representativeness of the sample.

- Routine checks of the meteorological system and database, in order to verify that the measured database reflect observed weather conditions.

- Daily flow checks of the PUF and HI-VOL samplers against current calibration results and flow controller set points.

- Daily field blanks of the PUF and HI-VOL sampling media.

- Daily collocated samples collected from the PUF and HI-VOL sampling systems.

- Laboratory blanks and spikes submitted to the laboratory after every 10 filters analyzed.

- Daily zero and span calibration of the HNU, OVA and Four Runner measurement systems.

- Weekly electronic calibration of all meteorological parameters and the incorporated strip chart recorder.

- Monthly multipoint flow calibrations of the PUF and HI-VOL samplers, the results of which were used to calculate flow curves used for determining set points for maintaining sampler flow conditions.

- Routine preventative maintenance on all equipment components.

- Primary calibration and/or recertification of all calibration, electronic test, and laboratory equipment used on the program.

- Field calibration of all meteorological parameters at the beginning and end of each of the three monitoring periods.

In addition to the field operation quality assurance activities, the data was subjected to a series of data consistency and validation checks during the final data processing phase. This included review of the strip chart output records for the meteorological parameters, program crosschecks between strip chart and DAS readings for 10 percent of all hours, review of all instrument performance, daily data sheets, calibration records, and computed data concentrations.

During the course of the program, no data was deleted from the database on the basis of quality assurance program results or acceptance criteria.

4.1 REFERENCE GUIDELINES

The following documents and guidelines dictated the operating and quality assurance protocol for the air monitoring program of the pilot study:

Polyurethane Foam (PUF) and High Volume (HI-VOL) Sampler Operations

- Quality Assurance Handbook for Air Pollution Measurement Systems - Volume II, Ambient Air Specific Methods (EPA-600/4-027a, May 1977).

- Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air: High Volume Polyurethane Foam Sampling (Method TO-4, EPA, 1984).

- Organochlorine Pesticides and PCBs: Gas Chromatographic Methodology (EPA Method 608, July 1982).

- Webb, R.G., And McCall, A.C., "Quantitative PCB Standards for Electron Capture Gas Chromatography", Journal of Chromatographic Science (v11, n366, 1973).

- Vendor-specific operating procedures manual for a Staplex High Volume sampler.

- Vendor-specific operating procedures manual for a General Metal Works PUF sampler.

Odor and Organic Vapor Monitoring

- Appropriate REM Field Technical Guidelines for Odor and Vapor Monitor Calibration.

- Vendor-specific operating procedures manual for a Gastech Inc., Combustable Gas Meter.

- Vendor-specific operating procedures manual for a Foxboro Company, Organic Vapor Analyzer.

- Vendor-specific operating procedures manual for an HNU Photoionization Analyzer.

Meteorological Monitoring

- Quality Assurance Handbook for Air Pollution Measurement Systems - Volume IV, Meteorological Measurements (EPA-600/4-82-060, February 1983).

- On-Site Meteorological Program Guidance For Regulatory Modeling Applications (EPA-450/4-87-013, June 1987, EPA, 1987d).

- Vendor-specific operating procedures manual for a Climatronics EWS Meteorological Station.

- Vendor-specific operating procedures manual for a Cambell Data Logger.

4.2 SAMPLER CALIBRATIONS

To ensure accuracy in the methodology by which data was collected and to prevent data loss due to undetected malfunctions in the sampling mechanisms, an intensive calibration schedule was implemented for each sampling device in the network. General descriptions of these calibration procedures are given in Section 3.0.

The information collected during these calibrations was reviewed and assessed to monitor changes in the performance of the test unit. Increases and decreases in calibration responses, reaction time, or stability could be an indication of component degradation or system failure.

4.2.1 PUF Sampler Calibrations

Frequency in calibrations of the PCB and heavy metal samplers allows adjustment to the set flow rates responsive to seasonal changes in temperature and pressure conditions and ensures consistent sampling conditions throughout the various phases of the study. Calibrations of the PUF samplers were completed in two steps.

4.2.1.1 Monthly Multipoint Calibrations

Multipoint calibrations were completed the first week of every month following the procedures specified by the manufacturer. Flow rates were measured in response to five settings on the sampler magnehelic (70, 60, 50, 40, 30). A calibration curve between the set points on the magnehelic and the measured flow observed on the manometer was computed at standard conditions. Using this curve, a set point was then determined which would result in a flow rate of 0.240 m^3/min for each sampler. The sampler flow would then be maintained using the magnehelic

setting to ensure a constant flow rate. Computer generated calibration sheets are listed in Appendix F of Volume II, which exemplify these procedures.

4.2.1.2 Daily Single Point Calibrations

Once the set point was established, it was used as the technician's daily reference of flow conditions for the sampler. This check is completed at the beginning and end of each sampling period during the installation of the clean PUF sample cartridge, and during each sampler check during the sample period (up to six checks per sample day). The magnehelic response was maintained within ±2 CFM from the established set point. If the observed set point exceeded this criteria, the unit was adjusted. Flow conditions monitored during the sampling period were documented on the daily data sheet. No further adjustments were made until the start of the next sample. Each of the observed conditions over the sampling period were automatically adjusted by the calibration curve at each interval measured. These individual responses were then averaged to determine a 24-hour total flow for each sampler.

In order to evaluate the continued performance of each sampler, the monthly curves were then compared in order to monitor major changes in the linearity of the flow responses. Excessive difference in the monthly curves could indicate leaks in the system or inaccuracies in the flow measurement or calibration components. Table F-1, in Appendix F of this Volume II, lists the flow calibration results for the PUF samplers.

4.2.2 HI-VOL Sampler Calibrations

As with the PUF samplers, frequent calibrations of the heavy metal samplers ensured consistent sampling conditions throughout the various phases of the study.

The procedures for calibrating the HI-VOL samplers were the same as those used by the PUF samplers, except that resistant plates were used to vary flow rates which were measured on a calibration magnehelic and on the rotometer supplied with the sampler. During the resistant plate calibration, the flow controllers were disconnected to allow flow conditions to vary. A curve was then computed between the certified flow at standard conditions determined on the magnehelic and the flow rate indicated on the rotometer. This calculated curve was used to determine routine flow rates as described with the PUF sampler calibrations.

The summary of the HI-VOL calibration data in Table F-2 in Appendix F was evaluated with the same criteria as that described for the PUF sampler.

4.2.3 Calibration Results

The only excessive change in the flow curves for the PUF samplers was observed after the motor brushes and component maintenance was completed on March 31, 1989. Concurrent to this was the largest change in meteorological conditions over the sampling period, which would also contribute to the differences observed.

The higher than average difference observed with the SWC and the SEC PUF during the January 27, 1989 calibration could be attributed to the severe weather conditions during the calibration. Otherwise, drift in the calibration curves observed exceeded that which would be defined as acceptable in a monitoring program of this type. Flow conditions between multipoint calibration remained stable throughout the study.

As with the PUF samplers, the HI-VOL samplers demonstrated the largest changes on the March 31, 1989 calibrations. Again, this can be attributed to system maintenance and changes in meteorological conditions. Changes in the flow curve for the SWC primary HI-VOL was attributed to a silicone seal which was replaced on December 7, 1988 and again on March 31, 1989 which affected the flow curve. Flow conditions during this period between these two calibrations remained stable and flow rate set points were easily obtained and maintained.

Calibration set points determined during multipoint calibration remained stable for both the PUF and the HI-VOL samplers throughout the project.

4.3 PRECISION RESULTS

Data precision assessments of the heavy metals and PUF data were conducted by collecting samples from collocated duplicate sampling devices at the SWC site. The collocated PUF and HI-VOL samplers operated simultaneously each sampling day of the pre-dredge through post-dredge phases of the program. The collocated sample media were handled using the same procedures and documentation as those implemented for the primary samples. Tables A-1 through A-4 in Appendix A summarize the precision data for the PCB and heavy metals data, respectively.

Precision results are also presented in a graphical format in Graphs D-16 through D-22, in Appendix D of Volume I. Figure 4-1 presents a graphical illustration of collocated sample results and total PCB precision throughout the sampling program.

Since the values measured were relatively low, the assessment of the data was completed in concentration ($\mu g/m^3$) as well as in percent to accurately indicate data precision. Individual differences were calculated for each data pair and then summarized into an average difference for all the samples collected and a calculated standard deviation for the entire sampling period. Average percent differences and percent standard deviation were also computed and listed.

Both the PCB and heavy metal samples precision reviews include an evaluation of data precision for each measured aroclor or metal determined from the laboratory analysis. This detailed statistical review allows for the evaluation of each parameter of concern.

In summary, the precision results from the PCB data:

Aroclor:	1016	1242	1254	TOTAL
Average Difference:	0.0001	0.0000	0.0001	0.0002
Standard Deviation:	0.0010	0.0004	0.0002	0.0011
Average % Difference:	-1.50%	1.70%	-7.50%	-1.60%
Standard Deviation (%):	19.40%	16.90%	31.00%	27.00%

In summary, the precision results from the heavy metal data:

Metal:	Lead	Cadmium	Chromium
Average Difference:	-0.0009	0.0000	0.0002
Standard Deviation:	0.0049	0.0002	0.0019
Average % Difference:	5.79%	0.00%	8.81%
Standard Deviation (%):	38.86%	0.01%	51.34%

In reviewing the precision data computed for the collocated PUF data, it can be seen that the correlation between aroclor measurements was acceptable. Nine collocated samples displayed aroclor or total PCB differences greater than the 50 percent acceptance limits. As mentioned previously, the inflated percent differences can be attributed to the low concentrations measured over the study, resulting in higher percentage differences.

The heavy metal data demonstrated similar precision for each metal detected. As with the PCB data, measured values were still relatively low, cadmuim differences being the highest with thirteen

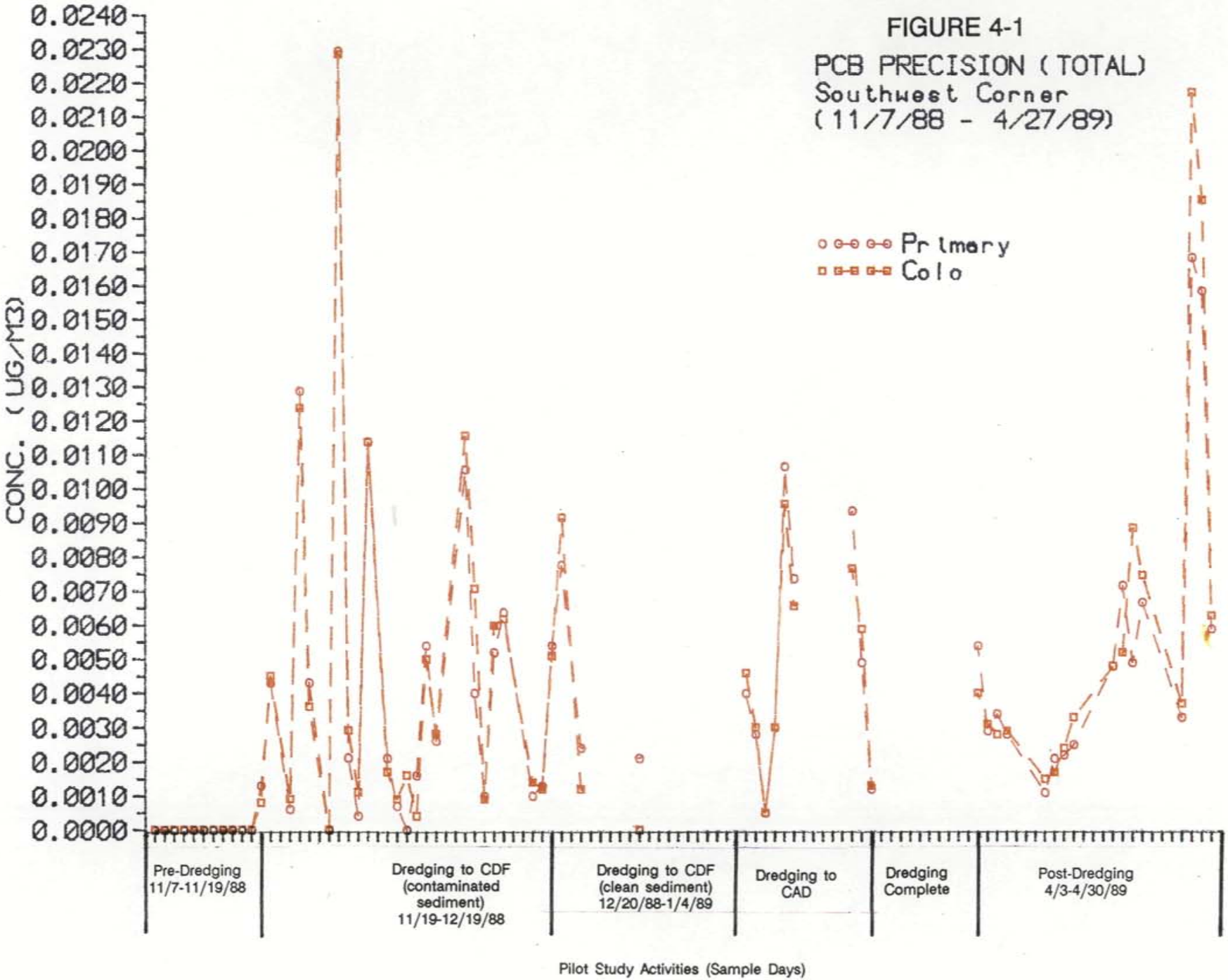


FIGURE 4-1
PCB PRECISION (TOTAL)
Southwest Corner
(11/7/88 - 4/27/89)
Primary
Colo
CONC. (UG/M3)
0.0240
0.0230
0.0220
0.0210
0.0200
0.0190
0.0180
0.0170
0.0160
0.0150
0.0140
0.0130
0.0120
0.0110
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
Pre-Dredging 11/7-11/19/88
Dredging to CDF (contaminated sediment) 11/19-12/19/88
Dredging to CDF (clean sediment) 12/20/88-1/4/89
Dredging to CAD
Dredging Complete
Post-Dredging 4/3-4/30/89
Pilot Study Activities (Sample Days)

percent difference values for 13 samples exceeding the 50 percent acceptance limits. No chromium percent difference exceeded these limits. Seven lead results were over the 50 percent acceptance limit. Again, the major cause of these excessive percent differences can be contributed to the low concentrations measured.

Precision data for the last six lead and chromium sampling dates demonstrated values which exceeded the statistical probability of the database. The comparison of concentrations measured beginning on April 19, 1989, and continuing through the end of the project showed high collocation differences. A review of the sampling conditions and procedures during this time period could not define any possible causes for this condition. Sampler calibrations prior to and after this period attest to the accuracy of the flow rates measured on each sampling system. Handling procedures were not considered, since, by the end of the project, the technicians were familiar with all handling and sampling procedures.

A review of the laboratory data showed that laboratories changed with the April 17-18, 1989 sample. It was after this point that the increased percent differences were first observed. An inspection of the laboratory quality assurance information indicated possible problems with the analysis techniques for both weekly data submittals.

During the post-dredging testing period, an independent precision study also took place which compared measurements on both the PUF and the HI-VOL samplers by interchanging glass fiber filters with the quartz filters as part of the precision study. The data computed using glass/glass and glass/quartz collocation has been included in this precision database. A more detailed evaluation of this study is discussed in Section 4.5.

4.4 FIELD AND LABORATORY BLANKS

4.4.1 Field Blanks

A field blank sample was collected every sample day for both the PCB and the heavy metal systems. The field blanks criteria entailed setting up sample media following the same procedures implemented for routine sampling. These samples were identified as "Field Blanks" on all documentation and were incorporated in the data submittal as such. The blanks were then taken to the SWC sampling site and installed on the sampler and the protective cover removed. The

samples were immediately covered without turning the sampler on. The samples were then returned to the staging trailer, removed, and stored for shipment. All sample handling and shipping procedures were the same as that used for routine sampling.

It was the intent of field blank data to assess the overall proficiency and accuracy of the field testing program. This would include handling and shipping procedures as well as identifying potential contamination sources for samples during the installation and removal procedures. Field blank data is summarized in Tables A-5 and A-6 for PCB and metals respectively. As with the precision data, these results have been listed based on the specific aroclor or metals detected by the laboratory. All measurements are listed by weight.

The percent of nondetectible results of all the aroclor field blank data is summarized below:

Aroclor	No. of Measured Concentrations (Total No. of Blanks)	% ND
1016	5/65	93%
1242	3/65	95%
1248	1/65	98%
1254	7/65	90%

The percent of nondetectible results of all the heavy metals field blank data is summarized below:

Metal	No. of Measured Concentrations (Total No. of Blanks)	% ND
Lead	3/71	96%
Cadmium	0/71	100%
Chromium	4/71	94%

In reviewing the field blank data listed for the PCB data, one field blank, collected on November 17-18, 1989, indicated high concentration of all four aroclors. In a review of the log notes and meteorological conditions for that sample date, it was found that the sampling period was influenced by a severe rain storm; precipitation can be a cause of field blank contamination. Low levels of aroclor 1242 and 1254 were indicated on two other samples during the study period, but were not considered indicative of any significant problems associated with the sampling methods employed.

As mentioned in other sections of this report, data associated with part of a shipment of samples collected from December 19, 1988, through January 8, 1989 (6 samples), indicated unreasonably

high aroclor concentrations and unrealistic field and laboratory blank results. Since no apparent sampling or analytical error could be identified as obviously responsible for these results, this data has been included in the overall data package.

The heavy metals data showed several incidents of blank contamination for lead, and four incidents of chromium contamination during the study period. No cadmium contamination incidents were found in this field blank study. Samples collected on December 13, 1988 and April 4, 1989 (the April 4 filter contamination being the highest observed) showed some blank contamination which was most likely influenced by rain during sampling activities. No specific explanations can be found for the chromium contamination indicated on field blanks taken on December 21 and 27, 1988.

4.4.2 Laboratory Blanks

A laboratory blank and laboratory spike filter sample was collected after every 10 sample days for both the PCB and the heavy metal systems. The preparation of laboratory blanks and spikes entailed removing clean PUF 4-inch filter media and HI-VOL 8"x12" filters from the storage container and directly packaging the media following the procedures used in transmitting exposed media. These samples were identified as "Lab Blanks/Spikes" on all documentation and were incorporated in the data submittal as such. The blank was not exposed to any sampling conditions.

The PUF cartridges used for laboratory blanks and spikes were removed from the PUF cartridge inventory during the initial cleaning process of the cartridges. The laboratory then retrieved cartridges from this supply for laboratory blank analysis after every ten samples. This assisted in the prevention of cartridge contamination from excessive handling or shipping.

It was the intent that the lab blank data to assist in the overall QA/QC assessment of the laboratory analysis program. Details of the laboratory procedures and data analysis results are included in the individual data analysis reports submitted by the laboratories retained on file.

4.5 QUARTZ/GLASS FILTER COMPARISION

As mentioned previously, a comparison was initiated during the post-dredge sampling period which assessed the efficiency of the micro quartz filters, used as the standard for the PCB and metals samples collected in this study, and glass fiber filters which were the media of choice prior to the

development of the quartz filter. This comparison was initiated in response to a request by the EPA.

The comparison was completed by running combinations of quartz/quartz, glass/glass, and quartz/gass filter collocations on both the PUF and the HI-VOL samplers, in an alternating schedule. All operations continued following the procedure described earlier. The results of these comparisons are listed in Tables A-7 through A-9 in Appendix A.

To ensure quality assurance for this study, both quartz and glass field blanks were also completed for each sample day. If quartz filters were run, a quartz field blank was submitted for analysis. If glass filters ran, a glass field blank was submitted. If a quartz/glass combination ran, both media were included in the field blanks submittal. The same held true for the laboratory blanks and spikes. Unfortunately, all data collected on the PUF filters for this period was non-detectable, resulting in inconclusive test result data comparisons.

Given that very limited interpretation was possible from the data, there appeared to be no obvious differences between glass filters or quartz filters in any of the data received. For systematic differences between the quartz/quartz, glass/glass, and quartz/glass collocated samples could not be discerned. Impact on the PUF cartridges did not change between glass and quartz filters.

5

5.0 DATA VALIDATION RESULTS

As part of the overall air sampling program, the analytical data generated by the chemical laboratories was subjected to a data validation (DV) review. The purpose of this review was to assess the overall validity of the data from a laboratory QA/QC perspective. The analytical data for the aroclors and metals were validated based on the guidelines described in the Special Analytical Services (SAS) Requests and the general Region I Contract Laboratory Program's (CLP's) Data Validation Guidelines, as applicable. The data validation was performed on analytical data packages received through the CLP SAS system. All data packages included chromatograms and/or instrument reports, quantified data for the environmental samples, QA/QC samples and calibrations.

One data validation package deliverable was generated for each data package. A data package was defined as a set of data with a laboratory QA/QC section unique to that set of samples and generated by the laboratory as a single deliverable. Most data packages included an average of approximately 65 aroclor or 14 metal samples. The puff samples and associated filters collected at individual sampling locations were evaluated as separate samples during the aroclor sample DV. With the exception of the field duplicate data, air volume corrections were not applied to the data for the evaluation of the data validation parameters. Table 5-1 demonstrates the DV parameters that were evaluated and further describes the criteria used to qualify the data. Section 5-1 includes a description of the reference guidelines for data validation.

No aroclor data was outrightly rejected based on the data validation results. However, approximately half of the aroclor data was qualified as approximated (J, U or UJ) due to various DV criteria. With respect to the metals data, six sample results were rejected due to extreme deviations from laboratory QA/QC requirements. In addition, a significant fraction of the metals data was also approximated (J, U, or UJ), although not rejected; the majority of this data was qualified due to analytes detected in the blanks, low recovery of laboratory spiked samples and laboratory quantification errors (see Section 5.5.2). Tables B-1 (aroclor data) and B-2 (metal data) in Appendix B summarize the DV qualifiers corresponding to individual sample numbers and locations.

5.1 REFERENCE GUIDELINES

The SAS request and the Region I Laboratory Data Validation Functional Guidelines for Evaluating Organics (2/88 revision) and Inorganics (7/88 revision) were used as the basis for the data validation. Table 5-1 summarizes the DV parameters and evaluation criteria as adjusted according to the regional guidelines, SAS requests and data packages. Table 5-1 includes information for the parameters evaluated, criteria used and DV actions required if the QA/QC results did not meet established criteria. In Table 5-1, QA/QC parameters not specified as "aroclor only" or "metals only" were included in both the aroclor and metal DV assessments. It should be noted that the DV criteria corresponding to some parameters are quite specific, while other criteria are only generally delineated and require technical judgement. It should also be noted that in the absence of specific Region I guidelines for validation of SAS requested air samples, general Regional guidelines were utilized. It was therefore necessary in some instances to exercize technical judgement regarding the nature of the DV actions which were recommended in response to specific DV concerns.

Each data validation package was composed of a memo, set of worksheets, data summary table, DV recommendations summary table, regional data assessment form and data quality objectives form. The memos were generated to summarize the DV recommendations and discuss technical issues. The worksheets were used as guides for the initial validation of the data. The tables were generated to summarize data in a concise manner. The data assessment and quality objective forms were included in the DV packages for consistency with EPA Region I requirements. Technical judgement was required in the evaluation of certain DV parameters. In addition, supplemental information clarifying technical judgements was included in the memos as part of the overall DV packages where it was considered appropriate.

5.2 GENERAL DATA VALIDATION RESULTS AND TRENDS

5.2.1 Aroclor Data

Approximately 50 percent of the aroclor data was qualified as approximated due to QA/QC concerns associated with DV guidelines. Table B-2 summarizes the results of the DV effort for aroclor data. This table lists aroclor samples by sample collection day, designates qualifier codes

Table 5-1

DV Parameters and Evaluation Criteria

Parameter	Criteria	Action

Data Completeness	Data package should include:
	• Chromatograms and tabulated concentrations for:
	  ◦ environmental samples
	  ◦ QA/QC samples
	  ◦ calibration standards
	• Tabulated data for:
	  ◦ calibration linearity
	  ◦ spiked samples
	• Sample extraction and analysis dates
		Missing information was requested from the laboratory.

Holding Times	Aroclors • Sample collection to laboratory extraction/preparation: 7 days • Laboratory extraction to laboratory analysis: 40 days Metals • samples collection to laboratory analysis: 6 months	Approximate data as follows: J = approximate positive (detected) data UJ = negative
Blanks	Aroclor or metal concentrations detected in any of the blanks were used to establish an adjusted detection limit (DL) raised by a factor of five times the concentration of the analyte in the blank. All corresponding samples were qualified according to the following criteria: • Field blank contamination - raise DL by five times contaminant concentration for samples collected on the same day as the contaminated blank for aroclors or all of the samples in the data package for metals. • Lab blank contamination - raise DL by five times contaminant concentration for samples analyzed on the same day as the contaminated blank for aroclors or all of the samples in the data package for metals.	If the sample concentration of corresponding contaminant is below the adjusted DL, qualify result with a "U", which means the result is below the adjusted DL.
Spiked Blank/ Spiked Blank Duplicate	Percent Recovery = ±30% (aroclors) Percent Recovery = ±10% (metals) Relative Percent Difference < 50% (aroclors only)	Approximate corresponding sample results for the analyte that does not meet criteria.

Calibrations	Aroclors
	• Initial Calibration
	Relative Percent Difference < 10%
	• Continuing Calibration
	Percent Difference (%D):
	  ◦ quantification column % D <15%
	  ◦ confirmation column % D <20%
	• General instrument performance should also be evaluated.
		Use technical judgement. If calibration errors were found on the quantification column, then corresponding data should be approximated according to the type of error. If calibration errors were found on the confirmation column, no action is likely to be necessary.

Table 5-1 (cont'd)

Parameter	Criteria	Action
Compound Identification (aroclors only)	Aroclor standard chromatograms should be compared with sample chromatograms for retention time and peak pattern.	Technical expertise must be applied for peak pattern judgement identification.
Compound Quantification (aroclors only)	Check concentration calculations for at least one sample result from the calibration through the sample chromatogram. If quantification error is found, then further investigation is necessary to delineate if the error is consistent or arbitrary.	• Use technical expert judgement based on type of error. • Call laboratory to discuss error. • Report correct concentration supported by documentation.
Field Duplicates	• Compare individual analyte concentrations in air. • Relative Percent Difference < 50%	Approximate ("J") analyte result in field duplicate samples only.
Calibration Verification (metals only)	• Positive results 90% < %R < 110% • Negative results 90% < %R < 125%	For positive (detected) data: • Estimate (J) 111 < %R < 125% 75% < %R < 89% • Reject (R) %R < 75%, %R >125% For negative (non-detected) data: • Estimate (UJ) 75% < %R < 89% • Reject (R) %R < 75%, %R >125%
ICP Interference Check Sample Results (metals only)	• Positive results %R ±20% • Negative results %R > 79%	Positive data: • Approximate (J) 50% < %R < 79% %R > 120% • Reject (R) %R < 50% Negative data: • Approximate (UJ) 50% < %R < 79% • Reject (R) %R < 50%
Detection Limits (metals only)	Instrument DLs must be less than DLs required in SAS request.	DLs for non-detected results may be approximated (UJ). Technical judgement must be used to make necessary adjustments.

for the specific aroclors and includes comments to explain the qualifiers. The comments are designed to identify whether the qualification was due to a laboratory (L) or field (F) error. The following items further clarify the DV concerns summarized in Table B-2:

- Holding Times Exceeded - One set of data that was collected from December 16, 1988 through December 30, 1988 was held longer than the required holding times. Holding times required for aroclors must be less than or equal to seven days between the time of sample collection and extraction. The samples that were flagged due to holding times, exceeded the holding time requirement by between 1 and 13 days.

- Sample Extraction Error - The concentration step associated with the extraction for sample 248P was not performed properly. It is possible that aroclors could have been lost during this concentration step. Therefore, data associated with this sample has been approximated.

- Spikes Not Analyzed - The SAS request specified that spikes and duplicate spikes of the sample collection media should be analyzed. The EPA regional guidelines require that matrix spikes (MS) and MS duplicates are to be analyzed. Typically, the MS is prepared by spiking an environmental sample. The environmental sample is collected in triplicate so that in addition to the real sample analysis an MS and MS duplicate can be analyzed. The MS/MS duplicate parameter is then used to evaluate matrix interferences from other chemicals possibly associated with the samples. However, due to significant field difficulties associated with extensive replicate collection during the air sampling programs, true MS samples were substituted with spiked blank samples prepared in the laboratory. These spiked blanks were used to evaluate the extraction method and possible interferences from the sample collection media. Samples associated with laboratory QC that did not include spiked blank analysis were approximated.

- Matrix Interference - Based on technical review of the chromatograms, a few samples were approximated due to potential matrix interference(s). This technical judgement relating to certain specific chromatograms was based on the observed presence of several chromatographic peaks in certain samples that were not identified as aroclor constituents, but which may have impaired aroclor identification.

- Duplicate Precision Error - Due to field duplicate relative percent differences (RPDs) which were greater than the established 50-percent criteria, several field duplicate results were approximated. Field duplicate precision was the only DV parameter that was based on actual analyte concentrations in air. Only analytes in the field duplicates that did not meet the relative percent difference criteria were qualified.

- Calibration Range Problems - Samples with concentrations that were not within the range of the associated calibrations were approximated. These sample concentrations were derived in certain cases from extensions of a linearity curve that ideally should not have been used to quantify concentrations beyond the curve. Since, in these cases, the calibration concentrations that the laboratory used to quantify these samples had not been verified for linearity, the associated sample results were approximated.

- Quantification Errors - Certain quantification errors were identified in some sample results during the DV effort; corresponding sample results were approximated. In addition, technical judgement was used to identify potential quantification errors based on inappropriate identifications of the aroclors. In some cases, the DV reviewers observed that alternate aroclor identifications were potentially warranted for certain samples (for example, aroclor 1016 versus arcolor 1242), thus introducing relatively minor variances in the response factors and resulting calculated concentration data.

- Insufficient Identification Criteria - Based on technical judgement several sample results were approximated due to potential identification problems. This parameter is discussed in more detail in Section 5.4.

- Blank Contamination - Due to contamination detected in blanks, the detection limit for aroclors detected in the samples associated with those blanks was raised. This parameter is discussed in more detail in Section 5.5.1.

5.2.2 Metals Data

The majority of the metals data which was evaluated (approximately 90 percent) was qualified due to limitations relating to various DV criteria. The majority of the qualifiers which were applied to

the metals data were due to the combination of low reported field sample concentrations and concentrations of the analytes detected in the collection media. Table B-3 was developed to summarize the DV qualifiers that were applied to the metals data. The following further clarifies the items which are summarized in Table B-3:

- Matrix Spike - The matrix spike analyses for filters were performed by cutting the filter in half and preparing half the filter. In some cases the laboratory(s) analyzed the background of the matrix spike from a sample filter other than the one from which the matrix spike was prepared. In those cases, the background level which was applied to adjust the spike recovery was considered to be incorrect and in a number of cases the recovery was out of the criteria range (±10%). Therefore, the matrix spike parameter was not used for DV in cases in which analytes were detected on the filter which was used for background concentration and subsequently applied as the background concentration for a separate spiked filter. However, in cases in which either:
    - the same filter was used for both background and spike analysis, or,
    - a separate background filter was used and no analytes were detected,

  the matrix spike parameter was used for DV. If the spike recovery was less than 90 percent, then the corresponding positive and negative sample results were approximated. Sample results associated with a low spike recovery signify the potential for results to be reported at concentrations lower than the actual concentrations.

- Duplicate Precision Error - Due to field duplicate relative percent differences greater than the established 50 percent criteria, several field duplicates and corresponding samples were approximated. The field duplicate parameter was the only DV parameter based on analyte concentrations in air.

- High Standards Concentrations - The analytical results for some laboratory standards were detected at concentrations greater than the actual standard concentration. The positive results for samples associated with those standards were approximated, since there is a similar potential for detecting analyte concentrations in those field samples at higher than actual levels.

- Blank Contamination - Due to the detection of specific metal contamination in blanks, the detection limits for the corresponding metals in the associated samples were raised by a factor of five. This parameter is discussed in further detail in Section 5.5.2.

  NOTE: Although not noted in Table B-3, a systematic calculation error was identifed during the DV for many metals samples. The data for metals samples collected from 11/28/88 to 1/12/89, and from 4/3/89 to 4/14/89 were found by DV reviewers to have a consistent error of a factor of two. In these cases evidence indicated that the laboratory reported the concentration of the analytes on a per filter basis, but did not quantitatively correct for the fact that only half of the filter was prepared for analysis.

5.3 GENERAL PRECISION AND ACCURACY

The precision and accuracy of the data was assessed in conjunction with the overall DV evaluation. Both field and laboratory precision were evaluated through duplicate relative percent difference (RPD) calculations with acceptable RPD values considered to be less than 50 percent. Duplicate sample results with values above this RPD were approximated. Duplicate samples included field collocated samples and duplicates of the laboratory spiked samples. Continuing calibration data was used to evaluate analytical instrument precision. The calibration ranges designated in Table 5-1 were the DV guidelines used to evaluate the instrument precision. In general, instrument calibration guidelines were met.

The overall accuracy of the analytical data was assessed through the evaluation of QA/QC data associated with laboratory standards, spikes, blanks and the initial calibrations that were run. QA/QC data relating to the standards and calibrations was used to assess the accuracy of the analytical instruments. Data on the recovery of spikes in the spiked samples was used to evaluate the accuracy of the preparation and extraction steps. The laboratory blank data was also used to evaluate the accuracy of the preparation/extraction and the analysis. The levels of the relevant contaminants detected in the blanks were used to decide if the detection limits reported by the laboratory were appropriate. Field accuracy was evaluated through the field blank only.

5.4 LABORATORY IDENTIFICATION OF AROCLORS

During laboratory analyses, determination of aroclors was conducted by identification and matching of chromatographic peak patterns. Aroclors are, in general, composed of patented mixtures of individual PCB congeners which generate characteristic chromatographic patterns. Since the individual PCB concentrations in aroclors vary and certain PCBs are different in the various aroclors, they demonstrate different chromatographic patterns. In addition, the individual PCBs which comprise different aroclors possess different physical/chemical properties including different vapor pressures, and biological and chemical degradation rates. Therefore, in the natural environment, the aroclors comprised of these PCBs can change their exact chemical characteristics over time and may do so at different rates. Therefore, when air samples are analyzed for aroclors the chromatographic pattern may not match aroclor standards exactly.

There are two analytical issues that are apparent from the aroclor data packages. First, several DV reviewers commented that there is potential for misinterpretation of the chromatograms. Since many of the peak retention times that the laboratories used for the identification of aroclors 1016 and 1242 are the same and some of the retention times for 1248 and 1254 also matched those for 1016 and 1242, the choice of the aroclor identified and quantified was somewhat arbitrary. Since the aroclors are present in the same relative order of magnitude and total aroclor concentration, possible misinterpretations of certain chromatographic profiles should not have a major impact on data quality with respect to total PCB concentrations.

The second issue concerning aroclor identification is demonstrated in the pre-dredging sample results. Although the laboratory appropriately did not identify any aroclors as detected, there is evidence that suggests that certain PCBs which are contained in aroclors or related degradation products may have been present. Chromatographic profiles indicated that several of the peaks and associated retention times for aroclor standards were present in the environmental samples. However, for these samples, most of the overall chromatographic pattern did not match aroclor standards.

5.5 FIELD AND LABORATORY BLANK RESULTS

5.5.1 Aroclor Data

Contaminants detected in the blanks were used to adjust the detection limit (DL) of the results for field samples associated with a given blank. Specifically, the detection limits of all field samples collected on the same day as a given field blank were adjusted if the field blank results indicated aroclor contamination. Likewise, results associated with contaminated laboratory blanks were adjusted if those samples were extracted and analyzed on the same day as the laboratory blank. This represents a slight modification of the general EPA regional guideline, which states that the highest contamination of any blank associated with an entire data package should result in a detection limit adjustment to all sample results in the data package. This modification was considered appropriate due to the fact that the aroclor data pakages contained abnormally large numbers of individual samples. None of the DVs qualified an entire data package based on blank contamination. Where appropriate, field results were qualified by raising the DL of the aroclor to five times the result detected in the associated blank.

5.5.2 Metals Data

The contaminants detected in the blanks for metals samples were used to adjust the detection limits of the corresponding samples in a manner similar to the method applied to aroclors. The guideline used to raise detection limits for the metals was the same as the Region I protocol and specified that the highest concentration of each contaminant detected in the blank was applied as the DL to all samples in the data package. The associated results for the environmental samples were qualified by raising the detection limit to five times the highest concentration detected in the blanks.

The blank results for the metals data indicated the possiblity of consistent problems with the quantification of the metals that were analyzed. Since metals were consistently detected in the blanks of the sample collection media, there appeared to be an inherent background metal concentration in "clean" filters. Therefore, the low concentrations of metals observed on many filters may be in part inherent or an artifact of the collection media.

Generally, positive cadmium and chromium results were approximated, due to the combination of contaminated blanks and the relatively low sample result concentrations (frequently less than 5 times the blank concentration) that were detected. Chromium and cadmium sample results were relatively low in comparison with lead results, and blank contamination was usually detected at concentrations close to the reported sample concentrations. Therefore, due to the upward detection limit adjustments necessitated by the detected blank contamination, low concentrations of these two metals were qualified in many samples. Chromium concentrations detected in the environmental samples were generally the lowest of the three metals and approximately 75 percent of the chromium results were qualified due to blank contamination. Cadmium results were higher than chromium results, but significantly less than lead results, and, correspondingly, approximately 30 percent of the cadmium results were qualified due to blank contamination.

6

6.0 PILOT STUDY RESULTS AND CONCLUSIONS

Results of ambient monitoring conducted to measure ambient contaminant levels prior to, during, and after the operational phases of the Pilot Study are summarized in this section. Included are the results from 37 sampling days during the period from November 7, 1988 to April 27, 1989. Also included is an evaluation of the data against the dredging phases, Decision Criteria/Regulatory Limits and meteorological influences.

The results were initially placed in a spreadsheet format to complete the required QA precision calculations. From this format, graphical presentations of the results were prepared to assist in identifying trends or correlations between contaminant concentrations and specific activities or locations. Any changes made to the results as a result of data validation activities have been carried through the entire process. To assist in the interpretation of the monitoring data, selected graphs and tables are presented. However, a complete listing of PCB, metals, VOC, H_2S and meteorological data is presented in Appendix C. A complete set of graphs comparing PCB and metals concentrations with sampling days as well as wind speed and direction are presented in Appendix D.

6.1 VOC AND H_2S RESULTS

As mentioned earlier in this report, VOCs and H_2S levels were undetectable throughout the pre-dredging and dredging phases of the study, and therefore, no detailed analysis of this data was conducted. Based on these results, monitoring for VOC and H_2S was not conducted during the post-dredging phase. VOC concentrations in 24-hour averages, based on the six measurements collected over a sampling period (0900 - 0900), are listed in Tables C-1 and C-2 of Appendix C.

6.2 METALS RESULTS AND EVALUATION

In general, ambient levels for the three metals (Cd, Cr, and Pb) during the Pilot Study were similar, but slightly lower than measurements obtained during previous studies.

The results of the metals monitoring for the three Pilot Study phases are presented in Tables 6-1 through 6-3. At the bottom of each table, ambient concentrations are summarized into "mean", "maximum", and "minimum" values. These values reflect detected samples only from that particular

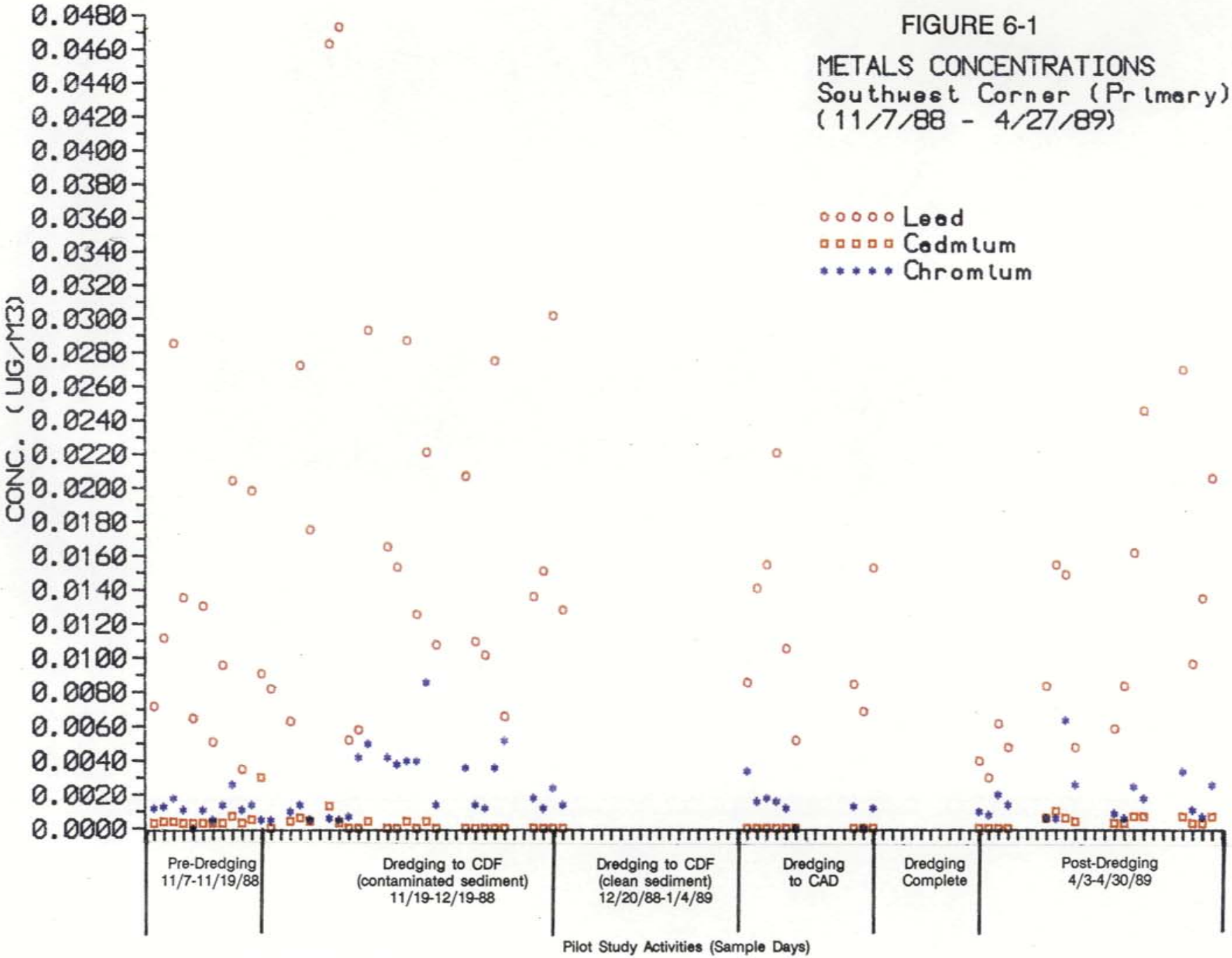


FIGURE 6-1
METALS CONCENTRATIONS
Southwest Corner (Primary)
(11/7/88 - 4/27/89)
Lead
Cadmium
Chromium
CONC. (UG/M3)
0.0480
0.0460
0.0440
0.0420
0.0400
0.0380
0.0360
0.0340
0.0320
0.0300
0.0280
0.0260
0.0240
0.0220
0.0200
0.0180
0.0160
0.0140
0.0120
0.0100
0.0080
0.0060
0.0040
0.0020
0.0000
Pre-Dredging 11/7-11/19/88
Dredging to CDF (contaminated sediment) 11/19-12/19-88
Dredging to CDF (clean sediment) 12/20/88-1/4/89
Dredging to CAD
Dredging Complete
Post-Dredging 4/3-4/30/89
Pilot Study Activities (Sample Days)

TABLE 6-1

HEAVY METALS CONCENTRATION SUMMARY
PRE-DREDGE SAMPLING

Date	PRIMARY SAMPLER Pb $\mu g/m^3$	Cd $\mu g/m^3$	Cr $\mu g/m^3$
11/7-8	0.0072	0.0003	0.0012
11/8-9	0.0112	0.0004	0.0013
11/9-10	0.0286	0.0004	0.0018
11/10-11	0.0136	0.0003	0.0011
11/11-12	0.0065	0.0003	ND
11/12-13	0.0131	0.0003	0.0011
11/13-14	0.0051	0.0003	0.0005
11/14-15	0.0096	0.0003	0.0014
11/15-16	0.0205	0.0007	0.0026
11/16-17	0.0035	0.0003	0.0011
11/17-18	0.0199	0.0005	0.0014
11/18-19	0.0091	0.0003	0.0005
MEAN	0.0123	0.0004	0.0012
MAX	0.0286	0.0007	0.0026
MIN	0.0035	0.0003	ND

TABLE 6-2

HEAVY METALS CONCENTRATION SUMMARY
DURING DREDGE SAMPLING

Date	PRIMARY SAMPLER Pb $\mu g/m^3$	Cd $\mu g/m^3$	Cr $\mu g/m^3$
11/19-20	0.0082	ND	0.0005
11/21-22	0.0063	0.0004	0.0010
11/22-23	0.0273	0.0006	0.0014
11/23-24	0.0176	0.0004	0.0005
11/25-26	0.0464	0.0013	0.0006
11/26-27	0.0474	0.0003	0.0005
11/27-28	0.0052	ND	0.0007
11/28-29	0.0058*	ND*	0.0042*
11/29-30	0.0294*	0.0004*	0.0050*
12/1-2	0.0166*	ND*	0.0042*
12/2-3	0.0154*	ND*	0.0038*
12/3-4	0.0288*	0.0004*	0.0040*
12/4-5	0.0126*	ND*	0.0040*
12/5-6	0.0222*	0.0004*	0.0086*
12/6-7	0.0108*	ND*	0.0014*
12/9-10	0.0208*	ND*	0.0036*
12/10-11	0.0110*	ND*	0.0014*
12/11-12	0.0102*	ND*	0.0012*
12/12-13	0.0276*	ND*	0.0036*
12/13-14	0.0066*	ND*	0.0052*
12/16-17	0.0137*	ND*	0.0018*
12/17-18	0.0152*	ND*	0.0012*
12/18-19	0.0303*	ND*	0.0024*
12/19-20	0.0129*	ND*	0.0014*
12/21-22	sample contaminated by lab		
12/27-28	sample contaminated by lab		
1/7-8	0.0086*	ND*	0.0034*
1/8-9	0.0142*	ND*	0.0016*
1/9-10	0.0156*	0.0004*	0.0018*
1/10-11	0.0222*	ND*	0.0016*
1/11-12	0.0106*	ND*	0.0012*
1/12-13	0.0052	ND	ND
1/18-19	0.0085	ND	0.0013
1/19-20	0.0069	ND	ND
1/20-21	0.0154	ND	0.0012
MEAN	0.0168	0.0001	0.0023
MAX	0.0474	0.0013	0.0086
MIN	0.0052	ND	ND

* Laboratory mistakenly reported half-filter weight. Weight was doubled to obtain correct concentration.

TABLE 6-3

HEAVY METALS CONCENTRATION SUMMARY
POST-DREDGE SAMPLING

Date	PRIMARY SAMPLER Pb $\mu g/m^3$	Cd $\mu g/m^3$	Cr $\mu g/m^3$
4/3-4	0.0040*	0.0004*	0.0010*
4/4-5	0.0030*	0.0004*	0.0008*
4/5-6**	0.0062*	0.0004*	0.0020*
4/6-7	0.0048*	0.0004*	0.0014*
4/10-11	0.0084*	0.0006*	0.0006*
4/11-12	0.0156*	0.0010*	0.0006*
4/12-13	0.0150*	0.0006*	0.0064*
4/13-14	0.0048*	0.0004*	0.0026*
4/17-18	0.0059	0.0003	0.0009
4/18-19	0.0084	0.0003	0.0006
4/19-20**	0.0163	0.0007	0.0025
4/20-21	0.0247	0.0007	0.0018
4/24-25	0.0271	0.0007	0.0034
4/25-26	0.0097	ND	0.0011
4/26-27	0.0136	0.0003	0.0007
4/27-28	0.0207	0.0007	0.0026
MEAN	0.0118	0.0005	0.0018
MAX	0.0271	0.0010	0.0064
MIN	0.0030	ND	0.0006

* Laboratory mistakenly reported half-filter weight. Weight was doubled to obtain correct concentration.

** Glass fiber filter

phase. Also indicated on the tables, are the samples that have been corrected to account for a laboratory quantification error identified during data validation.

Validation of the metals data indicated that a large portion of the cadmium and chromium data collected were qualified due to the relatively low concentrations of these metals measured. Most of these qualifiers are based on the concentration levels detected in on the field and laboratory blanks being greater than the sample measurements. The lead data tended to be flagged less frequently because of the higher levels measured. In drawing conclusions from the lead data, the only data values excluded were those that were qualified due to conditions which definitely indicate data questionability. Data values qualified because of field duplication problems would be an example of conditions that exempted data from being included in drawing conclusions from this study. Two sample days were explicitly removed from the database during the data validation process (12/21/89, and 12/27/89). These samples were contaminated by the laboratory when they were inadvertently used as lab spikes. Detailed discussion of data validation and the results are provided in Section 5.0 and Appendix B, respectively.

6.2.1 Results in Relation to Dredging Phases

The results of the metals monitoring are presented in Figure 6-1. This graph presents the ambient concentrations for each metal prior to, during, and after the dredging and disposal phases. These results are from the single metals monitoring station located adjacent to the southwest corner of the CDF. Similar results were obtained from the collated HI-VOL sampler, also located on the southwest corner sampling platform. As can be observed from the metals data, the only metal measured at any significant level was lead. Cadmium levels were essentially undetectable throughout all phases of the study program. Chromium levels were at relatively low levels for an urban environment. For this reason the majority of the discussion in this section is in reference to the lead concentrations measured.

The average levels of lead measured during the three phases of the study were similar: pre-dredging, 0.0123 $\mu g/m^3$; dredging, 0.0168 $\mu g/m^3$; post-dredging, 0.0118 $\mu g/m^3$. Although the average value was slightly higher during the dredging phase, this may be attributable to the larger number of sampling days during this period and/or the greater presence of construction equipment/vehicular traffic during this phase. While no correlation between the different

operational phases was observed, some of the highest lead levels did occur on sample days when high PCB concentrations were observed. This suggests that the ambient levels for the Pilot Study may have been influenced by climatic conditions and not the dredging and disposal activities.

6.2.2 Regulatory Limits (Metals)

Based on the low levels of metals observed during previous monitoring studies, no Decision Criteria were developed for the Pilot Study. However, a general comparison of the observed levels against the proposed Allowable Ambient Limits (AALs) is provided below in Table 6-4. This comparison illustrates that all three of the metals were well below these proposed standards. Please note that only a general comparison was completed because of the difference in averaging times for the observed levels and the AALs.

TABLE 6-4

AVERAGE HEAVY METAL CONCENTRATIONS AND PROPOSED AALs

Analyte	Proposed AAL ($\mu g/m^3$) (Annual Average)	Heavy Metal Concentrations ($\mu g/m^3$) Pre-Dredge	Dredging	Post-Dredge
Lead (Pb)	0.07	0.0123	0.0168	0.0118
Chromium (Cr)	0.68	0.0012	0.0023	0.0018
Cadmium (Cd)	0.001	0.0004	0.0001	0.0005

In addition, the results obtained during the Pilot Study were all well below the NAAQS quarterly average value of 1.5 $\mu g/m^3$ for lead. The lead levels measured during the Pilot Study are also lower than typical urban values measured elsewhere across the state (shown in the shaded area to the right). This is probably due to the shoreline location of the monitors, which, for the most part, were away from vehicular and truck traffic. Please note that the observed values should not be directly compared with the NAAQS value because of the difference in averaging times.

	Jan - Mar	Oct - Dec
Boston	.115 $\mu g/m^3$	.085 $\mu g/m^3$
Springfield	.142 $\mu g/m^3$	.080 $\mu g/m^3$
Worcester	.060 $\mu g/m^3$	.040 $\mu g/m^3$
Lowell	.075 $\mu g/m^3$	.050 $\mu g/m^3$

6.2.3 Meteorological Influences (Metals)

Another variable confirming the fact that the metals data are typical of New Bedford background levels is the wind direction data. The distribution of metals concentrations over the wind direction quadrants indicate that the data was almost exclusively coming from the 180° (southern) to 360° (northern) direction, which covers the entire New Bedford urban area or everything west of the river. Essentially no metals data was observed from winds coming from the 0° (northern) to 180° (southern) quadrant, which is in the direction of the river from the site. Lead and cadmium levels seemed to be unaffected by all other meteorological parameters. Concentrations did not vary in response to changes in wind speed, temperature, or solar radiation. Surprisingly, some of the highest measured concentrations occurred during periods of precipitation, though not exclusively. Typical particulate levels are generally decreased by rain and snow fall.

The meteorological data collected during the pilot study is summarized in Table C-15 of Appendix C. Graph G-23 in Appendix D is a scatter graph, developed to demonstrate the correlation between metals concentrations and wind direction. The wind data is further interpreted in a series of daily wind roses and wind frequency distribution tables found in Appendix G of Volume II.

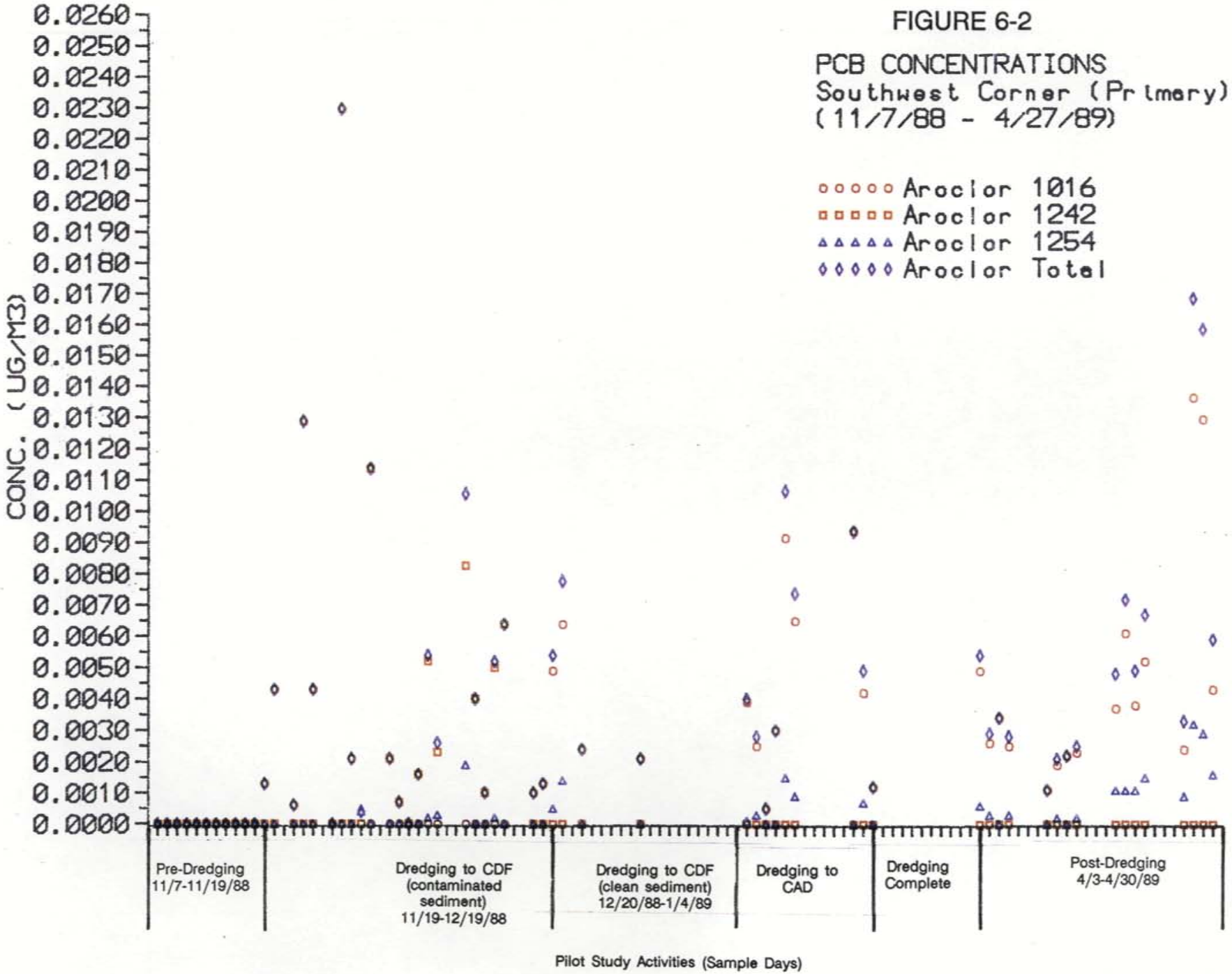
In summary, the meteorological data appear to indicate that metal concentrations were not influenced by any of the activities occurring at the study site. For the most part, the wind direction data would indicate that the largest influence on the metals levels is the New Bedford urban environment.

6.3 PCB RESULTS AND EVALUATION

The first step in reviewing the PCB results was to determine if the data was to be evaluated as aroclor specific PCB (1016, 1242, 1248, and 1254) or as total PCB as the summation of aroclors. It is important to note that although aroclors 1016 and 1242 are reported separately, they produce similar chromatographic patterns that are difficult to differentiate. Therefore, within the remainder of this report they will be referred to as aroclor 1016/1242. This is a valid assumption for this data set because the laboratories never reported both of these PCB mixtures, only 1016 or 1242. For the most part, the total PCB measurements were composed of aroclor 1016/1242 with a small component of aroclor 1254. This relationship is highlighted in Figure 6-2, which presents PCB

FIGURE 6-2

PCB CONCENTRATIONS
Southwest Corner (Primary)
(11/7/88 - 4/27/89)



concentrations in terms of individual PCB aroclors and total PCB versus sampling days. Throughout the entire monitoring program, aroclor 1248 was not detected.

It had been suggested that by presenting the data for the PUF and filter sampling media separately, PCB values for the vapor and particulate phases could be determined. However, Ebasco believes this approach is incorrect based on the design and operation of the sampling unit. For example, PCB in the vapor phase may have attached to a particulate while being drawn through the filter. Therefore, a combination of the PUF and filter concentrations were used as the total for each sample. However, a separate listing of the PUF and filter concentrations is provided in Table C-6 of Appendix C.

To simplify the remaining graphs in this section, total PCB is composed of aroclors 1016/1242 and 1254, using the combination of PUF and filter concentrations. However, the values for the individual aroclor concentrations for the three phases of the Pilot Study are summarized by sampling site in Tables 6-5 through 6-7. Each table also has the "mean", "maximum", and "minimum" concentration values for the measured values at each sampling location during the respective phases.

6.3.1 Results in Relation to Dredging Phases

The results of the ambient PCB levels for all five monitoring stations in relation to the three phases of the study are presented in Figure 6-3. Based on the wide range of PCB concentrations observed during the three phases of the study, and the range of meteorological conditions encountered, it is difficult to distinguish between releases caused by dredging and disposal activities and those due to the surrounding contaminated sediment and water areas. However, by evaluating the monitoring stations directly adjacent to the CDF, general trends concerning PCB release from both the CDF and the surrounding areas were observed. In addition, using field observations, a correlation between the operation of the CDF and increased concentrations was developed.

6.3.1.1 Pre-Dredging Levels

Data collected during the pre-dredging phase of the monitoring program indicated that PCB levels were non-detectable between November 7, 1988 and November 17, 1988, essentially the entire pre-dredging phase of the program. This period of data represented several specific data packages

TABLE 6-5

PCB Concentration Summary
Pre-Dredge Sampling

Run Date	SOUTHWEST CORNER Conc. 1016 µg/m³	Conc. 1242 µg/m³	Conc. 1254 µg/m³	Conc. Total µg/m³	NORTHWEST CORNER Conc. 1016 µg/m³	Conc. 1242 µg/m³	Conc. 1254 µg/m³	Conc. Total µg/m³	NORTHEAST CORNER Conc. 1016 µg/m³	Conc. 1242 µg/m³	Conc. 1254 µg/m³	Conc. Total µg/m³	SOUTHEAST CORNER Conc. 1016 µg/m³	Conc. 1242 µg/m³	Conc. 1254 µg/m³	Conc. 1248 µg/m³	Conc. Total µg/m³	BACKGROUND Conc. 1016 µg/m³	Conc. 1242 µg/m³	Conc. 1254 µg/m³	Conc. Total µg/m³
11/7-8	ND	ND	ND	ND																	
11/8-9	ND	ND	ND	ND																	
11/9-10	ND	ND	ND	ND																	
11/10-11	ND	ND	ND	ND																	
11/11-12	ND	ND	ND	ND																	
11/12-13	ND	ND	ND	ND																	
11/13-14	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND				
11/14-15	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND				
11/15-16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND				
11/16-17	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND				
11/17-18	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0055	0.0006	0.0061	ND	ND	ND	ND	ND				
11/18-19	0.0013	ND	ND	0.0013	0.0019	ND	ND	0.0019	0.0037	ND	ND	0.0018	0.0018	ND	ND	ND	0.0018				
Mean	0.0013	0.0000	0.0000	0.0013	0.0018	0.0000	0.0000	0.0018	0.0037	0.0055	0.0006	0.0049	0.0018	0.0000	0.0000	0.0000	0.0018				
Maximum	0.0013	0.0000	0.0000	0.0013	0.0018	0.0000	0.0000	0.0018	0.0037	0.0055	0.0006	0.0061	0.0018	0.0000	0.0000	0.0000	0.0018				
Minimum	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000				

TABLE 6-6

PCB Concentration Summary
During Dredge Sampling

Run Date	SOUTHWEST CORNER Conc. 1016 µg/m³	Conc. 1242 µg/m³	Conc. 1254 µg/m³	Conc. Total µg/m³	NORTHWEST CORNER Conc. 1016 µg/m³	Conc. 1242 µg/m³	Conc. 1254 µg/m³	Conc. Total µg/m³	NORTHEAST CORNER Conc. 1016 µg/m³	Conc. 1242 µg/m³	Conc. 1254 µg/m³	Conc. Total µg/m³	SOUTHEAST CORNER Conc. 1016 µg/m³	Conc. 1242 µg/m³	Conc. 1254 µg/m³	Conc. 1248 µg/m³	Conc. Total µg/m³	BACKGROUND Conc. 1016 µg/m³	Conc. 1242 µg/m³	Conc. 1254 µg/m³	Conc. Total µg/m³
11/19-20	0.0043	ND	ND	0.0043	0.0053	ND	ND	0.0053	0.0049	ND	ND	0.0049	0.0039	ND	ND	ND	0.0039				
11/21-22	0.0006	ND	ND	0.0006	VOID	VOID	VOID	VOID	0.0052	ND	ND	0.0052	0.0024	ND	ND	ND	0.0024				
11/22-23	0.0129	ND	ND	0.0129	NO RUN	NO RUN	NO RUN	NO RUN	0.0165	ND	ND	0.0165	0.0143	ND	ND	ND	0.0143				
11/23-24	0.0043	ND	ND	0.0043	0.0044	ND	ND	0.0044	0.0050	ND	ND	0.0050	0.0054	ND	ND	ND	0.0054				
11/25-26	ND	ND	ND	ND	ND	ND	ND	ND	0.0084	ND	ND	0.0084	0.0090	ND	ND	ND	0.0090				
11/26-27	0.0230	ND	ND	0.0230	0.0026	ND	ND	0.0026	0.0184	ND	ND	0.0184	0.0229	ND	ND	ND	0.0229				
11/27-28	0.0021	ND	ND	0.0021	0.0024	ND	ND	0.0024	0.0067	ND	ND	0.0067	0.0104	ND	ND	ND	0.0104				
11/28-29	ND	ND	0.0004	0.0004	0.0020	ND	ND	0.0020	ND	0.0098	ND	0.0098	ND	0.0073	ND	ND	0.0073				
11/29-30	ND	0.0114	ND	0.0114	ND	0.0100	ND	0.0100	ND	0.0196	ND	0.0196	ND	0.0144	0.0004	ND	0.0192				
12/1-2	ND	0.0021	ND	0.0021	ND	0.0026	ND	0.0026	ND	0.0066	ND	0.0066	ND	0.0030	ND	ND	0.0030				
12/2-3	ND	0.0007	ND	0.0007	ND	0.0012	ND	0.0012	ND	0.0088	ND	0.0088	ND	0.0048	ND	ND	0.0049				
12/3-4	VOID	VOID	VOID	VOID	ND	0.0027	ND	0.0027	ND	0.0093	ND	0.0093	VOID	VOID	VOID	VOID	VOID				
12/4-5	ND	0.0016	ND	0.0016	ND	0.0018	ND	0.0018	ND	0.0069	ND	0.0069	ND	0.0053	ND	ND	0.0053				
12/5-6	ND	0.0050	0.0002	0.0052	ND	0.0060	0.0004	0.0064	ND	0.0084	0.0010	0.0094	ND	0.0093	0.0007	ND	0.0100				
12/6-7	ND	0.0023	0.0003	0.0026	ND	0.0005	0.0016	0.0066	ND	0.0069	ND	0.0069	ND	0.0055	0.0003	ND	0.0058				
12/9-10	ND	0.0083	0.0019	0.0102	ND	0.0054	0.0006	0.0060	ND	0.0048	0.0003	0.0051	ND	0.0065	0.0009	ND	0.0052				
12/10-11	ND	0.0040	ND	0.0040	ND	0.0047	0.0003	0.0047	ND	0.0051	ND	0.0051	ND	0.0044	ND	ND	0.0044				
12/11-12	ND	0.0010	ND	0.0010	ND	0.0019	ND	0.0019	ND	0.0032	ND	0.0032	ND	0.0023	ND	ND	0.0023				
12/12-13	ND	0.0050	0.0002	0.0052	ND	0.0052	0.0003	0.0055	ND	0.0066	0.0003	0.0069	ND	0.0051	0.0006	ND	0.0057				
12/13-14	ND	0.0064	ND	0.0064	ND	0.0063	ND	0.0063	ND	0.0084	ND	0.0084	ND	0.0061	ND	ND	0.0061				
12/16-17	0.0010	ND	ND	0.0010	0.0060	ND	0.0020	0.0080	0.0020	ND	ND	0.0020	0.0057	ND	0.0020	ND	0.0074				
12/17-18	0.0013	ND	ND	0.0013	0.0022	ND	ND	0.0022	0.0038	ND	0.0011	0.0049	0.0040	ND	0.0020	ND	0.0050				
12/18-19	0.0049	ND	0.0005	0.0054	0.0104	ND	0.0028	0.0132	0.0070	ND	0.0014	0.0084	0.0058	ND	0.0023	ND	0.0081				
12/19-20	0.0064	ND	0.0014	0.0078	0.0091	ND	ND	0.0091	0.0033	ND	0.0014	0.0047	ND	ND	ND	ND	ND				
12/21-22	0.0024	ND	ND	0.0024	0.0020	ND	ND	0.0020	0.0062	ND	0.0010	0.0072	ND	ND	ND	0.0004	0.0004				
12/27-28	0.0021	ND	ND	0.0021	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0012	ND	0.0006	0.0018
12/28-29																		0.0013	ND	ND	0.0013
12/29-30																		ND	ND	ND	ND
1/7-8	0.0039	ND	0.0001	0.0040	0.0045	ND	0.0009	0.0054	0.0094	ND	ND	0.0094	0.0086	ND	0.0011	ND	0.0097	0.0063	ND	0.0004	0.0067
1/8-9	0.0025	ND	0.0003	0.0028	0.0024	ND	ND	0.0024	0.0047	ND	0.0010	0.0057	0.0049	ND	ND	ND	0.0049	0.0079	ND	0.0020	0.0144
1/9-10	0.0005	ND	ND	0.0005	0.0012	ND	ND	0.0012	0.0057	ND	ND	0.0057	0.0019	ND	ND	ND	0.0019	0.0014	ND	ND	0.0014
1/10-11	0.0030	ND	ND	0.0030	0.0038	ND	0.0013	0.0051	0.0049	ND	0.0005	0.0054	0.0044	ND	ND	ND	0.0044	0.0090	ND	ND	0.0090
1/11-12	0.0092	ND	0.0015	0.0107	0.0098	ND	0.0017	0.0058	0.0151	ND	0.0008	0.0159	0.0077	ND	ND	ND	0.0077	0.0068	ND	0.0014	0.0082
1/12-13	0.0065	ND	0.0009	0.0074	0.0044	ND	0.0004	0.0044	0.0094	ND	0.0011	0.0105	0.0059	ND	0.0008	ND	0.0067	0.0098	ND	0.0004	0.0102
1/18-19	0.0096	ND	ND	0.0096	0.0087	ND	ND	0.0087	0.0158	ND	ND	0.0158	0.0138	ND	ND	ND	0.0138	0.0171	ND	ND	0.0171
1/19-20	0.0043	ND	0.0007	0.0049	0.0048	ND	0.0009	0.0057	0.0075	ND	0.001	0.0085	ND	0.0059	0.0014	ND	0.0014	VOID	VOID	VOID	VOID
1/20-21	0.0013	ND	ND	0.0013	0.0013	ND	ND	0.0012	0.0028	ND	ND	0.0028	ND	0.0026	ND	ND	0.0026	0.0056	ND	ND	0.0056
Mean	0.0050	0.0044	0.0008	0.0049	0.0046	0.0044	0.0013	0.0047	0.0077	0.0080	0.0009	0.0082	0.0077	0.0061	0.0012	0.0004	0.0071	0.0065	0.0000	0.0027	0.0076
Maximum	0.0230	0.0114	0.0019	0.0230	0.0104	0.0100	0.0028	0.0132	0.0184	0.0196	0.0014	0.0196	0.0229	0.0189	0.0023	0.0004	0.0229	0.0171	0.0000	0.0079	0.0171
Minimum	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

TABLE 6-7

PCB Concentration Summary
Post-Dredge Sampling

Run Date	SOUTHWEST CORNER Conc. 1016 µg/m³	Conc. 1242 µg/m³	Conc. 1254 µg/m³	Conc. Total µg/m³	NORTHWEST CORNER Conc. 1016 µg/m³	Conc. 1242 µg/m³	Conc. 1254 µg/m³	Conc. Total µg/m³	NORTHEAST CORNER Conc. 1016 µg/m³	Conc. 1242 µg/m³	Conc. 1254 µg/m³	Conc. Total µg/m³	SOUTHEAST CORNER Conc. 1016 µg/m³	Conc. 1242 µg/m³	Conc. 1254 µg/m³	Conc. 1248 µg/m³	Conc. Total µg/m³	BACKGROUND Conc. 1016 µg/m³	Conc. 1242 µg/m³	Conc. 1254 µg/m³	Conc. Total µg/m³
4/3-4	0.0049	ND	0.0006	0.0055	0.0053	ND	0.0007	0.0060	0.0102	ND	0.0007	0.0109	0.0081	ND	0.0006	ND	0.0087	0.0137	ND	0.0010	0.0147
4/4-5	0.0026	ND	0.0003	0.0029	0.0028	ND	0.0002	0.0030	0.0057	ND	0.0002	0.0059	0.0054	ND	ND	ND	0.0054	0.0136	ND	0.0002	0.0138
4/5-6	0.0034	ND	ND	0.0034	0.0037	ND	ND	0.0037	0.0079	ND	ND	0.0079	0.0076	ND	ND	ND	0.0076	0.0177	ND	ND	0.0177
4/6-7	0.0025	ND	0.0003	0.0028	0.0028	ND	0.0006	0.0034	0.0048	ND	0.0005	0.0053	0.0045	ND	0.0004	ND	0.0049	VOID	VOID	VOID	VOID
4/10-11	0.0011	ND	ND	0.0011	0.0016	ND	0.0003	0.0019	0.0029	ND	0.0002	0.0031	0.0025	ND	0.0002	ND	0.0027	0.0016	ND	0.0002	0.0018
4/11-12	0.0019	ND	0.0002	0.0021	0.0022	ND	ND	0.0022	0.0048	ND	ND	0.0048	0.0033	ND	0.0002	ND	0.0035	0.0030	ND	ND	0.0030
4/12-13	0.0022	ND	ND	0.0022	0.0025	ND	ND	0.0025	0.0026	ND	0.0002	0.0028	0.0047	ND	0.0002	ND	0.0049	0.0065	ND	0.0004	0.0069
4/13-14	0.0023	ND	0.0002	0.0025	0.0020	ND	0.0003	0.0023	0.0059	ND	0.0003	0.0062	0.0065	ND	0.0003	ND	0.0068	0.0060	ND	0.0005	0.0065
4/17-18	0.0037	ND	0.0011	0.0048	0.0051	ND	0.0014	0.0065	0.0110	ND	0.0014	0.0124	0.0078	ND	0.0011	ND	0.0089	0.0172	ND	0.0018	0.0190
4/18-19	0.0061	ND	0.0011	0.0072	0.0092	ND	0.0005	0.0097	0.0117	ND	0.0013	0.0130	0.0112	ND	0.0013	ND	0.0125	0.0084	ND	0.0009	0.0093
4/19-20	0.0038	ND	0.0011	0.0049	0.0057	ND	0.0012	0.0069	0.0090	ND	0.0011	0.0101	0.0069	ND	0.0010	ND	0.0079	0.0051	ND	0.0007	0.0058
4/20-21	0.0052	ND	0.0015	0.0067	0.0091	ND	0.0015	0.0106	0.0111	ND	0.0020	0.0131	0.0094	ND	0.0018	ND	0.0112	0.0047	ND	0.0012	0.0059
4/24-25	0.0024	ND	0.0009	0.0033	0.0031	ND	0.0013	0.0044	0.0068	ND	0.0017	0.0085	0.0045	ND	0.0016	ND	0.0061	0.0027	ND	0.0010	0.0037
4/25-26	0.0137	ND	0.0032	0.0169	0.0160	ND	0.0031	0.0191	0.0193	ND	0.0034	0.0227	0.0185	ND	0.0036	ND	0.0221	0.0183	ND	0.0040	0.0223
4/26-27	0.0130	ND	0.0029	0.0159	0.0144	ND	0.0031	0.0175	0.0197	ND	0.0038	0.0235	0.0212	ND	0.0039	ND	0.0251	0.0219	ND	0.0048	0.0267
4/27-28	0.0043	ND	0.0016	0.0059	0.0043	ND	0.0024	0.0067	0.0072	ND	0.0020	0.0092	0.0090	ND	0.0024	ND	0.0114	0.0040	ND	0.0015	0.0055
Mean	0.0046	0.0000	0.0012	0.0055	0.0056	0.0000	0.0013	0.0067	0.0088	0.0000	0.0013	0.0100	0.0082	0.0000	0.0013	0.0000	0.0094	0.0096	0.0000	0.0014	0.0108
Maximum	0.0137	0.0000	0.0032	0.0169	0.0160	0.0000	0.0031	0.0191	0.0197	0.0000	0.0038	0.0235	0.0212	0.0000	0.0039	0.0000	0.0251	0.0219	0.0000	0.0048	0.0267
Minimum	0.0011	0.0000	0.0000	0.0011	0.0016	0.0000	0.0000	0.0019	0.0026	0.0000	0.0002	0.0028	0.0025	0.0000	0.0000	0.0000	0.0027	0.0000	0.0000	0.0002	0.0008

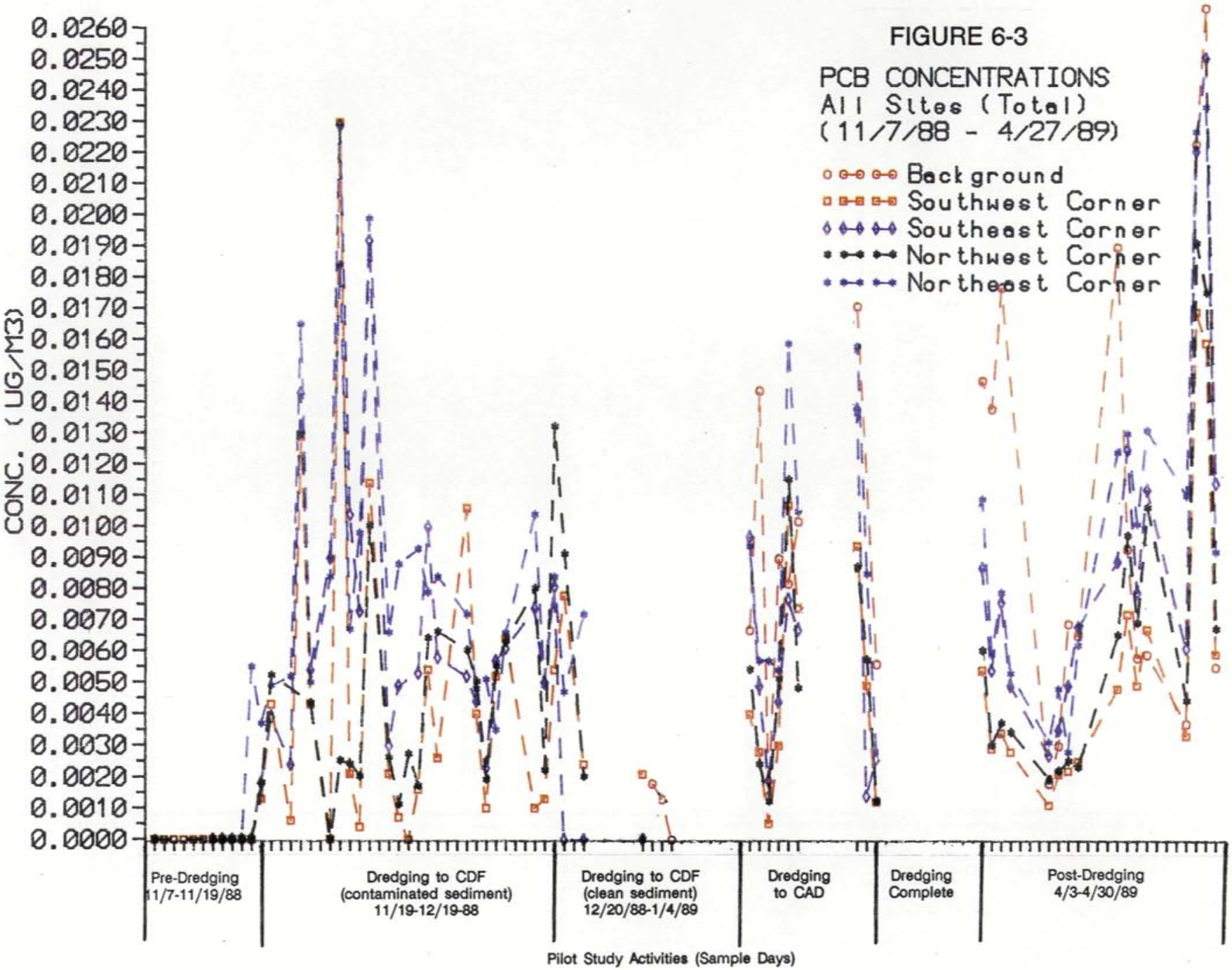


FIGURE 6-3
PCB CONCENTRATIONS
All Sites (Total)
(11/7/88 - 4/27/89)
Background
Southwest Corner
Southeast Corner
Northwest Corner
Northeast Corner
CONC. (UG/M3)
0.0260
0.0250
0.0240
0.0230
0.0220
0.0210
0.0200
0.0190
0.0180
0.0170
0.0160
0.0150
0.0140
0.0130
0.0120
0.0110
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
Pre-Dredging 11/7-11/19/88
Dredging to CDF (contaminated sediment) 11/19-12/19-88
Dredging to CDF (clean sediment) 12/20/88-1/4/89
Dredging to CAD
Dredging Complete
Post-Dredging 4/3-4/30/89
Pilot Study Activities (Sample Days)

submitted to the same laboratory. However, a review of the sample chromatograms during the data validation process identified peak retention times associated with several congeners that would normally be present within the aroclor mixture. Although these samples displayed patterns which did not closely match aroclor standards, it is believed that several PCB congeners were nonetheless indicated on the samples. This finding was not novel based on the different physical/chemical properties of the various PCB congeners that comprise an aroclor mixture, as well as the weathering that may have occurred to the PCB since being released into the environment. Despite the evidence that ambient PCB levels did exist during the pre-dredging phase, strict validation protocol was followed and the samples were reported as non-detects.

6.3.1.2 Dredging Levels

During the dredging period, the mean values for the SWC and NWC sites were similar, 4.9 ng/m^3 and 4.7 ng/m^3, respectively. The NEC and SEC sites also yielded similar mean values, 8.2 ng/m^3 and 7.1 ng/m^3, respectively. Evaluating the data as mean values for the entire dredging period only provided summary trends such as the influence of dominant wind direction tended to mask out the effects of specific dredging/disposal activities or meteorological occurrences. To provide insight into whether the different activities were conducive to PCB release, the data was reviewed against the daily operations. The major trend observed while contaminated sediment was being dredged to the CDF, was that contaminant release was higher during the periods when sediment was being pumped into the CDF with the end of the dredge line above the surface of the ponded water. During this condition, the monitoring station located approximately 75 feet away (NEC), was impacted with a fine mist that soaked the filter.

During the dredging and disposal of contaminated sediment to the CAD cell (January 7, 1989 through January 15, 1989), the ambient PCB levels surrounding the CDF were similar to the levels observed when the CDF was receiving sediment. During this period, the CDF was covered by a layer of snow and ice. The ambient PCB levels measured at the station adjacent to the CAD facility (BG) appeared to rise relative to the small number of samples taken prior to the initiation of CAD activities. However, all of the values fell within the range of measurements obtained at this location during the post-dredging phase, when conditions were equivalent to pre-dredging conditions.

6.3.1.3 Post-Dredging Levels

The post-dredging monitoring was primarily conducted to evaluate whether the CDF might act as a source following the completion of the Pilot Study. Post-dredging monitoring was also conducted at the BG site in an effort to gather additional data on releases not directly associated with dredging and disposal activities.

The post-dredging monitoring also demonstrated a wide range of results. For some stations, a range greater than an order of magnitude was observed. For each station, the post-dredging mean value exceeded the mean values for the pre-dredging and dredging phases. Based on the meteorological conditions, these concentrations do not appear to be correlated to CDF or CAD areas, but to daily climatic conditions and larger-scale temporal variabilities.

6.3.2 Decision Criteria and Regulatory Limits (PCB)

The Decision Criteria value as an average daily PCB concentration, during the 3-month duration of the dredging and disposal activities was 0.064 $\mu g/m^3$, or 64 ng/m^3. The Criteria for a 1-day maximum value was 10 $\mu g/m^3$. These numbers were developed to indicate when conditions might have posed a potential risk above the existing conditions. A review of the results indicates that at no time were either of these values exceeded or even approached. In fact, the highest individual PCB measurement was a factor of 3 below the 3-month average daily value. Additionally, the location of the measurement (at the BG site), and the meteorological conditions during the sampling day (4/26/89) would suggest that this measurement was not at all associated with any component of the Pilot Study.

In summary, given the results of the monitoring, the Decision Criteria were never approached and therefore no corrective action was required. Had the running average value exceeded the criteria or the 1-day value control measures would have been required to lower the releases. These measures could have included increasing the water depth within the CDF, halting or modifying dredging activities, or placing additional clean cap material within the CDF.

The results were also compared against the proposed Commonwealth of Massachusetts PCB standards, which include a Threshold Effects Exposure Limit (TEL) and an Allowable Ambient Limit (AAL). These standards were developed by the Massachusetts Department of Environmental

Protection (DEP), Office of Research and Standards (ORS). The proposed standards are intended to be used together to protect public health, using the TEL for short-term exposures of 24 hours and the AAL for lifetime exposures to average annual concentrations.

Approximately 63 percent of the PCB samples collected during the pilot study exceeded the proposed TEL. Samples that exceeded the TEL were collected from all phases of the program, including pre-and post-dredging, indicating that PCB levels under existing conditions were generally above the proposed level. It is important to note that the TEL was developed in response to air contaminant releases from *single* sources and not as an assessment of general air quality conditions, particularly in industrial areas, where ambient air quality is affected by multiple sources. A numerical comparison of the data was not conducted against the proposed AAL value of 0.5 ng/m^3. This proposed value is a factor of 20 below the assumed background levels in New Bedford and above most of the measurements made in the New Bedford area to date. In addition, results of ambient PCB monitoring conducted off George's Bank and in Vineyard Sound reported in the GCA air study were well above these levels. The average levels reported in the GCA study for these two locations were 0.97 ng/m^3 and 4.6 ng/m^3, respectively. Based on the remote location of the measurements and the general PCB levels in urban areas similar to New Bedford, this proposed standard would not appear to be enforceable in the New Bedford area at this time.

6.3.3 Meteorological Influences (PCB)

In reviewing the effect that wind conditions had on PCB levels and the distribution of concentrations in the network, no specific pattern was found. Sites were equally impacted from all wind quadrants, and under all wind speeds. Although Figure 6-4 illustrates that the majority of concentrations are associated with winds from the south-southwest and the northwest, this relationship is a function of the predominant wind directions and not a correlation between wind direction and PCB concentrations. This implies that there is not a single source having a major impact on the network, in this case the CDF. Since the sampling sites, including the Background site, seem to be impacted proportionately, this also implies that the major influence of PCB levels was not one particular source but a more wide-spread ambient condition.

In a further examination of the wind data, it was found that the higher PCB concentrations occurred on days of low wind speed and high standard deviation of wind direction (sigma theta). These types of conditions demonstrate a wind direction scenario that has no dominant direction

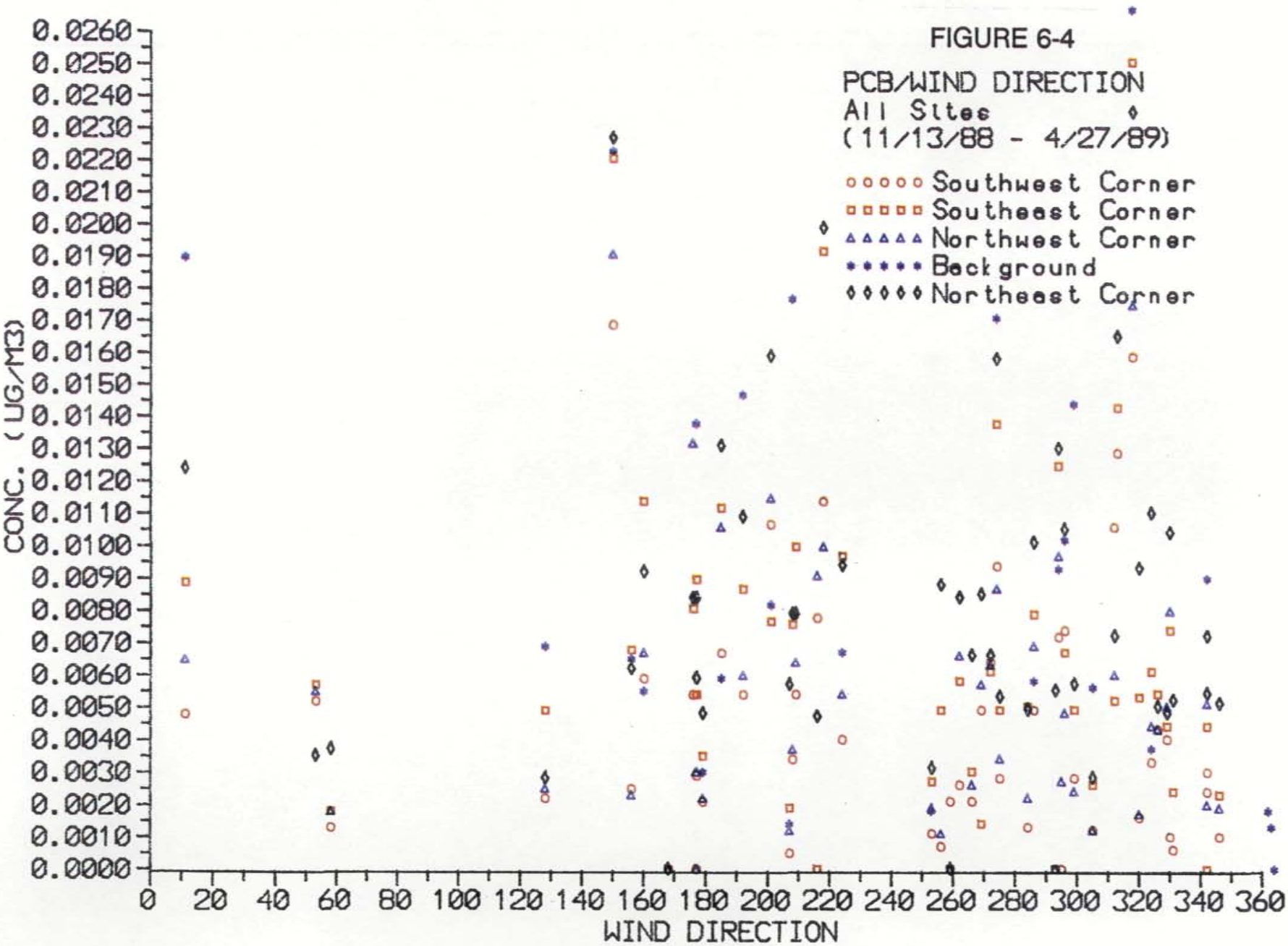


FIGURE 6-4
PCB/WIND DIRECTION
All Sites
(11/13/88 - 4/27/89)
Southwest Corner
Southeast Corner
Northwest Corner
Background
Northeast Corner
CONC. (UG/M3)
0.0260
0.0250
0.0240
0.0230
0.0220
0.0210
0.0200
0.0190
0.0180
0.0170
0.0160
0.0150
0.0140
0.0130
0.0120
0.0110
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360
WIND DIRECTION

influencing contaminant transport, since wind speeds are too light. Since a large percentage of elevated PCB concentrations occurred on sample days meeting this scenario, it can be assumed that the sampling sites are impacted by the volatilization of PCBs off the mudflats, the water in the estuary, and the CDF. These PCB concentrations are continuously rising off these sources (relative to temperature and solar radiation variation). On a day of high wind speeds, they are diluted and dispersed by the wind. On days of low wind speeds, they tend to disperse in a vapor over the ground. Figure 6-5 is a scatter graph developed to demonstrate the correlation between PCB concentrations and wind speed.

This scenario also explains the observation that the sampling sites on the western end of the CDF were typically lower than the sampling sites on the eastern end and the background site. As described in Section 2.0, the NW and SW Corner sites were sited at a location higher and farther away from the water/mudflat areas and the CDF than the other sites. So, this elevation in the sampling sites, as well as the extended distance from the source, allowed for a dissipation of PCB levels before reaching the samplers. Therefore, even though the western sites increased proportionately to the other sites, they did not increase to the same magnitude because they were not impacted as directly as the other sites.

The meteorological data collected during the pilot study is summarized in Table C-12 of Appendix C. The wind data is further interpreted in a series of wind roses and wind frequency distribution tables found in Appendix G of Volume II. The wind roses are based on 24-hour averages correlating to the sampling periods (0900 - 0900). Essentially, wind roses graphically display the predominant wind directions and wind speed conditions over the sampling period. Wind frequency distribution tables list the variability in wind speed over the sampling period.

6.4 CONCLUSIONS

6.4.1 Metals Levels

In summary, the following conclusions can be drawn from the review of the heavy metals data.

- Though all three metals were indicated detected throughout the pilot study, only lead was measured at levels substantially higher than the detection limit.

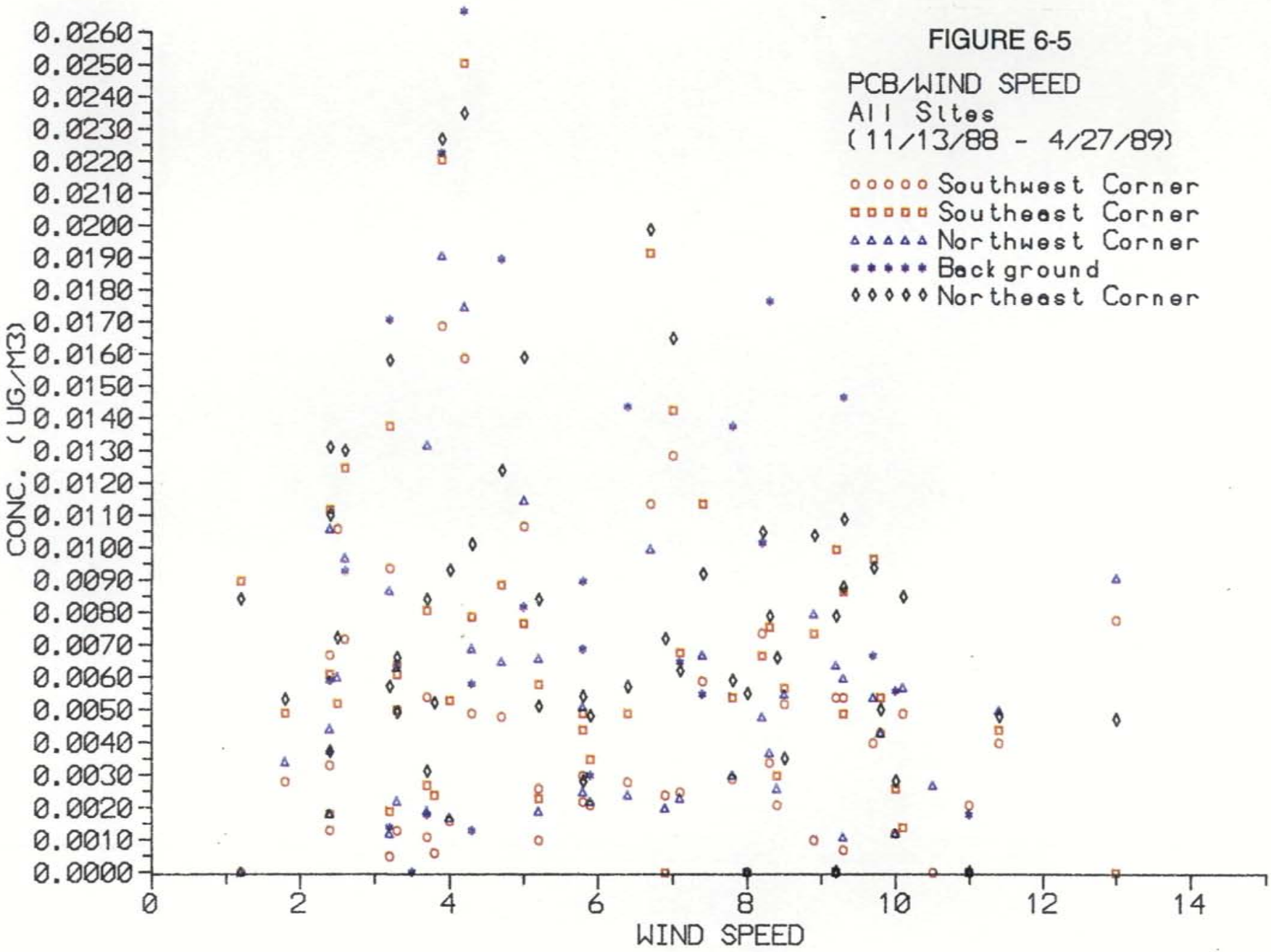


FIGURE 6-5
PCB/WIND SPEED
All Sites
(11/13/88 - 4/27/89)
Southwest Corner
Southeast Corner
Northwest Corner
Background
Northeast Corner
CONC. (UG/M3)
0.0260
0.0250
0.0240
0.0230
0.0220
0.0210
0.0200
0.0190
0.0180
0.0170
0.0160
0.0150
0.0140
0.0130
0.0120
0.0110
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
0
2
4
6
8
10
12
14
WIND SPEED

Chromium levels were low throughout the study. Cadmium was essentially undetected.

- The data validation process has qualified a large portion of the cadmium and chromium results because of their low levels in comparison to the results of lab and field blank analysis. Lead was measured at much higher levels, and was not subjected to the same problems observed with the other parameters.

- Concentrations remained consistent throughout the monitoring program. There was essentially no change based on meteorological or pilot study variations. In many cases elevated levels in metals data coincided with similar conditions measured with the PCB data.

- The single notable meteorological influence over the database was that essentially all data was collected under winds that came from the south-southwest to the north-northwest.

- In comparing the data collected during this study to that collected previously in the New Bedford area and other urban locations, it has been found that the data is similar but somewhat lower than typical urban conditions.

In considering the aforementioned conclusions, it appears that the metals data are similar to background condition in the New Bedford area and were not influenced by the pilot study. Maximum concentrations indicated were most likely influenced by anomalies in the large-scale sampling area (New Bedford) rather than by events in the immediate vicinity (the pilot study area).

6.4.2 PCB Levels

In summary, the following conclusions can be drawn from the review of the PCB data.

- Though the laboratory indicated that the data collected during the pre-dredging phase of the pilot study was non-detectable, evidence was found during the data validation process that specific chromatographic patterns

were observed, suggesting that certain components of aroclors did, in fact, exist during this period.

- The results of the measurement indicated that three aroclors were measured during the monitoring program: aroclor 1016, 1242, and 1254. It was concluded during the data validation process that the reporting of aroclors 1016 and 1242 was a laboratory-specific interpretation based on the similarity of the chromatographic patterns.

- Aroclor 1016/1242 was the predominant PCB constituent during all phases of the pilot study.

- All site concentrations increased and decreased proportionately. When levels were elevated, they were elevated at all sites.

- The sites located on the western end of the CDF tended to be lower than the sites located at the eastern end, and all of the CDF sites were in general lower than the site located adjacent to the north side of the Pilot Study cove.

- PCB concentrations between the dredging and post-dredging phases of the study remained consistent, with high peaks occurring during the post-dredging phase, suggesting little effect of the dredging activities over the PCB levels.

- Cold temperatures and an ice layer over the CDF may have limited PCB volatilization during the dredging phases of the study.

- The single notable meteorological influence over the database is that most elevated levels of PCB occurred during low wind speed and high sigma-theta wind conditions, suggesting localized impacts that may be driven by the existing level of contamination and the meteorological conditions.

In considering the aforementioned conclusions, it appears that the sites were impacted by the volatilization of PCB from the mudflats and the water in the area surrounding the Pilot Study.

Although the dredging activities appeared to cause increased releases during the dredging phase, the effect the climatic changes had on the post-dredging phase precluded the quantification of these releases. In addition, the layer of ice and snow on the CDF may have acted to control the PCB releases during the dredging phase. Once into the post-dredging phase, the PCB levels were close to the background value of 10 ng/m^3 estimated in the NUS.

Although the Pilot Study did not appear to cause significant releases above background conditions, the results may be significant with respect to potential future dredging activities. However, the actual quantity of the PCB released will be a function of the sediment concentrations, meteorological conditions and operation of the CDF.

submitted to the same laboratory. However, a review of the sample chromatograms during the data validation process identified peak retention times associated with several congeners that would normally be present within the aroclor mixture. Although these samples displayed patterns which did not closely match aroclor standards, it is believed that several PCB congeners were nonetheless indicated on the samples. This finding was not novel based on the different physical/chemical properties of the various PCB congeners that comprise an aroclor mixture, as well as the weathering that may have occurred to the PCB since being released into the environment. Despite the evidence that ambient PCB levels did exist during the pre-dredging phase, strict validation protocol was followed and the samples were reported as non-detects.

6.3.1.2 Dredging Levels

During the dredging period, the mean values for the SWC and NWC sites were similar, 4.9 ng/m^3 and 4.7 ng/m^3, respectively. The NEC and SEC sites also yielded similar mean values, 8.2 ng/m^3 and 7.1 ng/m^3, respectively. Evaluating the data as mean values for the entire dredging period only provided summary trends such as the influence of dominant wind direction tended to mask out the effects of specific dredging/disposal activities or meteorological occurrences. To provide insight into whether the different activities were conducive to PCB release, the data was reviewed against the daily operations. The major trend observed while contaminated sediment was being dredged to the CDF, was that contaminant release was higher during the periods when sediment was being pumped into the CDF with the end of the dredge line above the surface of the ponded water. During this condition, the monitoring station located approximately 75 feet away (NEC), was impacted with a fine mist that soaked the filter.

During the dredging and disposal of contaminated sediment to the CAD cell (January 7, 1989 through January 15, 1989), the ambient PCB levels surrounding the CDF were similar to the levels observed when the CDF was receiving sediment. During this period, the CDF was covered by a layer of snow and ice. The ambient PCB levels measured at the station adjacent to the CAD facility (BG) appeared to rise relative to the small number of samples taken prior to the initiation of CAD activities. However, all of the values fell within the range of measurements obtained at this location during the post-dredging phase, when conditions were equivalent to pre-dredging conditions.

6.3.1.3 Post-Dredging Levels

The post-dredging monitoring was primarily conducted to evaluate whether the CDF might act as a source following the completion of the Pilot Study. Post-dredging monitoring was also conducted at the BG site in an effort to gather additional data on releases not directly associated with dredging and disposal activities.

The post-dredging monitoring also demonstrated a wide range of results. For some stations, a range greater than an order of magnitude was observed. For each station, the post-dredging mean value exceeded the mean values for the pre-dredging and dredging phases. Based on the meteorological conditions, these concentrations do not appear to be correlated to CDF or CAD areas, but to daily climatic conditions and larger-scale temporal variabilities.

6.3.2 Decision Criteria and Regulatory Limits (PCB)

The Decision Criteria value as an average daily PCB concentration, during the 3-month duration of the dredging and disposal activities was 0.064 $\mu g/m^3$, or 64 ng/m^3. The Criteria for a 1-day maximum value was 10 $\mu g/m^3$. These numbers were developed to indicate when conditions might have posed a potential risk above the existing conditions. A review of the results indicates that at no time were either of these values exceeded or even approached. In fact, the highest individual PCB measurement was a factor of 3 below the 3-month average daily value. Additionally, the location of the measurement (at the BG site), and the meteorological conditions during the sampling day (4/26/89) would suggest that this measurement was not at all associated with any component of the Pilot Study.

In summary, given the results of the monitoring, the Decision Criteria were never approached and therefore no corrective action was required. Had the running average value exceeded the criteria or the 1-day value control measures would have been required to lower the releases. These measures could have included increasing the water depth within the CDF, halting or modifying dredging activities, or placing additional clean cap material within the CDF.

The results were also compared against the proposed Commonwealth of Massachusetts PCB standards, which include a Threshold Effects Exposure Limit (TEL) and an Allowable Ambient Limit (AAL). These standards were developed by the Massachusetts Department of Environmental

Protection (DEP), Office of Research and Standards (ORS). The proposed standards are intended to be used together to protect public health, using the TEL for short-term exposures of 24 hours and the AAL for lifetime exposures to average annual concentrations.

Approximately 63 percent of the PCB samples collected during the pilot study exceeded the proposed TEL. Samples that exceeded the TEL were collected from all phases of the program, including pre-and post-dredging, indicating that PCB levels under existing conditions were generally above the proposed level. It is important to note that the TEL was developed in response to air contaminant releases from *single* sources and not as an assessment of general air quality conditions, particularly in industrial areas, where ambient air quality is affected by multiple sources. A numerical comparison of the data was not conducted against the proposed AAL value of 0.5 ng/m^3. This proposed value is a factor of 20 below the assumed background levels in New Bedford and above most of the measurements made in the New Bedford area to date. In addition, results of ambient PCB monitoring conducted off George's Bank and in Vineyard Sound reported in the GCA air study were well above these levels. The average levels reported in the GCA study for these two locations were 0.97 ng/m^3 and 4.6 ng/m^3, respectively. Based on the remote location of the measurements and the general PCB levels in urban areas similar to New Bedford, this proposed standard would not appear to be enforceable in the New Bedford area at this time.

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In a further examination of the wind data, it was found that the higher PCB concentrations occurred on days of low wind speed and high standard deviation of wind direction (sigma theta). These types of conditions demonstrate a wind direction scenario that has no dominant direction

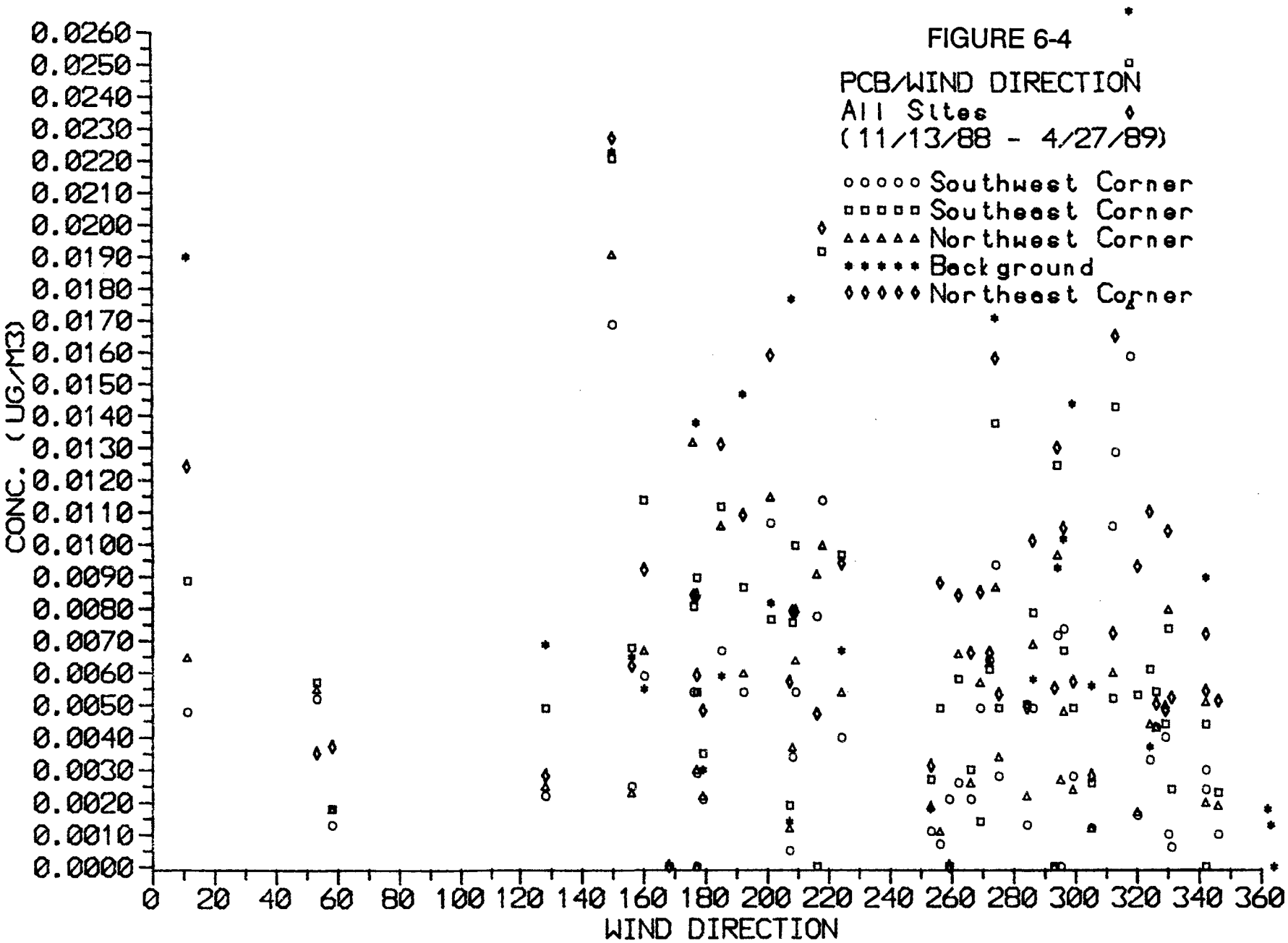
FIGURE 6-4
PCB/WIND DIRECTION
All Sites
(11/13/88 - 4/27/89)
Southwest Corner
Southeast Corner
Northwest Corner
Background
Northeast Corner
CONC. (UG/M3)
0.0260
0.0250
0.0240
0.0230
0.0220
0.0210
0.0200
0.0190
0.0180
0.0170
0.0160
0.0150
0.0140
0.0130
0.0120
0.0110
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360
WIND DIRECTION

influencing contaminant transport, since wind speeds are too light. Since a large percentage of elevated PCB concentrations occurred on sample days meeting this scenario, it can be assumed that the sampling sites are impacted by the volatilization of PCBs off the mudflats, the water in the estuary, and the CDF. These PCB concentrations are continuously rising off these sources (relative to temperature and solar radiation variation). On a day of high wind speeds, they are diluted and dispersed by the wind. On days of low wind speeds, they tend to disperse in a vapor over the ground. Figure 6-5 is a scatter graph developed to demonstrate the correlation between PCB concentrations and wind speed.

This scenario also explains the observation that the sampling sites on the western end of the CDF were typically lower than the sampling sites on the eastern end and the background site. As described in Section 2.0, the NW and SW Corner sites were sited at a location higher and farther away from the water/mudflat areas and the CDF than the other sites. So, this elevation in the sampling sites, as well as the extended distance from the source, allowed for a dissipation of PCB levels before reaching the samplers. Therefore, even though the western sites increased proportionately to the other sites, they did not increase to the same magnitude because they were not impacted as directly as the other sites.

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6.4 CONCLUSIONS

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In summary, the following conclusions can be drawn from the review of the heavy metals data.

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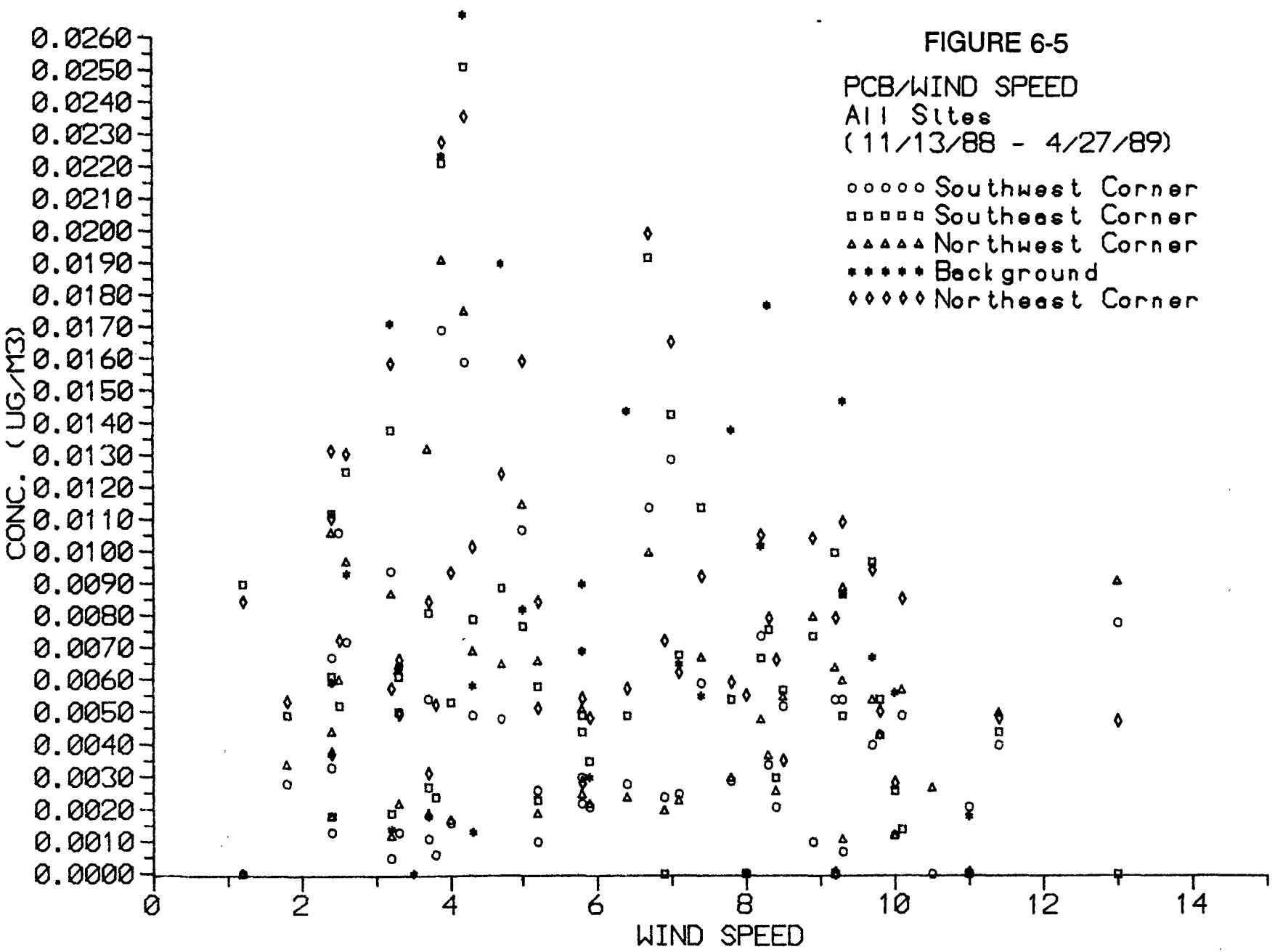
FIGURE 6-5
PCB/WIND SPEED
All Sites
(11/13/88 - 4/27/89)
Southwest Corner
Southeast Corner
Northwest Corner
Background
Northeast Corner
CONC. (UG/M3)
0.0260
0.0250
0.0240
0.0230
0.0220
0.0210
0.0200
0.0190
0.0180
0.0170
0.0160
0.0150
0.0140
0.0130
0.0120
0.0110
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
0
2
4
6
8
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12
14
WIND SPEED

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- The single notable meteorological influence over the database was that essentially all data was collected under winds that came from the south-southwest to the north-northwest.

- In comparing the data collected during this study to that collected previously in the New Bedford area and other urban locations, it has been found that the data is similar but somewhat lower than typical urban conditions.

In considering the aforementioned conclusions, it appears that the metals data are similar to background condition in the New Bedford area and were not influenced by the pilot study. Maximum concentrations indicated were most likely influenced by anomalies in the large-scale sampling area (New Bedford) rather than by events in the immediate vicinity (the pilot study area).

6.4.2 PCB Levels

In summary, the following conclusions can be drawn from the review of the PCB data.

- Though the laboratory indicated that the data collected during the pre-dredging phase of the pilot study was non-detectable, evidence was found during the data validation process that specific chromatographic patterns

were observed, suggesting that certain components of aroclors did, in fact, exist during this period.

- The results of the measurement indicated that three aroclors were measured during the monitoring program: aroclor 1016, 1242, and 1254. It was concluded during the data validation process that the reporting of aroclors 1016 and 1242 was a laboratory-specific interpretation based on the similarity of the chromatographic patterns.

- Aroclor 1016/1242 was the predominant PCB constituent during all phases of the pilot study.

- All site concentrations increased and decreased proportionately. When levels were elevated, they were elevated at all sites.

- The sites located on the western end of the CDF tended to be lower than the sites located at the eastern end, and all of the CDF sites were in general lower than the site located adjacent to the north side of the Pilot Study cove.

- PCB concentrations between the dredging and post-dredging phases of the study remained consistent, with high peaks occurring during the post-dredging phase, suggesting little effect of the dredging activities over the PCB levels.

- Cold temperatures and an ice layer over the CDF may have limited PCB volatilization during the dredging phases of the study.

- The single notable meteorological influence over the database is that most elevated levels of PCB occurred during low wind speed and high sigma-theta wind conditions, suggesting localized impacts that may be driven by the existing level of contamination and the meteorological conditions.

In considering the aforementioned conclusions, it appears that the sites were impacted by the volatilization of PCB from the mudflats and the water in the area surrounding the Pilot Study.

Although the dredging activities appeared to cause increased releases during the dredging phase, the effect the climatic changes had on the post-dredging phase precluded the quantification of these releases. In addition, the layer of ice and snow on the CDF may have acted to control the PCB releases during the dredging phase. Once into the post-dredging phase, the PCB levels were close to the background value of 10 ng/m^3 estimated in the NUS.

Although the Pilot Study did not appear to cause significant releases above background conditions, the results may be significant with respect to potential future dredging activities. However, the actual quantity of the PCB released will be a function of the sediment concentrations, meteorological conditions and operation of the CDF.

7

7.0 RECOMMENDATIONS

This section of the report presents recommendations for air monitoring support that may be required in support of future dredging and disposal activities at the new Bedford Harbor site. The recommendations are directed toward sediment disposal in shoreline disposal facilities similar to the CDF used during the Pilot Study. This is based on the subaqueous nature of hydraulic dredging and the volatile PCB releases measured during the disposal of sediment within the CDF. Included are recommendations for potential engineering control measures to minimize PCB release and a brief description of an ambient air quality monitoring program that could be used to support sediment disposal operations.

Although the results of the air program demonstrated that the Pilot Study activities did not cause ambient PCB levels to rise above existing background levels found in New Bedford, the results did indicated that the disposal of contaminated sediment in a shoreline disposal facility did promote airborne PCB releases. The quantity of, or potential for PCB release is a function of sediment PCB concentration, the size of the disposal facility and the operating procedures used during sediment disposal and dewatering activities. These operating procedures include the pumping rate and suspended solids concentration of the incoming dredge material slurry, the ponded water depth within the disposal facility, the climatic conditions during disposal, the type and thickness of capping material placed over the contaminated sediment and any engineering controls employed to minimize the releases.

The degree to which engineering controls would be necessary is a function of the contaminant release potential and whether the sediment will be subsequently removed from the disposal facility for treatment. Potential engineering controls range from maintaining a foam or geomembrane blanket on the disposal area's water surface to the construction of structures over the disposal area. In general, sediment with PCB levels similar to the Pilot Study (< 200 ppm PCB) may require no engineering controls, however, the degree of control necessary for shoreline disposal of sediment with higher PCB levels should be established through further bench-scale testing.

Shoreline disposal of New Bedford Harbor sediment should be supported by an ambient air quality monitoring program. The program should be targeted for PCBs and may include some VOC and H_2S monitoring. Based on the Pilot Study results, ambient monitoring for heavy metals would not be necessary. Additionally, all monitoring should be supported by an on-site meteorological

program to assist in the evaluation of the data gathered. In choosing an analytical chemistry program, consideration should be given to whether the PCBs should be quantified by homologue groups (i.e., by number of chlorines), instead of by aroclors.

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APPENDIX A

APPENDIX A

QUALITY ASSURANCE

TABLE A-1

PCB Precision Summary ($\mu g/m^3$)

Run Date	SOUTHWEST CORNER Sample No.	Conc. 1016 $\mu g/m^3$	Conc. 1242 $\mu g/m^3$	Conc. 1254 $\mu g/m^3$	Conc. Total $\mu g/m^3$	SOUTHWEST CORNER (Collocated) Sample No.	Conc. 1016 $\mu g/m^3$	Conc. 1242 $\mu g/m^3$	Conc. 1254 $\mu g/m^3$	Total $\mu g/m^3$	1016 Diff. $\mu g/m^3$	1242 Diff. $\mu g/m^3$	1254 Diff. $\mu g/m^3$	Total $\mu g/m^3$
11/7-8	101	ND	ND	ND	ND	102	ND	ND	ND	ND	0.0000	0.0000	0.0000	0.0000
11/8-9	103	ND	ND	ND	ND	104	ND	ND	ND	ND	0.0000	0.0000	0.0000	0.0000
11/9-10	105	ND	ND	ND	ND	106	ND	ND	ND	ND	0.0000	0.0000	0.0000	0.0000
11/10-11	107	ND	ND	ND	ND	108	ND	ND	ND	ND	0.0000	0.0000	0.0000	0.0000
11/11-12	109	ND	ND	ND	ND	110	ND	ND	ND	ND	0.0000	0.0000	0.0000	0.0000
11/12-13	111	ND	ND	ND	ND	112	ND	ND	ND	ND	0.0000	0.0000	0.0000	0.0000
11/13-14	113	ND	ND	ND	ND	114	ND	ND	ND	ND	0.0000	0.0000	0.0000	0.0000
11/14-15	115	ND	ND	ND	ND	116	ND	ND	ND	ND	0.0000	0.0000	0.0000	0.0000
11/15-16	117	ND	ND	ND	ND	118	ND	ND	ND	ND	0.0000	0.0000	0.0000	0.0000
11/16-17	119	ND	ND	ND	ND	120	ND	ND	ND	ND	0.0000	0.0000	0.0000	0.0000
11/17-18	121	ND	ND	ND	ND	122	ND	ND	ND	ND	0.0000	0.0000	0.0000	0.0000
11/18-19	123	0.0013	ND	ND	0.0013	124	0.0008	ND	ND	0.0008	-0.0005	0.0000	0.0000	-0.0005
11/19-20	125	0.0043	ND	ND	0.0043	126	0.0038	ND	ND	0.0038	0.0000	0.0000	0.0000	0.0000
11/21-22	127	0.0006	ND	ND	0.0006	128	0.0009	ND	ND	0.0009	0.0003	0.0000	0.0000	0.0003
11/22-23	129	0.0129	ND	ND	0.0129	130	0.0124	ND	ND	0.0124	-0.0005	0.0000	0.0000	-0.0005
11/23-24	131	0.0043	ND	ND	0.0043	132	0.0036	ND	ND	0.0036	-0.0007	0.0000	0.0000	-0.0007
11/25-26	133	ND	ND	ND	ND	134	ND	ND	ND	ND	0.0000	0.0000	0.0000	0.0000
11/26-27	135	0.0230	ND	ND	0.0230	136	0.0229	ND	ND	0.0029	-0.0001	0.0000	0.0000	-0.0201
11/27-28	137	0.0021	ND	ND	0.0021	138	0.0029	ND	ND	0.0029	0.0008	0.0000	0.0000	0.0008
11/28-29	139	ND	ND	0.0004	0.0004	140	ND	ND	0.0011	0.0011	0.0000	0.0000	0.0007	0.0007
11/29-30	141	ND	0.0114	ND	0.0114	142	ND	0.0114	ND	0.0014	0.0000	0.0000	0.0000	-0.0100
12/1-2	143	ND	0.0021	ND	0.0021	144	ND	0.0017	ND	0.0017	0.0000	-0.0004	0.0000	-0.0004
12/2-3	145	ND	0.0007	ND	0.0007	146	ND	0.0009	ND	0.0009	0.0000	0.0002	0.0000	0.0002
12/3-4	147	VOID	VOID	VOID	VOID	148	ND	0.0016	ND	0.0016	0.0000	0.0000	0.0000	0.0000
12/4-5	149	ND	0.0016	ND	0.0016	150	ND	0.0004	ND	0.0004	0.0000	-0.0012	0.0000	-0.0012
12/5-6	151	ND	0.0052	0.0002	0.0054	152	ND	0.0047	0.0003	0.0050	0.0000	-0.0005	0.0001	-0.0004
12/6-7	153	ND	0.0023	0.0003	0.0026	154	ND	0.0017	0.0011	0.0028	0.0000	-0.0006	0.0008	0.0002
12/9-10	155	ND	0.0083	ND	0.0087	156	ND	0.0096	0.0004	0.0100	0.0000	0.0013	0.0000	0.0013
12/10-11	157	ND	0.0054	ND	0.0050	158	ND	0.0071	ND	0.0071	0.0000	0.0021	0.0000	0.0021
12/11-12	159	ND	0.0010	ND	0.0010	160	ND	0.0009	ND	0.0009	0.0000	-0.0001	0.0000	-0.0001
12/12-13	161	ND	0.0050	0.0002	0.0052	162	ND	0.0058	0.0002	0.0060	0.0000	0.0008	0.0000	0.0008
12/13-14	163	ND	0.0064	ND	0.0064	164	ND	0.0062	ND	0.0062	0.0000	-0.0002	0.0000	-0.0002
12/16-17	165	0.0010	ND	ND	0.0010	166	0.0014	ND	ND	0.0014	0.0004	0.0000	0.0000	0.0004
12/17-18	167	0.0013	ND	ND	0.0013	168	0.0012	ND	ND	0.0012	-0.0001	0.0000	0.0000	-0.0001
12/18-19	169	0.0049	ND	0.0005	0.0054	170	0.0047	ND	0.0004	0.0051	-0.0002	0.0000	-0.0050	-0.0003
12/19-20	171	0.0064	ND	0.0014	0.0078	172	0.0082	ND	0.0010	0.0092	0.0018	0.0000	-0.0068	0.0014
12/21-22	173	0.0024	ND	ND	0.0024	174	0.0012	ND	ND	0.0012	-0.0012	0.0000	0.0000	-0.0012
12/27-28	175	0.0021	ND	ND	0.0021	176	ND	ND	ND	ND	0.0000	0.0000	0.0000	0.0000

TABLE A-1 (cont'd)

Run Date	SOUTHWEST CORNER Sample No.	Conc. 1016 µg/m³	Conc. 1242 µg/m³	Conc. 1254 µg/m³	Conc. Total µg/m³	SOUTHWEST CORNER (Collocated) Sample No.	Conc. 1016 µg/m³	Conc. 1242 µg/m³	Conc. 1254 µg/m³	Total µg/m³	1016 Diff. µg/m³	1242 Diff. µg/m³	1254 Diff. µg/m³	Diff. Total µg/m³
1/7-8	177	0.0039	ND	0.0001	0.0040	178	0.0036	ND	0.0010	0.0046	-0.0003	0.0000	-0.0030	0.0006
1/8-9	179	0.0025	ND	0.0003	0.0028	180	0.0025	ND	0.0005	0.003	0.0000	0.0000	-0.0023	0.0002
1/9-10	181	0.0005	ND	ND	0.0005	182	0.0005	ND	ND	0.0005	0.0000	0.0000	0.0000	0.0000
1/10-11	183	0.0030	ND	ND	0.0030	184	0.0030	ND	ND	0.003	0.0000	0.0000	0.0000	0.0000
1/11-12	185	0.0092	ND	0.0015	0.0107	186	0.0092	ND	0.0009	0.0101	0.0000	0.0000	-0.0098	-0.0006
1/12-13	187	0.0065	ND	ND	0.0065	188	0.0062	ND	ND	0.0062	-0.0003	0.0000	0.0000	-0.0003
1/18-19	189	0.0094	ND	ND	0.0094	190	0.0077	ND	ND	0.0077	-0.0017	0.0000	0.0000	-0.0017
1/19-20	191	0.0042	ND	0.0007	0.0049	192	0.0048	ND	0.0012	0.0060	0.0006	0.0000	-0.0037	0.0011
1/20-21	193	0.0012	ND	ND	0.0012	194	0.0013	ND	ND	0.0013	0.0001	0.0000	0.0000	0.0001
4/3-4	195	0.0049	ND	0.0006	0.0055	196	0.0036	ND	0.0004	0.0040	-0.0013	0.0000	-0.0051	-0.0015
4/4-5	197	0.0026	ND	0.0003	0.0029	198	0.0028	ND	0.0003	0.0031	0.0002	0.0000	-0.0026	0.0002
4/5-6	199	0.0034	ND	ND	0.0034	1100	0.0028	ND	ND	0.0028	-0.0006	0.0000	0.0000	-0.0006
4/6-7	1101	0.0025	ND	0.0003	0.0028	1102	0.0026	ND	0.0003	0.0029	0.0001	0.0000	-0.0025	0.0001
4/10-11	1103	0.0011	ND	ND	0.0011	1104	0.0013	ND	0.0002	0.0015	0.0002	0.0000	-0.0009	0.0004
4/11-12	1105	0.0019	ND	0.0002	0.0021	1106	0.0017	ND	ND	0.0017	-0.0002	0.0000	0.0000	-0.0004
4/12-13	1107	0.0022	ND	ND	0.0022	1108	0.0024	ND	ND	0.0024	0.0002	0.0000	0.0000	0.0002
4/13-14	1109	0.0023	ND	0.0002	0.0025	1110	0.0030	ND	0.0003	0.0033	0.0007	0.0000	-0.0022	0.0008
4/17-18	1111	0.0037	ND	0.0011	0.0048	1112	0.0037	ND	0.0011	0.0048	0.0000	0.0000	-0.0037	0.0000
4/18-19	1113	0.0061	ND	0.0011	0.0072	1114	0.0041	ND	0.0011	0.0052	-0.0020	0.0000	-0.0061	-0.0020
4/19-20	1115	0.0038	ND	0.0011	0.0049	1116	0.0079	ND	0.0010	0.0089	0.0041	0.0000	-0.0039	0.0040
4/20-21	1117	0.0052	ND	0.0015	0.0067	1118	0.0058	ND	0.0017	0.0075	0.0006	0.0000	-0.0050	0.0008
4/24-25	1119	0.0024	ND	0.0009	0.0033	1120	0.0026	ND	0.0011	0.0037	0.0002	0.0000	-0.0022	0.0004
4/25-26	1121	0.0137	ND	0.0032	0.0169	1122	0.0180	ND	0.0038	0.0218	0.0043	0.0000	-0.0131	0.0049
4/26-27	1123	0.0130	ND	0.0029	0.0159	1124	0.0152	ND	0.0034	0.0186	0.0022	0.0000	-0.0125	0.0027
4/27-28	1125	0.0043	ND	0.0016	0.0059	1126	0.0046	ND	0.0017	0.0063	0.0003	0.0000	-0.0042	0.0004
											---	---	---	---
										AVERAGE	0.0001	0.0000	-0.0015	-0.0003
										STND. DEVIATION	0.0009	0.0004	0.0029	0.0030

TABLE A-2

Heavy Metals Precision Summary ($\mu g/m^3$)

	PRIMARY				COLLOCATED						
Sample Date	Sample No.	Pb $\mu g/m^3$	Cd $\mu g/m^3$	Cr $\mu g/m^3$	Sample No.	Pb $\mu g/m^3$	Cd $\mu g/m^3$	Cr $\mu g/m^3$	Pb Diff. $\mu g/m^3$	Cd Diff. $\mu g/m^3$	Cr Diff. $\mu g/m^3$
11/7-8	101	0.0072	0.0003	0.0012	201	0.0092	0.0003	0.0008	0.0020	0.0000	-0.0004
11/8-9	102	0.0112	0.0004	0.0013	202	0.0167	0.0003	0.0009	0.0055	-0.0001	-0.0005
11/9-10	103	0.0286	0.0004	0.0018	203	0.0288	0.0004	0.0015	0.0002	0.0000	-0.0003
11/10-11	104	0.0136	0.0003	0.0011	204	0.0118	0.0003	0.0012	-0.0018	0.0000	0.0001
11/11-12	105	0.0065	0.0003	ND	205	0.0097	0.0003	0.0010	0.0032	0.0000	0.0009
11/12-13	106	0.0131	0.0003	0.0011	206	0.0111	0.0003	0.0005	-0.0020	0.0000	-0.0006
11/13-14	107	0.0051	0.0003	0.0005	207	0.0054	0.0003	0.0010	0.0003	0.0000	0.0005
11/14-15	108	0.0096	0.0003	0.0014	208	0.0093	0.0003	0.0015	-0.0003	0.0000	0.0001
11/15-16	109	0.0205	0.0007	0.0026	209	0.0276	0.0004	0.0016	0.0071	-0.0003	-0.0010
11/16-17	110	0.0035	0.0003	0.0011	210	0.0042	0.0003	0.0021	0.0007	0.0000	0.0010
11/17-18	111	0.0199	0.0005	0.0014	211	0.0234	0.0003	0.0005	0.0035	-0.0002	-0.0009
11/18-19	112	0.0091	0.0003	0.0005	212	0.0093	0.0005	0.0009	0.0002	0.0002	0.0004
11/19-20	113	0.0082	ND	0.0005	213	0.0074	0.0003	0.0009	-0.0008	0.0003	0.0004
11/21-22	114	0.0063	0.0004	0.0010	214	0.0054	0.0004	0.0006	-0.0009	0.0000	-0.0004
11/22-23	115	0.0273	0.0006	0.0014	215	0.0269	0.0004	0.0021	-0.0004	-0.0002	0.0007
11/23-24	116	0.0176	0.0004	0.0005	216	0.0197	0.0004	0.0005	0.0021	0.0000	0.0000
11/25-26	117	0.0464	0.0013	0.0006	217	0.0535	0.0013	0.0006	0.0071	0.0000	0.0000
11/26-27	118	0.0474	0.0003	0.0005	218	0.0502	0.0010	0.0008	0.0028	0.0007	0.0003
11/27-28	119	0.0052	ND	0.0007	219	0.0071	0.0003	0.0007	0.0019	0.0003	0.0000
11/28-29	120	0.0058*	ND*	0.0042*	220	0.0042*	ND*	0.0044*	-0.0016	0.0000	0.0002
11/29-30	121	0.0294*	0.0004*	0.0050*	221	0.0320*	0.0004*	0.0042*	0.0026	0.0000	-0.0008
12/1-2	122	0.0166*	ND*	0.0042*	222	0.0172*	ND*	0.0060*	0.0006	0.0000	0.0018
12/2-3	123	0.0154*	ND*	0.0038*	223	0.0158*	ND*	0.0030*	0.0004	0.0000	-0.0008
12/3-4	124	0.0288*	0.0004*	0.0040*	224	0.0260*	ND*	0.0116*	-0.0028	-0.0004	0.0076
12/4-5	125	0.0126*	ND*	0.0040*	225	0.0100*	ND*	0.0052*	-0.0026	0.0000	0.0012
12/5-6	126	0.0222*	0.0004*	0.0086*	226	0.0240*	0.0004*	0.0068*	0.0018	0.0000	-0.0018
12/6-7	127	0.0108*	ND*	0.0014*	227	0.0206*	0.0004*	0.0020*	0.0098	0.0004	0.0006
12/9-10	128	0.0208*	ND*	0.0036*	228	0.0166*	ND*	0.0032*	-0.0042	0.0000	-0.0004
12/10-11	129	0.0110*	ND*	0.0014*	229	0.0170*	0.0004*	0.0022*	0.0060	0.0004	0.0008
12/11-12	130	0.0102*	ND*	0.0012*	230	0.0106*	ND*	0.0012*	0.0004	0.0000	0.0000
12/12-13	131	0.0276*	ND*	0.0036*	231	0.0242*	0.0004*	0.0038*	-0.0034	0.0004	0.0002
12/13-14	132	0.0066*	ND*	0.0052*	232	0.0048*	ND*	0.0048*	-0.0018	0.0000	-0.0004
12/16-17	133	0.0137*	ND*	0.0018*	233	0.0116*	ND*	0.0018*	-0.0021	0.0000	0.0000
12/17-18	134	0.0152*	ND*	0.0012*	234	0.0124*	ND*	0.0014*	-0.0028	0.0000	0.0002
12/18-19	135	0.0303*	ND*	0.0024*	235	0.0252*	ND*	0.0024*	-0.0051	0.0000	0.0000
12/19-20	136	0.0129*	ND*	0.0014*	236	0.0114*	ND*	0.0018*	-0.0015	0.0000	0.0004
12/21-22	137	sample contaminated by lab			237	sample contaminated by lab					
12/27-28	138	sample contaminated by lab			238	sample contaminated by lab					

TABLE A-2 (cont'd)

	PRIMARY				COLLOCATED						
Sample Date	Sample No.	Pb $\mu g/m^3$	Cd $\mu g/m^3$	Cr $\mu g/m^3$	Sample No.	Pb $\mu g/m^3$	Cd $\mu g/m^3$	Cr $\mu g/m^3$	Pb Diff. $\mu g/m^3$	Cd Diff. $\mu g/m^3$	Cr Diff. $\mu g/m^3$
1/7-8	139	0.0086*	ND*	0.0034*	239	0.0070*	ND*	0.0004*	-0.0016	0.0000	-0.0030
1/8-9	140	0.0142*	ND*	0.0016*	240	0.0142*	ND*	0.0008*	0.0000	0.0000	-0.0008
1/9-10	141	0.0156*	ND*	0.0018*	241	0.0106*	ND*	0.0018*	-0.0050	0.0000	0.0000
1/10-11	142	0.0222*	ND*	0.0016*	242	0.0222*	ND*	0.0018*	0.0000	0.0000	0.0002
1/11-12	143	0.0106*	ND*	0.0012*	243	0.0168*	0.0004*	0.0008*	0.0062	0.0004	-0.0004
1/12-13	144	0.0052	ND	ND	244	0.0041	0.0002	0.0002	-0.0011	0.0002	0.0002
1/18-19	145	0.0085	ND	0.0013	245	0.0058	0.0002	0.0010	-0.0027	0.0002	-0.0003
1/19-20	146	0.0069	ND	ND	246	0.0086	0.0002	0.0007	0.0017	0.0002	0.0007
1/20-21	147	0.0154	ND	0.0012	247	0.0091	0.0004	0.0012	-0.0063	0.0004	0.0000
4/3-4	148Q	0.0040*	ND*	0.0010*	248Q	0.0064*	0.0006*	0.0014*	0.0024	0.0006	0.0004
4/4-5	149Q	0.0030*	ND*	0.0008*	249G	0.0040*	0.0006*	0.0016*	0.0010	0.0006	0.0008
4/5-6	150G	0.0062*	ND*	0.0020*	250G	0.0086*	0.0006*	0.0036*	0.0024	0.0006	0.0016
4/6-7	151Q	0.0048*	ND*	0.0014*	251G	0.0092*	0.0006*	0.0034*	0.0044	0.0006	0.0020
4/10-11	152Q	0.0084*	0.0006*	0.0006*	252Q	0.0074*	0.0012*	0.0006*	-0.0010	0.0006	0.0000
4/11-12	153Q	0.0156*	0.0010*	0.0006*	253G	0.0214*	0.0006*	0.0020*	0.0058	-0.0004	0.0014
4/12-13	154Q	0.0150*	0.0006*	0.0064*	254Q	0.0202*	0.0014*	0.0010*	0.0052	0.0008	-0.0054
4/13-14	155Q	0.0048*	0.0004*	0.0026*	255G	0.0054*	0.0006*	0.0014*	0.0006	0.0002	-0.0012
4/17-18	156Q	0.0059	0.0003	0.0009	256Q	0.0038	0.0002	0.0005	-0.0021	-0.0001	-0.0004
4/18-19	157Q	0.0084	0.0003	0.0006	257G	0.0066	0.0002	0.0009	-0.0018	-0.0001	0.0003
4/19-20	158G	0.0163	0.0007	0.0025	258G	0.0044	0.0002	0.0010	-0.0119	-0.0005	-0.0015
4/20-21	159Q	0.0247	0.0007	0.0018	259G	0.0076	0.0002	0.0010	-0.0171	-0.0005	-0.0008
4/24-25	160Q	0.0271	0.0007	0.0034	260Q	0.0067	ND	0.0008	-0.0204	-0.0007	-0.0026
4/25-26	161Q	0.0097	0.0003	0.0011	261G	0.0061	ND	ND	-0.0036	-0.0003	-0.0011
4/26-27	162Q	0.0136	0.0003	0.0007	262Q	0.0101	ND	0.0006	-0.0035	-0.0003	-0.0001
4/27-28	163Q	0.0207	0.0007	0.0026	263G	0.0044	0.0003	0.0009	-0.0163	-0.0004	-0.0017
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								AVERAGE	-0.0007	0.0001	0.0000
								STANDARD DEVIATION	0.0054	0.0003	0.0015

* Laboratory mistakenly reported half-filter weight. Weight was doubled to obtain correct concentration.

TABLE A-3

PCB Precision Summary (Percentage)

	SOUTHWEST CORNER					SOUTHWEST CORNER (Collocated)					STATISTICS			
Run Date	Sample No.	Conc. 1016 µg/m³	Conc. 1242 µg/m³	Conc. 1254 µg/m³	Conc. Total µg/m³	Sample No.	Conc. 1016 µg/m³	Conc. 1242 µg/m³	Conc. 1254 µg/m³	Conc. TOTAL µg/m³	RPD 1016	RPD 1242	RPD 1254	RPD TOTAL
11/7-8	101	ND	ND	ND	ND	102	ND	ND	ND	ND	0.00%	0.00%	0.00%	0.00%
11/8-9	103	ND	ND	ND	ND	104	ND	ND	ND	ND	0.00%	0.00%	0.00%	0.00%
11/9-10	105	ND	ND	ND	ND	106	ND	ND	ND	ND	0.00%	0.00%	0.00%	0.00%
11/10-11	107	ND	ND	ND	ND	108	ND	ND	ND	ND	0.00%	0.00%	0.00%	0.00%
11/11-12	109	ND	ND	ND	ND	110	ND	ND	ND	ND	0.00%	0.00%	0.00%	0.00%
11/12-13	111	ND	ND	ND	ND	112	ND	ND	ND	ND	0.00%	0.00%	0.00%	0.00%
11/13-14	113	ND	ND	ND	ND	114	ND	ND	ND	ND	0.00%	0.00%	0.00%	0.00%
11/14-15	115	ND	ND	ND	ND	116	ND	ND	ND	ND	0.00%	0.00%	0.00%	0.00%
11/15-16	117	ND	ND	ND	ND	118	ND	ND	ND	ND	0.00%	0.00%	0.00%	0.00%
11/16-17	119	ND	ND	ND	ND	120	ND	ND	ND	ND	0.00%	0.00%	0.00%	0.00%
11/17-18	121	ND	ND	ND	ND	122	ND	ND	ND	ND	0.00%	0.00%	0.00%	0.00%
11/18-19	123	0.0013	ND	ND	0.0013	124	0.0008	ND	ND	0.0008	-47.62%	0.00%	0.00%	-47.62%
11/19-20	125	0.0043	ND	ND	0.0043	126	0.0038	ND	ND	0.0038	-12.35%	0.00%	0.00%	-12.35%
11/21-22	127	0.0006	ND	ND	0.0006	128	0.0009	ND	ND	0.0009	40.00%	0.00%	0.00%	40.00%
11/22-23	129	0.0129	ND	ND	0.0129	130	0.0124	ND	ND	0.0124	-3.95%	0.00%	0.00%	-3.95%
11/23-24	131	0.0043	ND	ND	0.0043	132	0.0036	ND	ND	0.0036	-17.72%	0.00%	0.00%	-17.72%
11/25-26	133	ND	ND	ND	ND	134	ND	ND	ND	ND	0.00%	0.00%	0.00%	0.00%
11/26-27	135	0.0230	ND	ND	0.0230	136	0.0229	ND	ND	0.0029	-0.44%	0.00%	0.00%	-155.21%
11/27-28	137	0.00210	ND	ND	0.0021	138	0.0029	ND	ND	0.0029	32.00%	0.00%	0.00%	32.00%
11/28-29	139	ND	ND	0.0004	0.0004	140	ND	ND	0.0011	0.0011	0.00%	0.00%	93.33%	93.33%
11/29-30	141	ND	0.0114	ND	0.0114	142	ND	0.0114	ND	0.0014	0.00%	0.00%	0.00%	-156.25%
12/1-2	143	ND	0.0021	ND	0.0021	144	ND	0.0017	ND	0.0017	0.00%	-21.05%	0.00%	-21.05%
12/2-3	145	ND	0.0007	ND	0.0007	146	ND	0.0008	ND	0.0009	0.00%	13.33%	0.00%	25.00%
12/3-4	147	VOID	VOID	VOID	VOID	148	ND	0.0016	ND	0.0016	0.00%	0.00%	0.00%	0.00%
12/4-5	149	ND	0.0016	ND	0.0016	150	ND	0.0004	ND	0.0004	0.00%	-120.00%	0.00%	-120.00%
12/5-6	151	ND	0.0052	0.0002	0.0054	152	ND	0.0047	0.0003	0.0050	0.00%	-10.10%	40.00%	-7.69%
12/6-7	153	ND	0.0023	0.0003	0.0026	154	ND	0.0017	0.0011	0.0028	0.00%	-30.00%	114.29%	7.41%
12/9-10	155	ND	0.0083	0.0019	0.0087	156	ND	0.0096	ND	0.0096	0.00%	14.53%	0.00%	9.84%
12/10-11	157	ND	0.0040	ND	0.0059	158	ND	0.0072	0.0020	0.0092	0.00%	57.14%	0.00%	43.71%
12/11-12	159	ND	0.0010	ND	0.0010	160	ND	0.0009	ND	0.0009	0.00%	-10.53%	0.00%	-10.53%
12/12-13	161	ND	0.0050	0.0002	0.0052	162	ND	0.0057	0.0002	0.0059	0.00%	13.08%	0.00%	12.61%
12/13-14	163	ND	0.0064	ND	0.0064	164	ND	0.0062	ND	0.0062	0.00%	-3.17%	0.00%	-3.17%
12/16-17	165	0.0010	ND	ND	0.0010	166	0.0014	ND	ND	0.0014	33.33%	0.00%	0.00%	33.33%
12/17-18	167	0.0013	ND	ND	0.0013	168	0.0012	ND	ND	0.0012	-8.00%	0.00%	0.00%	-8.00%
12/18-19	169	0.0049	ND	0.0005	0.0054	170	0.0047	ND	0.0004	0.0051	-4.17%	0.00%	-22.22%	-5.71%
12/19-20	171	0.0064	ND	0.0014	0.0078	172	0.0082	ND	0.0010	0.0092	24.66%	0.00%	-33.33%	16.47%
12/21-22	173	0.0024	ND	ND	0.0024	174	0.0012	ND	ND	0.0012	-66.67%	0.00%	0.00%	-66.67%
12/27-28	175	0.0021	ND	ND	0.0021	176	ND	ND	ND	ND	0.00%	0.00%	0.00%	0.00%

TABLE A-3 (cont'd)

Run Date	SOUTHWEST CORNER Sample No.	Conc. 1016 µg/m³	Conc. 1242 µg/m³	Conc. 1254 µg/m³	Conc. Total µg/m³	SOUTHWEST CORNER (Collocated) Sample No.	Conc. 1016 µg/m³	Conc. 1242 µg/m³	Conc. 1254 µg/m³	Conc. TOTAL µg/m³	STATISTICS RPD 1016	RPD 1242	RPD 1254	RPD TOTAL
1/7-8	177	0.0039	ND	0.0001	0.0040	178	0.0036	ND	0.0010	0.0046	-8.00%	0.00%	163.64%	13.95%
1/8-9	179	0.0025	ND	0.0003	0.0028	180	0.0025	ND	0.0005	0.003	0.00%	0.00%	50.00%	6.90%
1/9-10	181	0.0005	ND	ND	0.0005	182	0.0005	ND	ND	0.0005	0.00%	0.00%	0.00%	0.00%
1/10-11	183	0.0030	ND	ND	0.0030	184	0.0030	ND	ND	0.003	0.00%	0.00%	0.00%	0.00%
1/11-12	185	0.0092	ND	0.0015	0.0107	186	0.0089	ND	0.0009	0.0098	-3.31%	0.00%	-50.00%	-8.78%
1/12-13	187	0.0065	ND	0.0008	0.0065	188	0.0062	ND	ND	0.0062	-4.72%	0.00%	0.00%	-4.72%
1/18-19	189	0.0094	ND	ND	0.0094	190	0.0077	ND	ND	0.0077	-19.88%	0.00%	0.00%	-19.88%
1/19-20	191	0.0042	ND	0.0007	0.0049	192	0.0048	ND	0.0012	0.0060	13.33%	0.00%	52.63%	20.18%
1/20-21	193	0.0012	ND	ND	0.0012	194	0.0013	ND	ND	0.0013	8.00%	0.00%	0.00%	8.00%
4/3-4	195	0.0049	ND	0.0006	0.0055	196	0.0036	ND	0.0004	0.0040	-30.59%	0.00%	-40.00%	-31.58%
4/4-5	197	0.0026	ND	0.0003	0.0029	198	0.0029	ND	0.0003	0.0032	10.91%	0.00%	0.00%	9.84%
4/5-6	199	0.0034	ND	ND	0.0034	1100	0.0029	ND	ND	0.0029	-15.87%	0.00%	0.00%	-15.87%
4/6-7	1101	0.0025	ND	0.0003	0.0028	1102	0.0026	ND	0.0003	0.0029	3.92%	0.00%	0.00%	3.51%
4/10-11	1103	0.0011	ND	ND	0.0011	1104	0.0013	ND	0.0002	0.0015	16.67%	0.00%	0.00%	30.77%
4/11-12	1105	0.0019	ND	0.0002	0.0021	1106	0.0017	ND	ND	0.0017	-11.11%	0.00%	0.00%	-21.05%
4/12-13	1107	0.0022	ND	ND	0.0022	1108	0.0024	ND	ND	0.0024	8.70%	0.00%	0.00%	8.70%
4/13-14	1109	0.0023	ND	0.0002	0.0025	1110	0.0030	ND	0.0003	0.0033	26.42%	0.00%	40.00%	27.59%
4/17-18	1111	0.0037	ND	0.0011	0.0048	1112	0.0037	ND	0.0011	0.0048	0.00%	0.00%	0.00%	0.00%
4/18-19	1113	0.0061	ND	0.0011	0.0072	1114	0.0041	ND	0.0011	0.0052	-39.22%	0.00%	0.00%	-32.26%
4/19-20	1115	0.0038	ND	0.0011	0.0049	1116	0.0079	ND	0.0010	0.0089	70.09%	0.00%	-9.52%	57.97%
4/20-21	1117	0.0052	ND	0.0015	0.0067	1118	0.0058	ND	0.0017	0.0075	10.91%	0.00%	12.50%	11.27%
4/24-25	1119	0.0024	ND	0.0009	0.0033	1120	0.0026	ND	0.0011	0.0037	8.00%	0.00%	20.00%	11.43%
4/25-26	1121	0.0137	ND	0.0032	0.0169	1122	0.0180	ND	0.0038	0.0218	27.13%	0.00%	17.14%	25.32%
4/26-27	1123	0.0130	ND	0.0029	0.0159	1124	0.0152	ND	0.0034	0.0186	15.60%	0.00%	15.87%	15.65%
4/27-28	1125	0.0043	ND	0.0016	0.0059	1126	0.0046	ND	0.0017	0.0063	6.74%	0.00%	6.06%	6.56%
										AVERAGE	1.00%	-1.54%	7.47%	-3.15%
										STND. DEVIATION	18.88%	17.66%	30.97%	39.06%

TABLE A-4

Heavy Metals Precision Summary (Percentage)

	PRIMARY				COLLOCATED				STATISTICS		
Sample Date	Sample No.	Pb $\mu g/m^3$	Cd $\mu g/m^3$	Cr $\mu g/m^3$	Sample No.	Pb $\mu g/m^3$	Cd $\mu g/m^3$	Cr $\mu g/m^3$	Pb RPD	Cd RPD	Cr RPD
11/7-8	101	0.0072	0.0003	0.0012	201	0.0092	0.0003	0.0008	24.39%%	0.00%	-40.00
11/8-9	102	0.0112	0.0004	0.0013	202	0.0167	0.0003	0.0009	39.43%	0.00%	-36.36
11/9-10	103	0.0286	0.0004	0.0018	203	0.0288	0.0004	0.0015	0.70%	0.00%	-18.18
11/10-11	104	0.0136	0.0003	0.0011	204	0.0118	0.0003	0.0012	-14.17%	0.00%	8.70%
11/11-12	105	0.0065	0.0003	0.0001	205	0.0097	0.0003	0.0010	39.51%	0.00%	163.64%
11/12-13	106	0.0131	0.0003	0.0011	206	0.0111	0.0003	0.0005	-16.53%	0.00%	0.00%
11/13-14	107	0.0051	0.0003	0.0005	207	0.0054	0.0003	0.0010	5.71%	0.00%	66.67%
11/14-15	108	0.0096	0.0003	0.0014	208	0.0093	0.0003	0.0015	3.17%	0.00%	6.90%
11/15-16	109	0.0205	0.0007	0.0026	209	0.0276	0.0004	0.0016	29.52%	0.00%	-47.62%
11/16-17	110	0.0035	0.0003	0.0011	210	0.0042	0.0003	0.0021	19.61%	0.00%	62.50%
11/17-18	111	0.0199	0.0005	0.0014	211	0.0234	0.0003	0.0005	16.42%	0.00%	0.00%
11/18-19	112	0.0091	0.0003	0.0005	212	0.0093	0.0005	0.0009	2.17%	0.00%	0.00%
11/19-20	113	0.0082	ND	0.0005	213	0.0074	0.0003	0.0009	-9.65%	0.00%	0.00%
11/21-22	114	0.0063	0.0004	0.0010	214	0.0054	0.0004	0.0006	-15.38%	0.00%	-50.00%
11/22-23	115	0.0273	0.0006	0.0014	215	0.0269	0.0004	0.0021	-1.48%	0.00%	40.00%
11/23-24	116	0.0176	0.0004	0.0005	216	0.0197	0.0004	0.0005	11.26%	0.00%	0.00%
11/25-26	117	0.0464	0.0013	0.0006	217	0.0535	0.0013	0.0006	14.21%	0.00%	0.00%
11/26-27	118	0.0474	0.0003	0.0005	218	0.0502	0.0010	0.0008	5.74%	0.00%	0.00%
11/27-28	119	0.0052	ND	0.0007	219	0.0071	0.0003	0.0007	30.89%	0.00%	0.00%
11/28-29	120	0.0058*	ND*	0.0042*	220	0.0042*	ND*	0.0044*	-32.00%	0.00%	4.65%
11/29-30	121	0.0294*	0.0004*	0.0050*	221	0.0320*	0.0004*	0.0042*	8.47%	0.00%	-17.39%
12/1-2	122	0.0166*	ND*	0.0042*	222	0.0172*	ND*	0.0060*	3.55%	0.00%	35.29%
12/2-3	123	0.0154*	ND*	0.0038*	223	0.0158*	ND*	0.0030*	2.56%	0.00%	-23.53%
12/3-4	124	0.0288*	0.0004*	0.0040*	224	0.0260*	ND*	0.0116*	-10.22%	0.00%	97.44%
12/4-5	125	0.0126*	ND*	0.0040*	225	0.0100*	ND*	0.0052*	-23.01%	0.00%	26.09%
12/5-6	126	0.0222*	0.0004*	0.0086*	226	0.0240*	0.0004*	0.0068*	7.79%	0.00%	-23.38%
12/6-7	127	0.0108*	ND*	0.0014*	227	0.0206*	0.0004*	0.0020*	62.42%	0.00%	35.29%
12/9-10	128	0.0208*	ND*	0.0036*	228	0.0166*	ND*	0.0032*	-22.46%	0.00%	-11.76%
12/10-11	129	0.0110*	ND*	0.0014*	229	0.0170*	0.0004*	0.0022*	42.86%	0.00%	-44.44%
12/11-12	130	0.0102*	ND*	0.0012*	230	0.0106*	ND*	0.0012*	3.85%	0.00%	0.00%
12/12-13	131	0.0276*	ND*	0.0036*	231	0.0242*	0.0004*	0.0038*	-13.13%	0.00%	-5.41%
12/13-14	132	0.0066*	ND*	0.0052*	232	0.0048*	ND*	0.0048*	-31.58%	0.00%	-8.00%
12/16-17	133	0.0137*	ND*	0.0018*	233	0.0116*	ND*	0.0018*	-16.60%	0.00%	0.00%
12/17-18	134	0.0152*	ND*	0.0012*	234	0.0124*	ND*	0.0014*	-20.29%	0.00%	15.38%
12/18-19	135	0.0303*	ND*	0.0024*	235	0.0252*	ND*	0.0024*	-18.38%	0.00%	0.00%
12/19-20	136	0.0129*	ND*	0.0014*	236	0.0114*	ND*	0.0018*	-12.35%	0.00%	25.00%
12/21-22	137	sample contaminated by lab			237	sample contaminated by lab			sample contaminated by lab		
12/27-28	138	sample contaminated by lab			238	sample contaminated by lab			sample contaminated by lab		

TABLE A-4 (cont'd)

	PRIMARY				COLLOCATED				STATISTICS		
Sample Date	Sample No.	Pb $\mu g/m^3$	Cd $\mu g/m^3$	Cr $\mu g/m^3$	Sample No.	Pb $\mu g/m^3$	Cd $\mu g/m^3$	Cr $\mu g/m^3$	Pb RPD	Cd RPD	Cr RPD
1/7-8	139	0.0086*	ND*	0.0034*	239	0.0070*	ND*	0.0004*	-20.51%	0.00%	0.0%
1/8-9	140	0.0142*	ND*	0.0016*	240	0.0142*	ND*	0.0008*	0.00%	0.00%	0.0%
1/9-10	141	0.0156*	ND*	0.0018*	241	0.0106*	ND*	0.0018*	-38.17%	0.00%	0.0%
1/10-11	142	0.0222*	ND*	0.0016*	242	0.0222*	ND*	0.0018*	0.00%	0.00%	11.76%
1/11-12	143	0.0106*	ND*	0.0012*	243	0.0168*	0.0004*	0.0008*	45.26%	0.00%	0.00%
1/12-13	144	0.0052	ND	ND	244	0.0041	0.0002	0.0002	-23.66%	0.00%	0.00%
1/18-19	145	0.0085	ND	0.0013	245	0.0058	0.0002	0.0010	-37.76%	0.00%	0.00%
1/19-20	146	0.0069	ND	ND	246	0.0086	0.0002	0.0007	21.94%	0.00%	0.00%
1/20-21	147	0.0159	ND	0.0012	247	0.0091	0.0004	0.0012	-51.43%	0.00%	0.00%
4/3-4	148Q	0.0040*	ND*	0.0010*	248Q	0.0064*	0.0006*	0.0014*	46.15%	0.00%	0.00%
4/4-5	149Q	0.0030*	ND*	0.0008*	249G	0.0040*	0.0006*	0.0016*	28.57%	0.00%	0.00%
4/5-6	150G	0.0062*	ND*	0.0020*	250G	0.0086*	0.0006*	0.0036*	32.43%	0.00%	57.14%
4/6-7	151Q	0.0048*	ND*	0.0014*	251G	0.0092*	0.0006*	0.0034*	62.86%	0.00%	83.33%
4/10-11	152Q	0.0084*	0.0006*	0.0006*	252Q	0.0074*	0.0012*	0.0006*	-12.66%	0.00%	0.00%
4/11-12	153Q	0.0156*	0.0010*	0.0006*	253G	0.0214*	0.0006*	0.0020*	31.35%	0.00%	0.00%
4/12-13	154Q	0.0150*	0.0006*	0.0064*	254Q	0.0202*	0.0014*	0.0010*	29.55%	0.00%	0.00%
4/13-14	155Q	0.0048*	0.0004*	0.0026*	255G	0.0054*	0.0006*	0.0014*	11.76%	0.00%	-60.00%
4/17-18	156Q	0.0059	0.0003	0.0009	256Q	0.0038	0.0002	0.0005	-43.30%	0.00%	-57.14%
4/18-19	157Q	0.0084	0.0003	0.0006	257G	0.0066	0.0002	0.0009	-24.00%	0.00%	40.00%
4/19-20	158G	0.0163	0.0007	0.0025	258G	0.0044	0.0002	0.0010	-114.98%	0.00%	-85.71%
4/20-21	159Q	0.0247	0.0007	0.0018	259G	0.0076	0.0002	0.0010	-105.88%	0.00%	-57.14%
4/24-25	160Q	0.0271	0.0007	0.0034	260Q	0.0067	ND	0.0008	-120.71%	0.00%	-123.81%
4/25-26	161Q	0.0097	0.0003	0.0011	261G	0.0061	ND	ND	0.00%	0.00%	-200.00%
4/26-27	162Q	0.0136	0.0003	0.0007	262Q	0.0101	ND	0.0006	-29.54%	0.00%	-15.38%
4/27-28	163Q	0.0207	0.0007	0.0026	263G	0.0044	0.0003	0.0009	-129.88%	0.00%	-97.14%
								AVERAGE	-5.44%	0.00%	2.34%
								STANDARD DEVIATION	39.33%	0.00%	50.59%

* Laboratory mistakenly reported half-filter weight. Weight was doubled to obtain correct concentration.

TABLE A-5

PCB Field Blank Summary

Date	Sample No.	FIELD BLANK 1016 NG	1242 NG	1248 NG	1254 NG
11/7-8	601	ND	ND	ND	ND
11/8-9	602	ND	ND	ND	ND
11/9-10	603	ND	ND	ND	ND
11/10-11	604	ND	ND	ND	ND
11/11-12	605	ND	ND	ND	ND
11/12-13	606	ND	ND	ND	ND
11/13-14	607	ND	ND	ND	ND
11/14-15	608	ND	ND	ND	ND
11/15-16	609	ND	ND	ND	ND
11/16-17	610	ND	ND	ND	ND
11/17-18	611	ND	ND	930	1000
11/18-19	612	ND	ND	ND	ND
11/19-20	613	ND	ND	ND	ND
11/21-22	614	ND	ND	ND	ND
11/22-23	615	ND	ND	ND	ND
11/23-24	616	ND	ND	ND	ND
11/25-26	617	ND	ND	ND	ND
11/26-27	618	ND	ND	ND	ND
11/27-28	619	310	ND	ND	290
11/28-29	620	ND	85	ND	ND
11/29-30	621	ND	ND	ND	ND
12/1-2	622	ND	ND	ND	ND
12/2-3	623	ND	ND	ND	ND
12/3-4	624	ND	ND	ND	67
12/4-5	625	ND	ND	ND	ND
12/5-6	626	ND	ND	ND	ND
12/6-7	627	ND	ND	ND	74
12/9-10	628	ND	ND	ND	ND
12/10-11	629	ND	ND	ND	ND
12/11-12	630	ND	ND	ND	ND
12/12-13	631	ND	ND	ND	ND
12/13-14	632	ND	ND	ND	ND
12/16-17	633	ND	ND	ND	ND
12/17-18	634	ND	ND	ND	ND
12/18-19	635	ND	ND	ND	ND
12/19-20	636	6000	ND	ND	230
12/21-22	637	1300	ND	ND	190
12/27-28	638	610	ND	ND	320
12/28-29	639	2900	ND	ND	550
12/29-30	640	ND	220	ND	ND
1/7-8	641	ND	ND	ND	78
1/8-9	642	ND	ND	ND	ND
1/9-10	643	ND	ND	ND	ND
1/10-11	644	ND	ND	ND	ND
1/11-12	645	ND	ND	ND	ND
1/12-13	646	ND	ND	ND	ND
1/18-19	647	ND	ND	ND	ND
1/19-20	648	ND	ND	ND	ND
1/20-21	649	ND	ND	ND	ND
4/3-4	650	ND	ND	ND	ND
4/4-5	651	ND	ND	ND	ND
4/5-6	652	ND	ND	ND	ND
4/6-7	653	ND	ND	ND	ND
4/10-11	654	ND	ND	ND	ND
4/11-12	655	ND	ND	ND	ND
4/12-13	656	ND	ND	ND	ND
4/13-14	657	ND	ND	ND	ND

TABLE A-5 (cont'd)

Date	Sample No.	FIELD BLANK 1016 NG	1242 NG	1248 NG	1254 NG
4/17-18	658	ND	ND	ND	ND
4/18-19	659	ND	ND	ND	ND
4/19-20	660	ND	ND	ND	ND
4/20-21	661	ND	ND	ND	ND
4/24-25	662	ND	ND	ND	ND
4/25-26	663	ND	ND	ND	ND
4/26-27	664	ND	ND	ND	ND
4/27-28	665	ND	ND	ND	ND

TABLE A-6

Heavy Metals Field Blank Summary

Date	Sample No.	FIELD BLANK Pb mg	Cd mg	Cr mg
11/7-8	301	ND	ND	ND
11/8-9	302	ND	ND	ND
11/9-10	303	ND	ND	ND
11/10-11	304	ND	ND	ND
11/11-12	305	ND	ND	ND
11/12-13	306	ND	ND	ND
11/13-14	307	ND	ND	ND
11/14-15	308	ND	ND	ND
11/15-16	309	ND	ND	ND
11/16-17	310	ND	ND	ND
11/17-18	311	ND	ND	ND
11/18-19	312	ND	ND	ND
11/19-20	313	ND	ND	ND
11/21-22	314	ND	ND	ND
11/22-23	315	ND	ND	ND
11/23-24	316	ND	ND	ND
11/25-26	317	ND	ND	ND
11/26-27	318	ND	ND	ND
11/27-28	319	ND	ND	ND
11/28-29	320	ND	ND	ND
11/29-30	321	ND	ND	ND
12/1-2	322	ND	ND	ND
12/2-3	323	ND	ND	ND
12/3-4	324	ND	ND	ND
12/4-5	325	ND	ND	ND
12/5-6	326	ND	ND	ND
12/6-7	327	0.0082	ND	ND
12/9-10	328	ND	ND	ND
12/10-11	329	ND	ND	ND
12/11-12	330	ND	ND	ND
12/12-13	331	ND	ND	ND
12/13-14	332	ND	ND	0.0091
12/16-17	333	ND	ND	ND
12/17-18	334	ND	ND	ND
12/18-19	335	ND	ND	ND
12/19-20	336	ND	ND	ND
12/21-22	337	ND	ND	0.0253
12/27-28	338	ND	ND	0.0119
1/7-8	339	ND	ND	ND
1/8-9	340	ND	ND	ND
1/9-10	341	ND	ND	ND
1/10-11	342	ND	ND	ND
1/11-12	343	ND	ND	ND
1/12-13	344	ND	ND	ND
1/18-19	345	ND	ND	ND
1/19-20	346	ND	ND	ND
1/20-21	347	ND	ND	ND
4/3-4	348Q	ND	ND	ND
4/4-5	349Q	ND	ND	ND
	349G	0.1112	ND	ND
4/5-6	350G	ND	ND	ND
4/6-7	351G	ND	ND	ND
	351Q	ND	ND	ND
4/10-11	352Q	ND	ND	ND
4/11-12	353Q	ND	ND	ND
	353G	ND	ND	ND
4/12-13	354Q	ND	ND	ND

TABLE A-6 (cont'd)

Date	Sample No.	FIELD BLANK Pb mg	Cd mg	Cr mg
4/13-14	355Q	ND	ND	ND
	355G	ND	ND	ND
4/17-18	356Q	ND	ND	ND
4/18-19	357G	ND	ND	ND
	357Q	ND	ND	ND
4/19-20	358G	ND	ND	ND
4/20-21	359G	ND	ND	ND
	359Q	0.0050	ND	0.0081
4/24-25	360Q	ND	ND	ND
4/25-26	361G	ND	ND	ND
	361Q	ND	ND	ND
4/26-27	362Q	ND	ND	ND
4/27-28	363G	ND	ND	ND
	363Q	ND	ND	ND

TABLE A-7

Heavy Metals Quartz/Glass Filter Comparison ($\mu g/m^3$)

	PRIMARY				COLLOCATED				STATISTICS		
Sample Date	Sample No.	Pb $\mu g/m^3$	Cd $\mu g/m^3$	Cr $\mu g/m^3$	Sample No.	Pb $\mu g/m^3$	Cd $\mu g/m^3$	Cr $\mu g/m^3$	Pb Diff.	Cd Diff.	Cr Diff.
4/3-4	148Q	0.0040*	ND*	0.0010*	248Q	0.0064*	0.0006*	0.0014*	0.0024	0.0006	0.0004
4/4-5	149Q	0.0030*	ND*	0.0008*	249G	0.0040*	0.0006*	0.0016*	0.0010	0.0006	0.0008
4/5-6	150G	0.0062*	ND*	0.0020*	250G	0.0086*	0.0006*	0.0036*	0.0024	0.0006	0.0016
4/6-7	151Q	0.0048*	ND*	0.0014*	251G	0.0092*	0.0006*	0.0034*	0.0044	0.0006	0.0020
4/10-11	152Q	0.0084*	0.0006*	0.0006*	252G	0.0074*	0.0012*	0.0006*	-0.0010	0.0006	0.0000
4/11-12	153Q	0.0156*	0.0010*	0.0006*	253G	0.0214*	0.0006*	0.0020*	0.0058	-0.0004	0.0014
4/12-13	154Q	0.0150*	0.0006*	0.0064*	254Q	0.0202*	0.0014*	0.0010*	0.0052	0.0008	-0.0054
4/13-14	155Q	0.0048*	0.0004*	0.0026*	255G	0.0054*	0.0006*	0.0014*	0.0006	0.0002	-0.0012
4/17-18	156Q	0.0059	0.0003	0.0009	256Q	0.0038	0.0002	0.0005	-0.0021	-0.0001	-0.0004
4/18-19	157Q	0.0084	0.0003	0.0006	257G	0.0066	0.0002	0.0009	-0.0018	-0.0001	-0.0003
4/19-20	158G	0.0163	0.0007	0.0025	258G	0.0044	0.0002	0.0010	-0.0119	-0.0005	-0.0015
4/20-21	159Q	0.0247	0.0007	0.0018	259G	0.0076	0.0002	0.0010	-0.0171	-0.0005	-0.0008
4/24-25	160Q	0.0271	0.0007	0.0034	260Q	0.0067	ND	0.0008	-0.0204	-0.0007	-0.0026
4/25-26	161Q	0.0097	0.0003	0.0011	261G	0.0061	ND	ND	-0.0036	-0.0003	-0.0011
4/26-27	162Q	0.0136	0.0003	0.0007	262Q	0.0101	ND	0.0006	-0.0035	-0.0003	-0.0001
4/27-28	163Q	0.0207	0.0007	0.0026	263G	0.0044	0.0003	0.0009	-0.0163	-0.0004	-0.0017
					TOTAL			Average	-0.0035	0.0000	-0.0006
								Stnd. Deviation	0.0078	0.0005	0.0017
					QUARTZ/QUARTZ			Average	-0.0037	0.0003	-0.0016
								Stnd. Deviation	0.0089	0.0006	0.0022
					GLASS/GLASS			Average	-0.0107	-0.0002	-0.0007
								Stnd. Deviation	0.0072	0.0006	0.0012
					QUARTZ/GLASS			Average	-0.0052	0.0000	-0.0002
								Stnd. Deviation	0.0078	0.0004	0.0012

* Laboratory mistakenly reported half-filter weight. Weight was doubled to obtain correct concentration.

TABLE A-8

Heavy Metals Quartz/Glass Filter Comparison (percentage)

	PRIMARY				COLLOCATED				STATISTICS		
Sample Date	Sample No.	Pb $\mu g/m^3$	Cd $\mu g/m^3$	Cr $\mu g/m^3$	Sample No.	Pb $\mu g/m^3$	Cd $\mu g/m^3$	Cr $\mu g/m^3$	RPD Pb	RPD Cd	RPD Cr
4/3-4	148Q	0.0040*	ND*	0.0010*	248Q	0.0064*	0.0006*	0.0014*	46.15%	200.00%	33.33%
4/4-5	149Q	0.0030*	ND*	0.0008*	249G	0.0040*	0.0006*	0.0016*	28.57%	200.00%	66.67%
4/5-6	150G	0.0062*	ND*	0.0020*	250G	0.0086*	0.0006*	0.0036*	32.43%	200.00%	57.14%
4/6-7	151Q	0.0048*	ND*	0.0014*	251G	0.0092*	0.0006*	0.0034*	62.86%	200.00%	83.33%
4/10-11	152Q	0.0084*	0.0006*	0.0006*	252G	0.0074*	0.0012*	0.0006*	-12.66%	100.00%	0.00%
4/11-12	153Q	0.0156*	0.0010*	0.0006*	253G	0.0214*	0.0006*	0.0020*	31.35%	66.67%	107.69%
4/12-13	154Q	0.0150*	0.0006*	0.0064*	254Q	0.0202*	0.0014*	0.0010*	29.55%	-50.00%	-145.95%
4/13-14	155Q	0.0048*	0.0004*	0.0026*	255G	0.0054*	0.0006*	0.0014*	11.76%	80.00%	-60.00%
4/17-18	156Q	0.0059	0.0003	0.0009	256Q	0.0038	0.0002	0.0005	-43.30%	40.00%	-57.14%
4/18-19	157Q	0.0084	0.0003	0.0006	257G	0.0066	0.0002	0.0009	-24.00%	-40.00%	40.00%
4/19-20	158G	0.0163	0.0007	0.0025	258G	0.0044	0.0002	0.0010	-114.98%	-40.00%	-85.71%
4/20-21	159Q	0.0247	0.0007	0.0018	259G	0.0076	0.0002	0.0010	-105.88%	-111.11%	57.14%
4/24-25	160Q	0.0271	0.0007	0.0034	260Q	0.0067	ND	0.0008	-120.71%	-111.11%	-123.81%
4/25-26	161Q	0.0097	0.0003	0.0011	261G	0.0061	ND	ND	-45.57%	-200.00%	-200.00%
4/26-27	162Q	0.0136	0.0003	0.0007	262Q	0.0101	ND	0.0006	-29.54%	-200.00%	-15.38%
4/27-28	163Q	0.0207	0.0007	0.0026	263G	0.0044	0.0003	0.0009	-129.88%	80.00%	-97.14%
					TOTAL			Average	-23.99%	-25.9%	-21.24%
								Stnd. Deviation	62.33%	134.28%	88.57%
					QUARTZ/QUARTZ			Average	-23.57%	-24.82%	-60.59%
								Stnd. Deviation	59.23%	136.76%	66.56%
					GLASS/GLASS			Average	-41.28%	80.00%	-14.29%
								Stnd. Deviation	73.71%	120.00%	71.43%
					QUARTZ/GLASS			Average	-20.38%	41.73%	-0.26%
								Stnd. Deviation	60.59%	127.16%	94.80%

* Laboratory mistakenly reported half-filter weight. Weight was doubled to obtain correct concentration.

TABLE A-9

PCBs Quartz/Glass Filter Comparison ($\mu g/m^3$)

	PRIMARY					COLLOCATED					STATISTICS			
Sample Date	Sample No.	Conc. 1016 $\mu g/m^3$	Conc. 1242 $\mu g/m^3$	Conc. 1248 $\mu g/m^3$	Conc. 1254 $\mu g/m^3$	Sample No.	Conc. 1016 $\mu g/m^3$	Conc. 1242 $\mu g/m^3$	Conc. 1248 $\mu g/m^3$	Conc. 1254 $\mu g/m^3$	1016 Diff. $\mu g/m^3$	1242 Diff. $\mu g/m^3$	1248 Diff. $\mu g/m^3$	1254 Diff. $\mu g/m^3$
4/3-4	195	ND	ND	ND	ND	196	ND	ND	ND	ND	0.0000	0.0000	0.0000	0.0000
4/4-5	197	ND	ND	ND	ND	198	ND	ND	ND	ND	0.0000	0.0000	0.0000	0.0000
4/5-6	199	ND	ND	ND	ND	1000	ND	ND	ND	ND	0.0000	0.0000	0.0000	0.0000
4/6-7	1101	ND	ND	ND	ND	1102	ND	ND	ND	ND	0.0000	0.0000	0.0000	0.0000
4/10-11	1103	ND	ND	ND	ND	1104	ND	ND	ND	ND	0.0000	0.0000	0.0000	0.0000
4/11-12	1105	ND	ND	ND	ND	1106	ND	ND	ND	ND	0.0000	0.0000	0.0000	0.0000
4/12-13	1107	ND	ND	ND	ND	1108	ND	ND	ND	ND	0.0000	0.0000	0.0000	0.0000
4/13-14	1109	ND	ND	ND	ND	1110	ND	ND	ND	ND	0.0000	0.0000	0.0000	0.0000
4/17-18	1111	ND	ND	ND	ND	1112	ND	ND	ND	ND	0.0000	0.0000	0.0000	0.0000
4/18-19	1113	ND	ND	ND	ND	1114	ND	ND	ND	ND	0.0000	0.0000	0.0000	0.0000
4/19-20	1115	ND	ND	ND	ND	1116	ND	ND	ND	ND	0.0000	0.0000	0.0000	0.0000
4/20-21	1117	ND	ND	ND	ND	1118	ND	ND	ND	ND	0.0000	0.0000	0.0000	0.0000
4/24-25	1119	ND	ND	ND	ND	1120	ND	ND	ND	ND	0.0000	0.0000	0.0000	0.0000
4/25-26	1121	ND	ND	ND	ND	1122	ND	ND	ND	ND	0.0000	0.0000	0.0000	0.0000
4/26-27	1123	ND	ND	ND	ND	1124	ND	ND	ND	ND	0.0000	0.0000	0.0000	0.0000
4/27-28	1125	ND	ND	ND	ND	1126	ND	ND	ND	ND	0.0000	0.0000	0.0000	0.0000

TOTAL	Average	0.0000	0.0000	0.0000	0.0000
	Stnd. Deviation	0.0000	0.0000	0.0000	0.0000
QUARTZ/QUARTZ	Average	0.0000	0.0000	0.0000	0.0000
	Stnd. Deviation	0.0000	0.0000	0.0000	0.0000
GLASS/GLASS	Average	0.0000	0.0000	0.0000	0.0000
	Stnd. Deviation	0.0000	0.0000	0.0000	0.0000
QUARTZ/GLASS	Average	0.0000	0.0000	0.0000	0.0000
	Stnd. Deviation	0.0000	0.0000	0.0000	0.0000

APPENDIX B

APPENDIX B

DATA VALIDATION

TABLE B-1

Aroclor Data Validation Summary

Date	Location	Sample	Qualifier 1016	1242	1248	1254	Comments 1016	1242	1248	1254
11/7-11/8	SW	101 F	A	A	A	A				
	SW	101 P	A	A	A	A				
	SW	102 F	A	A	A	A				
	SW	102 P	A	A	A	A				
	FB	601 F	A	A	A	A				
	FB	601 P	A	A	A	A				
11/8-11/9	SW	103 F	A	A	A	A				
	SW	103 P	A	A	A	A				
	SW	104 F	A	A	A	A				
	SW	104 P	A	A	A	A				
	FB	602 F	A	A	A	A				
	FB	602 P	A	A	A	A				
11/9-11/10	SW	105 F	A	A	A	A				
	SW	105 P	A	A	A	A				
	SW	106 F	A	A	A	A				
	SW	106 P	A	A	A	A				
	FB	603 F	A	A	A	A				
	FB	603 P	A	A	A	A				
11/10-11/11	SW	107 F	A	A	A	A				
	SW	107 P	A	A	A	A				
	SW	108 F	A	A	A	A				
	SW	108 P	A	A	A	A				
	FB	604 F	A	A	A	A				
	FB	604 P	A	A	A	A				
11/11-11/12	SW	109 F	A	A	A	A				
	SW	109 P	A	A	A	A				
	SW	110 F	A	A	A	A				
	SW	110 P	A	A	A	A				
	FB	605 F	A	A	A	A				
	FB	605 P	A	A	A	A				
11/12-11/13	SW	111 F	A	A	A	A				
	SW	111 P	A	A	A	A				
	SW	112 F	A	A	A	A				
	SW	112 P	A	A	A	A				
	FB	606 F	A	A	A	A				
	FB	606 P	A	A	A	A				
11/13-11/14	SW	113 F	A	A	A	A				
	SW	113 P	A	A	A	A				
	SW	114 F	A	A	A	A				
	SW	114 P	A	A	A	A				
	NW	201 F	A	A	A	A				
	NW	201 P	A	A	A	A				
	NE	301 F	A	A	A	A				
	NE	301 P	A	A	A	A				
	SE	401 F	A	A	A	A				
	SE	401 P	A	A	A	A				
	FB	607 F	A	A	A	A				
	FB	607 P	A	A	A	A				

TABLE B-1 (cont'd)

Date	Location	Sample	Qualifier 1016	1242	1248	1254	Comments 1016	1242	1248	1254
11/14-11/15	SW	115 F	A	A	A	A				
	SW	115 P	A	A	A	A				
	SW	116 F	A	A	A	A				
	SW	116 P	A	A	A	A				
	NW	202 F	A	A	A	A				
	NW	202 P	A	A	A	A				
	NE	302 F	A	A	A	A				
	NE	302 P	A	A	A	A				
	SE	402 F	A	A	A	A				
	SE	402 P	A	A	A	A				
	FB	608 F	A	A	A	A				
	FB	608 P	A	A	A	A				
11/15-11/16	SW	117 F	A	A	A	A				
	SW	117 P	A	A	A	A				
	SW	118 F	A	A	A	A				
	SW	118 P	A	A	A	A				
	NW	203 F	A	A	A	A				
	NW	203 P	A	A	A	A				
	NE	303 F	A	A	A	A				
	NE	303 P	A	A	A	A				
	SE	403 F	A	A	A	A				
	SE	403 P	A	A	A	A				
	FB	609 F	A	A	A	A				
	FB	609 P	A	A	A	A				
11/16-11/17	SW	119 F	A	A	A	A				
	SW	119 P	A	A	A	A				
	SW	120 F	A	A	A	A				
	SW	120 P	A	A	A	A				
	NW	204 F	A	A	A	A				
	NW	204 P	A	A	A	A				
	NE	304 F	A	A	A	A				
	NE	304 P	A	A	A	A				
	SE	404 F	A	A	A	A				
	SE	404 P	A	A	A	A				
	FB	610 F	A	A	A	A				
	FB	610 P	A	A	A	A				
11/17-11/18	SW	121 F	A	A	A	A				
	SW	121 P	A	A	A	A				
	SW	122 F	A	A	A	A				
	SW	122 P	A	A	A	A				
	NW	205 F	A	A	A	A				
	NW	205 P	A	A	A	A				
	NE	305 F	A	A	A	A				
	NE	305 P	A	A	A	U				FB
	SE	405 F	A	A	A	A				
	SE	405 P	A	A	A	A				
	FB	611 F	A	A	A	A				
	FB	611 P	A	A	A	A				
11/18-11/19	SW	123 F	A	A	A	A				
	SW	123 P	A	A	A	A				
	SW	124 F	A	A	A	A				
	SW	124 P	A	A	A	A				
	NW	206 F	A	A	A	A				
	NW	206 P	A	A	A	A				
	NE	306 F	A	A	A	A				
	NE	306 P	A	A	A	A				
	SE	406 F	A	A	A	A				
	SE	406 P	A	A	A	A				
	FB	612 F	A	A	A	A				
	FB	612 P	A	A	A	A				

TABLE B-1 (cont'd)

Date	Location	Sample	Qualifier 1016	1242	1248	1254	Comments 1016	1242	1248	1254
11/19-11/20	SW	125 F	A	A	A	A				
	SW	125 P	A	A	A	A				
	SW	126 F	A	A	A	A				
	SW	126 P	A	A	A	A				
	NW	207 F	A	A	A	A				
	NW	207 P	A	A	A	A				
	NE	307 F	A	A	A	A				
	NE	307 P	A	A	A	A				
	SE	407 F	A	A	A	A				
	SE	407 P	A	A	A	A				
	FB	613 F	A	A	A	A				
	FB	613 P	A	A	A	A				
11/21-11/22	SW	127 F	A	A	A	A				
	SW	127 P	A	A	A	A				
	SW	128 F	A	A	A	A				
	SW	128 P	A	A	A	A				
	NW	208 F	NO RUN							
	NW	208 P	NO RUN							
	NE	308 F	A	A	A	A				
	NE	308 P	A	A	A	A				
	NE	408 F	A	A	A	A				
	NE	408 P	A	A	A	A				
	FB	614 F	A	A	A	A				
	FB	614 P	A	A	A	A				
11/22-11/23	SW	129 F	A	A	A	A				
	SW	129 P	A	A	A	A				
	SW	130 F	A	A	A	A				
	SW	130 P	A	A	A	A				
	NE	309 F	A	A	A	A				
	NE	309 P	A	A	A	A				
	SE	409 F	A	A	A	A				
	SE	409 P	A	A	A	A				
	FB	615 F	A	A	A	A				
	FB	615 P	A	A	A	A				
11/23-11/24	SW	131 F	A	A	A	A				
	SW	131 P	A	A	A	A				
	SW	132 F	A	A	A	A				
	SW	132 P	A	A	A	A				
	NW	209 F	A	A	A	A				
	NW	209 P	A	A	A	A				
	NE	310 F	A	A	A	A				
	NE	310 P	A	A	A	A				
	SE	410 F	A	A	A	A				
	SE	410 P	A	A	A	A				
	FB	616 F	A	A	A	A				
	FB	616 P	A	A	A	A				
11/25-11/26	SW	133 F	A	A	A	A				
	SW	133 P	UJ	UJ	UJ	UJ	LM	LM	LM	LM
	SW	134 F	A	A	A	A				
	SW	134 P	UJ	UJ	UJ	UJ	LM	LM	LM	LM
	NW	210 F	A	A	A	A				
	NW	210 P	UJ	UJ	UJ	UJ	LM	LM	LM	LM
	NE	311 F	A	A	A	A				
	NE	311 P	A	A	A	A				
	SE	411 F	A	A	A	A				
	SE	411 P	A	A	A	A				
	FB	617 F	A	A	A	A				
	FB	617 P	A	A	A	A				

TABLE B-1 (cont'd)

Date	Location	Sample	Qualifier 1016	1242	1248	1254	Comments 1016	1242	1248	1254
11/26-11/27	SW	135 F	A	A	A	A				
	SW	135 P	A	A	A	A				
	SW	136 F	A	A	A	A				
	SW	136 P	A	A	A	A				
	NW	211 F	A	A	A	A				
	NW	211 P	J	A	A	A	LQ			
	NE	312 F	A	A	A	A				
	NE	312 P	A	A	A	A				
	SE	412 F	A	A	A	A				
	SE	412 P	A	A	A	A				
	FB	618 F	A	A	A	A				
	FB	618 P	A	A	A	A				
11/27-11/28	SW	137 F	A	A	A	A				
	SW	137 P	U	A	A	A	FB			
	SW	138 F	A	A	A	A				
	SW	138 P	U	A	A	A	FB			
	NW	212 F	A	A	A	A				
	NW	212 P	U	A	A	A	FB			
	NE	313 F	A	A	A	A				
	NE	313 P	A	A	A	A				
	SE	413 F	A	A	A	A				
	SE	413 P	A	A	A	A				
	FB	619 F	A	A	A	A				
	FB	619 P	A	A	A	A				
11/28-11/29	SW	139 F	A	A	A	A				
	SW	139 P	A	A	A	A				
	SW	140 F	A	A	A	A				
	SW	140 P	A	A	A	A				
	NW	213 F	A	A	A	A				
	NW	213 P	U	A	A	A	FB			
	NE	314 F	A	A	A	A				
	NE	314 P	A	U	A	A		FB		
	SE	414 F	A	A	A	A				
	SE	414 P	A	U	A	A		FB		
	FB	620 F	A	A	A	A				
	FB	620 P	A	A	A	A				
11/29-11/30	SW	141 F	A	A	A	A				
	SW	141 P	A	A	A	A				
	SW	142 F	A	A	A	A				
	SW	142 P	A	A	A	A				
	NW	214 F	A	A	A	A				
	NW	214 P	A	A	A	A				
	NE	315 F	A	A	A	A				
	NE	315 P	A	A	A	A				
	SE	415 F	A	A	A	A				
	SE	415 P	A	A	A	A				
	FB	621 F	A	A	A	A				
	FB	621 P	A	A	A	A				
12/1-12/2	SW	143 F	A	A	A	A				
	SW	143 P	A	A	A	A				
	SW	144 F	A	A	A	A				
	SW	144 P	A	A	A	A				
	NW	215 F	A	A	A	A				
	NW	215 P	A	A	A	A				
	NE	316 F	A	A	A	A				
	NE	316 P	A	A	A	A				
	SE	416 F	A	A	A	A				
	SE	416 P	A	A	A	A				
	FB	622 F	A	A	A	A				
	FB	622 P	A	A	A	A				

TABLE B-1 (cont'd)

Date	Location	Sample	Qualifier 1016	1242	1248	1254	Comments 1016	1242	1248	1254
12/2-12/3	SW	145 F	A	A	A	A				
	SW	145 P	A	A	A	A				
	SW	146 F	A	A	A	A				
	SW	146 P	A	A	A	A				
	NW	216 F	A	A	A	A				
	NW	216 P	A	A	A	A				
	NE	317 F	A	A	A	A				
	NE	317 P	A	A	A	J				LI
	SE	417 F	A	A	A	A				
	SE	417 P	A	A	A	J				LI
	FB	623 F	A	A	A	A				
	FB	623 P	A	A	A	A				
12/3-12/4	SW	147 F	A	A	A	A				
	SW	147 P	A	A	A	A				
	SW	148 F	A	A	A	A				
	SW	148 P	A	A	A	A				
	NW	217 F	A	A	A	A				
	NW	217 P	A	A	A	A				
	NE	318 F	A	A	A	A				
	NE	318 P	A	A	A	UJ				LI,FB
	SE	418 F	A	A	A	A				
	SE	418 P	A	A	A	A				
	FB	624 F	A	A	A	A				
	FB	624 P	A	A	A	A				
12/4-12/5	SW	149 F	A	J	A	A		FD		
	SW	149 P	A	A	A	A				
	SW	150 F	A	J	A	A		FD		
	SW	150 P	A	A	A	A				
	NW	218 F	A	A	A	A				
	NW	218 P	A	A	A	A				
	NE	319 F	A	A	A	A				
	NE	319 P	A	A	A	J				LI
	SE	419 F	A	A	A	A				
	SE	419 P	A	A	A	A				
	FB	625 F	A	A	A	A				
	FB	625 P	A	A	A	A				
12/5-12/6	SW	151 F	A	A	A	A				
	SW	151 P	A	A	A	A				
	SW	152 F	A	A	A	A				
	SW	152 P	A	A	A	A				
	NW	219 F	A	A	A	A				
	NW	219 P	A	A	A	A				
	NE	320 F	A	A	A	A				
	NE	320 P	A	A	A	A				
	SE	420 F	A	A	A	A				
	SE	420 P	A	A	A	A				
	FB	626 F	A	A	A	A				
	FB	626 P	A	A	A	A				
12/6-12/7	SW	153 F	A	A	A	A				
	SW	153 P	A	A	A	U				FB
	SW	154 F	A	A	A	A				
	SW	154 P	A	A	A	U				FB
	NW	220 F	A	A	A	A				
	NW	220 P	A	A	A	A				
	NE	321 F	A	A	A	A				
	NE	321 P	A	A	A	A				
	SE	421 F	A	A	A	A				
	SE	421 P	A	A	A	A				
	FB	627 F	A	A	A	A				
	FB	627 P	A	A	A	A				

TABLE B-1 (cont'd)

Date	Location	Sample	Qualifier 1016	1242	1248	1254	Comments 1016	1242	1248	1254
12/9-12/10	SW	155 F	UJ	UJ	UJ	J	LC	LC	LC	LC
	SW	155 P	UJ	J	UJ	A	LC	LC	LC	
	SW	156 F	UJ	UJ	UJ	A	LC	LC	LC	
	SW	156 P	UJ	J	UJ	A	LC	LC	LC	
	NW	221 F	UJ	UJ	UJ	A	LC	LC	LC	
	NW	221 P	UJ	J	UJ	UJ	LC	LC	LC	LC
	NE	322 F	UJ	UJ	UJ	J	LC	LC	LC	LC
	NE	322 P	UJ	J	UJ	UJ	LC	LC	LC	LC
	SE	422 F	UJ	UJ	UJ	A	LC	LC	LC	
	SE	422 P	UJ	J	UJ	UJ	LC	LC	LC	LC
	FB	628 F	UJ	UJ	UJ	UJ	LC	LC	LC	LC
	FB	628 P	UJ	UJ	UJ	UJ	LC	LC	LC	LC
12/10-12/11	SW	157 F	UJ	UJ	UJ	UJ	LC	LC	LC	LC
	SW	157 P	UJ	J	UJ	UJ	LC	LC	LC	LC
	SW	158 F	UJ	UJ	UJ	UJ	LC	LC	LC	LC
	SW	158 P	UJ	J	UJ	UJ	LC	LC	LC	LC
	NW	222 F	UJ	UJ	UJ	UJ	LC	LC	LC	LC
	NW	222 P	UJ	J	UJ	J	LC	LC	LC	LC
	NE	323 F	UJ	UJ	UJ	UJ	LC	LC	LC	LC
	NE	323 P	UJ	J	UJ	UJ	LC	LC	LC	LC
	SE	423 F	UJ	UJ	UJ	UJ	LC	LC	LC	LC
	SE	423 P	UJ	J	UJ	UJ	LC	LC	LC	LC
	FB	629 F	UJ	UJ	UJ	UJ	LC	LC	LC	LC
	FB	629 P	UJ	UJ	UJ	UJ	LC	LC	LC	LC
12/11-12/12	SW	159 F	UJ	UJ	UJ	UJ	LC	LC	LC	LC
	SW	159 P	UJ	A	UJ	J	LC		LC	LC
	SW	160 F	UJ	UJ	UJ	UJ	LC	LC	LC	LC
	SW	160 P	UJ	A	UJ	UJ	LC		LC	LC
	NW	223 F	UJ	UJ	UJ	UJ	LC	LC	LC	LC
	NW	223 P	UJ	A	UJ	UJ	LC		LC	LC
	NE	324 F	UJ	UJ	UJ	UJ	LC	LC	LC	LC
	NE	324 P	UJ	J	UJ	UJ	LC	LC	LC	LC
	SE	424 F	UJ	UJ	UJ	UJ	LC	LC	LC	LC
	SE	424 P	UJ	A	UJ	UJ	LC		LC	LC
	FB	630 F	UJ	UJ	UJ	UJ	LC	LC	LC	LC
	FB	630 P	UJ	UJ	UJ	UJ	LC	LC	LC	LC
12/12-12/13	SW	161 F	UJ	J	UJ	J	LC	LC	LC	LC
	SW	161 P	UJ	J	UJ	UJ	LC	LC	LC	LC
	SW	162 F	UJ	J	UJ	J	LC	LC	LC	LC
	SW	162 P	UJ	J	UJ	UJ	LC	LC	LC	LC
	NW	224 F	UJ	UJ	UJ	J	LC	LC	LC	LC
	NW	224 P	UJ	J	UJ	UJ	LC	LC	LC	LC
	NE	325 F	UJ	UJ	UJ	J	LC	LC	LC	LC
	NE	325 P	UJ	J	UJ	UJ	LC	LC	LC	LC
	SE	425 F	UJ	A	UJ	A	LC		LC	
	SE	425 P	UJ	J	UJ	UJ	LC	LC	LC	LC
	FB	631 F	UJ	UJ	UJ	UJ	LC	LC	LC	LC
	FB	631 P	UJ	UJ	UJ	UJ	LC	LC	LC	LC
12/13-12/14	SW	163 F	UJ	UJ	UJ	UJ	LC	LC	LC	LC
	SW	163 P	UJ	J	UJ	UJ	LC	LC	LC	LC
	SW	164 F	UJ	UJ	UJ	UJ	LC	LC	LC	LC
	SW	164 P	UJ	J	UJ	UJ	LC	LC	LC	LC
	NW	225 F	UJ	UJ	UJ	UJ	LC	LC	LC	LC
	NW	225 P	UJ	J	UJ	UJ	LC	LC	LC	LC
	NE	326 F	UJ	UJ	UJ	UJ	LC	LC	LC	LC
	NE	326 P	UJ	J	UJ	UJ	LC	LC	LC	LC
	SE	426 F	UJ	UJ	UJ	UJ	LC	LC	LC	LC
	SE	426 P	UJ	J	UJ	UJ	LC	LC	LC	LC
	FB	632 F	UJ	UJ	UJ	UJ	LC	LC	LC	LC
	FB	632 P	UJ	UJ	UJ	UJ	LC	LC	LC	LC

TABLE B-1 (cont'd)

Date	Location	Sample	Qualifier 1016	1242	1248	1254	Comments 1016	1242	1248	1254
12/16-12/17	SW	165 F	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	SW	165 P	J	UJ	UJ	UJ	LH	LH	LH	LH
	SW	166 F	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	SW	166 P	J	UJ	UJ	UJ	LH	LH	LH	LH
	NW	226 F	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	NW	226 P	J	UJ	UJ	J	LH	LH	LH	LH
	NE	327 F	J	UJ	UJ	J	LH	LH	LH	LH
	NE	327 P	J	UJ	UJ	UJ	LH	LH	LH	LH
	SE	427 F	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	SE	427 P	J	UJ	UJ	J	LH	LH	LH	LH
	FB	633 F	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	FB	633 P	UJ	UJ	UJ	UJ	LH	LH	LH	LH
12/17-12/18	SW	167 F	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	SW	167 P	J	UJ	UJ	UJ	LH	LH	LH	LH
	SW	168 F	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	SW	168 P	J	UJ	UJ	UJ	LH	LH	LH	LH
	NW	227 F	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	NW	227 P	J	UJ	UJ	UJ	LH	LH	LH	LH
	NE	328 F	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	NE	328 P	J	UJ	UJ	J	LH	LH	LH	LH
	SE	428 F	UJ	UJ	UJ	J	LH	LH	LH	LH
	SE	428 P	J	UJ	UJ	J	LH	LH	LH	LH
	FB	634 F	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	FB	634 P	UJ	UJ	UJ	UJ	LH	LH	LH	LH
12/18-12/19	SW	169 F	J	UJ	UJ	J	LH	LH	LH	LH
	SW	169 P	J	UJ	UJ	UJ	LH	LH	LH	LH
	SW	170 F	J	UJ	UJ	J	LH	LH	LH	LH
	SW	170 P	J	UJ	UJ	UJ	LH	LH	LH	LH
	NW	228 F	J	UJ	UJ	J	LH	LH	LH	LH
	NW	228 P	J	UJ	UJ	J	LH	LH	LH	LH
	NE	329 F	J	UJ	UJ	J	LH	LH	LH	LH
	NE	329 P	J	UJ	UJ	J	LH	LH	LH	LH
	SE	429 F	J	UJ	UJ	J	LH	LH	LH	LH
	SE	429 P	J	UJ	UJ	J	LH	LH	LH	LH
	FB	635 F	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	FB	635 P	UJ	UJ	UJ	UJ	LH	LH	LH	LH
12/19-12/20	SW	171 F	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	SW	171 P	UJ	UJ	UJ	J	LH,FB	LH	LH	LH
	SW	172 F	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	SW	172 P	UJ	UJ	UJ	J	LH,FB	LH	LH	LH
	NW	229 F	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	NW	229 P	UJ	UJ	UJ	UJ	LH,FB	LH	LH	LH
	NE	330 F	UJ	UJ	UJ	J	LH	LH	LH	LH
	NE	330 P	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	SE	430 F	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	SE	430 P	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	FB	636 F	LAB LOST SAMPLE							
	FB	636 P	J	UJ	UJ	J	LH	LH	LH	LH
12/21-12/22	SW	173 F	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	SW	173 P	UJ	UJ	UJ	UJ	LH,FD	LH	LH	LH
	SW	174 F	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	SW	174 P	UJ	UJ	UJ	UJ	LH,FD,FB	LH	LH	LH
	NW	230 F	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	NW	230 P	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	NE	331 F	J	UJ	UJ	UJ	LH	LH	LH	LH
	NE	331 P	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	SE	431 F	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	SE	431 P	UJ	UJ	J	UJ	LH	LH	LH	LH
	FB	637 F	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	FB	637 P	J	UJ	UJ	J	LH	LH	LH	LH

TABLE B-1 (cont'd)

Date	Location	Sample	Qualifier 1016	1242	1248	1254	Comments 1016	1242	1248	1254
12/27/12/28	SW	175 F	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	SW	175 P	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	SW	176 F	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	SW	176 P	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	NW	231 F	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	NW	231 P	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	NE	332 F	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	NE	332 P	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	SE	432 F	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	SE	432 P	UJ		UJ		LH	LH	LH	LH
	BG	501 F	LAB LOST SAMPLE							
	BG	501 P	J	UJ	UJ	J	LH	LH	LH	LH
	FB	638 F	UJ	UJ	UJ	UJ	LH,LB	LH	LH	LH,LB
	FB	638 P	J	UJ	UJ	J	LH,LB	LH	LH	LH,LB
12/28-12/29	BG	502 F	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	BG	502 P	UJ	UJ	UJ	UJ	LH,LB	LH	LH	LH
	FB	639 F	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	FB	639 P	J	UJ	UJ	J	LH	LH	LH	LH
12/29-12/30	BG	503 F	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	BG	503 P	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	FB	640 F	UJ	UJ	UJ	UJ	LH	LH	LH	LH
	FB	640 P	UJ	UJ	UJ	UJ	LH	LH	LH	LH
1/7-1/8	SW	177 F	A	A	A	J				FD
	SW	177 P	A	A	A	A				
	SW	178 F	A	A	A	J				FD
	SW	178 P	A	A	A	A				
	NW	232 F	A	A	A	A				
	NW	232 P	A	A	A	A				
	NE	333 F	A	A	A	A				
	NE	333 P	A	A	A	A				
	SE	433 F	A	A	A	A				
	SE	433 P	A	A	A	A				
	BG	504 F	A	A	A	A				
	BG	504 P	A	A	A	A				
	FB	641 F	A	A	A	A				
	FB	641 P	A	A	A	A				
1/8-1/9	SW	179 F	A	A	A	A				
	SW	179 P	A	A	A	A				
	SW	180 F	A	A	A	A				
	SW	180 P	A	A	A	A				
	NW	233 F	A	A	A	A				
	NW	233 P	A	A	A	A				
	NE	334 F	A	A	A	A				
	NE	334 P	A	A	A	A				
	SE	434 F	A	A	A	A				
	SE	434 P	A	A	A	A				
	BG	505 F	A	A	A	A				
	BG	505 P	U	A	A	U	LB			LB
	FB	642 F	A	A	A	A				
	FB	642 P	A	A	A	A				

TABLE B-1 (cont'd)

Date	Location	Sample	Qualifier 1016	1242	1248	1254	Comments 1016	1242	1248	1254
1/9-1/10	SW	181 F	A	A	A	A				
	SW	181 P	A	A	A	A				
	SW	182 F	A	A	A	A				
	SW	182 P	A	A	A	A				
	NW	234 F	A	A	A	A				
	NW	234 P	A	A	A	A				
	NE	335 F	A	A	A	A				
	NE	335 P	A	A	A	A				
	SE	435 F	A	A	A	A				
	SE	435 P	A	A	A	A				
	BG	506 F	A	A	A	A				
	BG	506 P	A	A	A	A				
	FB	643 F	A	A	A	A				
	FB	643 P	A	A	A	A				
1/10-1/11	SW	183 F	A	A	A	A				
	SW	183 P	A	A	A	A				
	SW	184 F	A	A	A	A				
	SW	184 P	A	A	A	A				
	NW	235 F	A	A	A	A				
	NW	235 P	A	A	A	A				
	NE	336 F	A	A	A	A				
	NE	336 P	A	A	A	A				
	SE	436 F	A	A	A	A				
	SE	436 P	A	A	A	A				
	BG	507 F	A	A	A	A				
	BG	507 P	A	A	A	A				
	FB	644 F	A	A	A	A				
	FB	644 P	A	A	A	A				
1/11-1/12	SW	185 F	A	A	A	A				
	SW	185 P	A	A	A	A				
	SW	186 F	A	A	A	A				
	SW	186 P	A	A	A	A				
	NW	236 F	A	A	A	A				
	NW	236 P	A	A	A	A				
	NE	337 F	A	A	A	A				
	NE	337 P	A	A	A	A				
	SE	437 F	A	A	A	A				
	SE	437 P	A	A	A	A				
	BG	508 F	A	A	A	A				
	BG	508 P	A	A	A	A				
	FB	645 F	A	A	A	A				
	FB	645 P	A	A	A	A				
1/12-1/13	SW	187 F	A	A	A	A				
	SW	187 P	A	A	A	A				
	SW	188 F	A	A	A	A				
	SW	188 P	A	A	A	A				
	NW	237 F	A	A	A	A				
	NW	237 P	A	A	A	A				
	NE	338 F	A	A	A	A				
	NE	338 P	A	A	A	A				
	SE	438 F	A	A	A	A				
	SE	438 P	A	A	A	A				
	BG	509 F	A	A	A	A				
	BG	509 P	A	A	A	A				
	FB	646 F	A	A	A	A				
	FB	646 P	A	A	A	A				

TABLE B-1 (cont'd)

Date	Location	Sample	Qualifier 1016	1242	1248	1254	Comments 1016	1242	1248	1254
1/18-1/19	SW	189 F	A	A	A	A				
	SW	189 P	A	A	A	A				
	SW	190 F	A	A	A	A				
	SW	190 P	A	A	A	A				
	NW	238 F	A	A	A	A				
	NW	238 P	A	A	A	A				
	NE	339 F	A	A	A	A				
	NE	339 P	A	A	A	A				
	SE	439 F	A	A	A	A				
	SE	439 P	A	A	A	A				
	BG	510 F	A	A	A	A				
	BG	510 P	A	A	A	A				
	FB	647 F	A	A	A	A				
	FB	647 P	A	A	A	A				
1/19-1/20	SW	191 F	A	A	A	A				
	SW	191 P	A	A	A	A				
	SW	192 F	A	A	A	A				
	SW	192 P	A	A	A	A				
	NW	239 F	A	A	A	A				
	NW	239 P	A	A	A	A				
	NE	340 F	A	A	A	A				
	NE	340 P	A	A	A	A				
	SE	440 F	A	A	A	A				
	SE	440 P	A	A	A	A				
	BG	511 F	J	A	A	A	LC			
	BG	511 P	LAB LOST SAMPLE							
	FB	648 F	A	A	A	A				
	FB	648 P	A	A	A	A				
1/20-1/21	SW	193 F	A	A	A	A				
	SW	193 P	A	A	A	A				
	SW	194 F	A	A	A	A				
	SW	194 P	A	A	A	A				
	NW	240 F	A	A	A	A				
	NW	240 P	A	A	A	A				
	NE	341 F	A	A	A	A				
	NE	341 P	A	A	A	A				
	SE	441 F	A	A	A	A				
	SE	441 P	A	A	A	A				
	BG	512 F	A	A	A	A				
	BG	512 P	A	A	A	A				
	FB	649 F	A	A	A	A				
	FB	649 P	A	A	A	A				
4/3-4/4	SW	195 F	A	UJ	UJ	A		LI	LI	
	SW	195 P	A	UJ	UJ	A		LI	LI	
	SW	196 F	A	UJ	UJ	A		LI	LI	
	SW	196 P	A	UJ	UJ	A		LI	LI	
	NW	241 F	A	UJ	UJ	A		LI	LI	
	NW	241 P	A	UJ	UJ	A		LI	LI	
	NE	342 F	A	UJ	UJ	A		LI	LI	
	NE	342 P	A	UJ	UJ	A		LI	LI	
	SE	442 F	A	UJ	UJ	A		LI	LI	
	SE	442 P	A	UJ	UJ	A		LI	LI	
	BG	513 F	A	UJ	UJ	A		LI	LI	
	BG	513 P	A	UJ	UJ	A		LI	LI	
	FB	650 F	A	UJ	UJ	A		LI	LI	
	FB	650 P	A	UJ	UJ	A		LI	LI	

TABLE B-1 (cont'd)

Date	Location	Sample	Qualifier 1016	1242	1248	1254	Comments 1016	1242	1248	1254
4/4-4/5	SW	197 F	A	UJ	UJ	A		LI	LI	
	SW	197 P	A	UJ	UJ	A		LI	LI	
	SW	198 FG	A	UJ	UJ	A		LI	LI	
	SW	198 P	A	UJ	UJ	A		LI	LI	
	NW	242 F	A	UJ	UJ	A		LI	LI	
	NW	242 P	A	UJ	UJ	A		LI	LI	
	NE	343 F	A	UJ	UJ	A		LI	LI	
	NE	343 P	A	UJ	UJ	A		LI	LI	
	SE	443 F	A	UJ	UJ	A		LI	LI	
	SE	443 P	A	UJ	UJ	A		LI	LI	
	BG	514 F	A	UJ	UJ	A		LI	LI	
	BG	514 P	A	UJ	UJ	A		LI	LI	
	FB	651 F	A	UJ	UJ	A		LI	LI	
	FB	651 P	A	UJ	UJ	A		LI	LI	
	FB	651 FG	A	UJ	UJ	A		LI	LI	
4/5-4/6	SW	199 F	A	UJ	UJ	A		LI	LI	
	SW	199 FG	A	UJ	UJ	A		LI	LI	
	SW	1100 FG	A	UJ	UJ	A		LI	LI	
	SW	1100 P	A	UJ	UJ	A		LI	LI	
	NW	243 F	A	UJ	UJ	A		LI	LI	
	NW	243 P	A	UJ	UJ	A		LI	LI	
	NE	344 F	A	UJ	UJ	A		LI	LI	
	NE	344 P	A	UJ	UJ	A		LI	LI	
	SE	444 F	A	UJ	UJ	A		LI	LI	
	SE	444 P	A	UJ	UJ	A		LI	LI	
	BG	515 F	A	UJ	UJ	A		LI	LI	
	BG	515 P	A	UJ	UJ	A		LI	LI	
	FB	652 F	A	UJ	UJ	A		LI	LI	
	FB	652 P	A	UJ	UJ	A		LI	LI	
	FB	652 FG	A	UJ	UJ	A		LI	LI	
4/6-4/7	SW	1101 F	A	UJ	UJ	A		LI	LI	
	SW	1101 P	A	UJ	UJ	A		LI	LI	
	SW	1102 F	A	UJ	UJ	A		LI	LI	
	SW	1102 P	A	UJ	UJ	A		LI	LI	
	NW	244 F	A	UJ	UJ	A		LI	LI	
	NW	244 P	A	UJ	UJ	A		LI	LI	
	NE	345 F	A	UJ	UJ	A		LI	LI	
	NE	345 P	A	UJ	UJ	A		LI	LI	
	SE	445 F	A	UJ	UJ	A		LI	LI	
	SE	445 P	A	UJ	UJ	A		LI	LI	
	BG	516 F	A	UJ	UJ	A		LI	LI	
	BG	516 P	A	UJ	UJ	A		LI	LI	
	FB	653 F	A	UJ	UJ	A		LI	LI	
	FB	653 P	A	UJ	UJ	A		LI	LI	
4/10-4/11	SW	1103 F	A	UJ	UJ	A		LI	LI	
	SW	1103 P	A	UJ	UJ	A		LI	LI	
	SW	1104 F	A	UJ	UJ	A		LI	LI	
	SW	1104 P	A	UJ	UJ	A		LI	LI	
	NW	245 F	A	UJ	UJ	A		LI	LI	
	NW	245 P	A	UJ	UJ	A		LI	LI	
	NE	346 F	A	UJ	UJ	A		LI	LI	
	NE	346 P	A	UJ	UJ	A		LI	LI	
	SE	446 F	A	UJ	UJ	A		LI	LI	
	SE	446 P	A	UJ	UJ	A		LI	LI	
	BG	517 F	A	UJ	UJ	A		LI	LI	
	BG	517 P	A	UJ	UJ	A		LI	LI	
	FB	654 F	A	UJ	UJ	A		LI	LI	
	FB	654 P	A	UJ	UJ	A		LI	LI	

TABLE B-1 (cont'd)

Date	Location	Sample	Qualifier 1016	1242	1248	1254	Comments 1016	1242	1248	1254
4/11-4/12	SW	1105 F	A	UJ	UJ	A		LI	LI	
	SW	1105 P	A	UJ	UJ	A		LI	LI	
	SW	1106 FG	A	UJ	UJ	A		LI	LI	
	SW	1106 P	A	UJ	UJ	A		LI	LI	
	NW	246 F	A	UJ	UJ	A		LI	LI	
	NW	246 P	A	UJ	UJ	A		LI	LI	
	NE	347 F	A	UJ	UJ	A		LI	LI	
	NE	347 P	A	UJ	UJ	A		LI	LI	
	SE	447 F	A	UJ	UJ	A		LI	LI	
	SE	447 P	A	UJ	UJ	A		LI	LI	
	BG	518 F	A	UJ	UJ	A		LI	LI	
	BG	518 P	A	UJ	UJ	A		LI	LI	
	FB	655 F	A	UJ	UJ	A		LI	LI	
	FB	655 P	A	UJ	UJ	A		LI	LI	
	FB	655 FG	A	UJ	UJ	A		LI	LI	
4/12-4/13	SW	1107 F	A	UJ	UJ	A		LI	LI	
	SW	1107 P	A	UJ	UJ	A		LI	LI	
	SW	1108 F	A	UJ	UJ	A		LI	LI	
	SW	1108 P	A	UJ	UJ	A		LI	LI	
	NW	247 F	A	UJ	UJ	A		LI	LI	
	NW	247 P	A	UJ	UJ	A		LI	LI	
	NE	348 F	A	UJ	UJ	A		LI	LI	
	NE	348 P	A	UJ	UJ	A		LI	LI	
	SE	448 F	A	UJ	UJ	A		LI	LI	
	SE	448 P	A	UJ	UJ	A		LI	LI	
	BG	519 F	A	UJ	UJ	A		LI	LI	
	BG	519 P	A	UJ	UJ	A		LI	LI	
	FB	656A F	A	UJ	UJ	A		LI	LI	
	FB	656A P	A	UJ	UJ	A		LI	LI	
4/13-4/14	SW	1109 F	A	UJ	UJ	A		LI	LI	
	SW	1109 P	A	UJ	UJ	A		LI	LI	
	SW	1110 FG	A	UJ	UJ	A		LI	LI	
	SW	1110 P	A	UJ	UJ	A		LI	LI	
	NW	248 F	A	UJ	UJ	A		LI	LI	
	NW	248 P	J	UJ	UJ	J	LE	LE,LI	LE,LI	LE
	NE	349 F	A	UJ	UJ	A		LI	LI	
	NE	349 P	A	UJ	UJ	A		LI	LI	
	SE	449 F	A	UJ	UJ	A		LI	LI	
	SE	449 P	A	UJ	UJ	A		LI	LI	
	BG	520 F	A	UJ	UJ	A		LI	LI	
	BG	520 P	A	UJ	UJ	A		LI	LI	
	FB	656B F	A	UJ	UJ	A		LI	LI	
	FB	656B P	A	UJ	UJ	A		LI	LI	
	FB	656B FG	A	UJ	UJ	A		LI	LI	
4/17-4/18	SW	1111 F	A	A	A	A				
	SW	1111 P	A	A	A	A				
	SW	1112 F	A	A	A	A				
	SW	1112 P	A	A	A	A				
	NW	249 F	A	A	A	A				
	NW	249 P	A	A	A	A				
	NE	350 F	A	A	A	A				
	NE	350 P	A	A	A	A				
	SE	450 F	A	A	A	A				
	SE	450 P	A	A	A	A				
	BG	521 F	A	A	A	A				
	BG	521 P	A	A	A	A				
	FB	657 F	A	A	A	A				
	FB	657 P	A	A	A	A				

TABLE B-1 (cont'd)

Date	Location	Sample	Qualifier 1016	1242	1248	1254	Comments 1016	1242	1248	1254
4/18-4/19	SW	1113 F	A	A	A	A				
	SW	1113 P	A	A	A	A				
	SW	1114 F	A	A	A	A				
	SW	1114 FG	A	A	A	A				
	NW	250 F	A	A	A	A				
	NW	250 P	A	A	A	A				
	NE	351 F	A	A	A	A				
	NE	351 P	A	A	A	A				
	SE	451 F	A	A	A	A				
	SE	451 P	A	A	A	A				
	BG	522 F	A	A	A	A				
	BG	522 P	A	A	A	A				
	FB	658 F	A	A	A	A				
	FB	658 P	A	A	A	A				
	FB	658 FG	A	A	A	A				
4/19-4/20	SW	1115 FG	A	A	A	A				
	SW	1115 P	J	A	A	A	FD			
	SW	1116 FG	A	A	A	A				
	SW	1116 P	J	A	A	A	FD			
	NW	251 F	A	A	A	A				
	NW	251 P	A	A	A	A				
	NE	352 F	A	A	A	A				
	NE	352 P	A	A	A	A				
	SE	452 F	A	A	A	A				
	SE	452 P	A	A	A	A				
	BG	523 F	A	A	A	A				
	BG	523 P	A	A	A	A				
	FB	659 F	A	A	A	A				
	FB	659 P	A	A	A	A				
	FB	659 FG	A	A	A	A				
4/20-4/21	SW	1117 F	A	A	A	A				
	SW	1117 P	A	A	A	A				
	SW	1118 FG	A	A	A	A				
	SW	1118 P	A	A	A	A				
	NW	252 F	A	A	A	A				
	NW	252 P	A	A	A	A				
	NE	353 F	A	A	A	A				
	NE	353 P	A	A	A	A				
	SE	453 F	A	A	A	A				
	SE	453 P	A	A	A	A				
	BG	524 F	A	A	A	A				
	BG	524 P	A	A	A	A				
	FB	660 F	A	A	A	A				
	FB	660 P	A	A	A	A				
	FB	660 FG	A	A	A	A				
4/24-4/25	SW	1119 F	A	A	A	A				
	SW	1119 P	J	UJ	UJ	J	LS	LS	LS	LS
	SW	1120 F	A	A	A	A				
	SW	1120 P	J	UJ	UJ	J	LS	LS	LS	LS
	NW	253 F	A	A	A	A				
	NW	253 P	J	UJ	UJ	J	LS	LS	LS	LS
	NE	354 F	A	A	A	A				
	NE	354 P	J	UJ	UJ	J	LS	LS	LS	LS
	SE	454 F	A	A	A	A				
	SE	454 P	J	UJ	UJ	J	LS	LS	LS	LS
	BG	525 F	A	A	A	A				
	BG	525 P	J	UJ	UJ	J	LS	LS	LS	LS
	FB	661 F	A	A	A	A				
	FB	661 P	UJ	UJ	UJ	UJ	LS	LS	LS	LS

TABLE B-1 (cont'd)

Date	Location	Sample	Qualifier 1016	1242	1248	1254	Comments 1016	1242	1248	1254
4/25-4/26	SW	1121 F	A	A	A	A				
	SW	1121 P	J	UJ	UJ	J	LS	LS	LS	LS
	SW	1122 FG	UJ	UJ	UJ	UJ	LS	LS	LS	LS
	SW	1122 P	J	UJ	UJ	J	LS	LS	LS	LS
	NW	254 F	A	A	A	A				
	NW	254 P	J	UJ	UJ	J	LS	LS	LS	LS
	NE	355 F	A	A	A	A				
	NE	355 P	J	UJ	UJ	J	LS	LS	LS	LS
	SE	455 F	A	A	A	A				
	SE	455 P	J	UJ	UJ	J	LS	LS	LS	LS
	BG	526 F	A	A	A	A				
	BG	526 P	J	UJ	UJ	J	LS	LS	LS	LS
	FB	662 F	A	A	A	A				
	FB	662 P	UJ	UJ	UJ	UJ	LS	LS	LS	LS
	FB	662 FG	UJ	UJ	UJ	UJ	LS	LS	LS	LS
4/26-4/27	SW	1123 F	A	A	A	A				
	SW	1123 P	J	UJ	UJ	J	LS	LS	LS	LS
	SW	1124 F	A	A	A	A				
	SW	1124 P	J	UJ	UJ	J	LS	LS	LS	LS
	NW	255 F	A	A	A	A				
	NW	255 P	J	UJ	UJ	J	LS	LS	LS	LS
	NE	356 F	A	A	A	A				
	NE	356 P	J	UJ	UJ	J	LS	LS	LS	LS
	SE	456 F	A	A	A	A				
	SE	456 P	J	UJ	UJ	J	LS	LS	LS	LS
	BG	527 F	A	A	A	A				
	BG	527 P	J	UJ	UJ	J	LS	LS	LS	LS
	FB	663 F	A	A	A	A				
	FB	663 P	UJ	UJ	UJ	UJ	LS	LS	LS	LS
4/27-4/28	SW	1125 F	A	A	A	A				
	SW	1125 P	J	UJ	UJ	J	LS	LS	LS	LS
	SW	1126 FG	UJ	UJ	UJ	UJ	LS	LS	LS	LS
	SW	1126 P	J	UJ	UJ	J	LS	LS	LS	LS
	NW	256 F	A	A	A	A				
	NW	256 P	J	UJ	UJ	J	LS	LS	LS	LS
	NE	357 F	A	A	A	A				
	NE	357 P	J	UJ	UJ	J	LS	LS	LS	LS
	SE	457 F	A	A	A	A				
	SE	457 P	J	UJ	UJ	J	LS	LS	LS	LS
	BG	528 F	A	A	A	A				
	BG	528 P	J	UJ	UJ	J	LS	LS	LS	LS
	FB	664 F	A	A	A	A				
	FB	664 P	UJ	UJ	UJ	UJ	LS	LS	LS	LS
	FB	664 FG	UJ	UJ	UJ	UJ	LS	LS	LS	LS

NOTES FOR TABLE B-1

Qualifiers

A	Data meets the data validation (DV) requirements and it is therefore accepted.
B	Data does not meet the DV requirements. Therefore, this positive result should be considered approximate.
U	The associated data does not meet the DV requirements for blanks. Therefore, the detection limit (DL) has been raised and this result is below the adjusted DL.
UJ	Data does not meet the DV requirements. Therefore, this result at or below the DL should be considered approximate (i.e., analyte could be present).
J	Data does not meet DV requirements. Therefore, positive result is approximated.

LAB LOST SAMPLE = The laboratory lost (broke, spilled, etc.) the sample during preparation.
NO RUN = The high volume sampler on this day was not running properly due to mechanical difficulties at this location.

NOTE: Data for samples collected 11/7-11/18/88 was reported as non-detected for the indicated aroclors. However, after review of the data from this period, it appears that some polychlorinated biphenyl (PCB) components of the aroclors are present. Therefore, although there is no laboratory/analytical error, it should be noted that some individual PCBs may be present in this data.

Comments

Primary

F	Result qualified due to field error.
L	Result qualified due to laboratory error.

Secondary

B	Data approximated due to blank contamination.
C	Data approximated due to instrument calibration problems.
D	Data approximated to duplicate precision error(s).
E	Data approximated due to sample extraction error.
H	Sample extraction holding times were exceeded.
I	Data approximated due to insufficient identification criteria.
M	Data approximated due to matrix interference.
Q	Data approximated due to quantification errors.
S	Spikes of glass filters and puffs were not extracted or analyzed.

TABLE B-2

Metals Data Validation Summary

Date	Location	Sample No.	Qualifier Cd	Qualifier Cr	Qualifier Pb	Comments Cd	Comments Cr	Comments Pb
11/7-11/8	SWH-1	101	A	U	A		FB	
	SWH-C	201	A	U	A		FB	
	FB	301	A	A	A			
11/8-11/9	SWH-1	102	UJ	U	A	LB,FD	FB	
	SWH-C	202	UJ	U	A	LB,FD	FB	
	FB	302	A	A	A			
11/9-11/10	SWH-1	103	U	UJ	A	LB	FB,FD	
	SWH-C	203	U	UJ	A	LB	FB,FD	
	FB	303	A	A	A			
11/10-11/11	SWH-1	104	UJ	U	A	LB,FD	FB	
	SWH-C	204	UJ	U	A	LB,FD	FB	
	FB	304	A	A	A			
11/11-11/12	SWH-1	105	UJ	UJ	A	LM	LM,FB,FD	
	SWH-C	205	UJ	UJ	A	LM	LM,FB,FD	
	FB	305	UJ	UJ	A	LM	LM	
11/12-11/13	SWH-1	106	UJ	UJ	A	LM	LM,FB	
	SWH-C	206	UJ	UJ	A	LM	LM,FB	
	FB	306	UJ	UJ	A	LM	LM	
11/13-11/14	SWH-1	107	UJ	UJ	A	LM	LM,FB	
	SWH-C	207	J	UJ	A	LM	LM,FB	
	FB	307	UJ	UJ	A	LM	LM	
11/14-11/15	SWH-1	108	J	UJ	A	LM	LM,FB,FD	
	SWH-C	208	UJ	UJ	A	LM	LM,FB,FD	
	FB	308	UJ	J	A	LM	LM	
11/15-11/16	SWH-1	109	J	UJ	A	LM	LM,FB,FD	
	SWH-C	209	J	UJ	A	LM	LM,FB,FD	
	FB	309	UJ	J	A	LM	LM	
11/16-11/17	SWH-1	110	UJ	UJ	J	LM,FB	LM,FD	LM
	SWH-C	210	UJ	J	J	LM,FB	LM,FD	LM
	FB	310	UJ	UJ	J	LM	LM	LM
11/17-11/18	SWH-1	111	UJ	J	J	LM,FB	LM	LM
	SWH-C	211	UJ	UJ	J	LM	LM	LM
	FB	311	UJ	UJ	UJ	LM	LM	LM
11/18-11/19	SWH-1	112	UJ	UJ	J	LM,FB	LM	LM
	SWH-C	212	UJ	J	J	LM,FB	LM	LM
	FB	312	UJ	UJ	J	LM	LM	LM
11/19-11/20	SWH-1	113	UJ	UJ	J	LM	LM	LM
	SWH-C	213	UJ	J	J	LM,FB	LM	LM
	FB	313	UJ	UJ	UJ	LM	LM	LM
11/21-11/22	SWH-1	114	UJ	J	J	LM,FB	LM	LM
	SWH-C	214	UJ	J	J	LM,FB	LM	LM
	FB	314	UJ	UJ	UJ	LM	LM	LM

TABLE B-2 (cont'd)

Date	Location	Sample No.	Qualifier Cd	Qualifier Cr	Qualifier Pb	Comments Cd	Comments Cr	Comments Pb
11/22-11/23	SWH-1	115	U	A	A	FB		
	SWH-C	215	U	A	A	FB		
	FB	315	A	A	A			
11/23-11/24	SWH-1	116	U	A	A	FB		
	SWH-C	216	U	A	A	FB		
	FB	316	A	A	A			
11/25-11/26	SWH-1	117	A	A	A			
	SWH-C	217	A	A	A			
	FB	317	A	A	A			
11/26-11/27	SWH-1	118	U	A	A	FB		
	SWH-C	218	A	A	A			
	FB	318	A	A	A			
11/27-11/28	SWH-1	119	A	A	A			
	SWH-C	219	A	A	A			
	FB	319	A	A	A			
11/28-11/29	SWH-1	120	UJ	UJ	J	LC,LM	LM,FB	LM
	SWH-C	220	UJ	UJ	UJ	LC,LM	LM,FB	LM
	FB	320	UJ	J	UJ	LC,LM	LM	LM
11/29-11/30	SWH-1	121	J	UJ	J	LC,LM	LM,FB	LM
	SWH-C	221	J	UJ	J	LC,LM	LM,FB	LM
	FB	321	UJ	J	UJ	LC,LM	LM	LM
11/30-12/1	SWH-1	122	J	UJ	J	LC,LM	LM,FB	LM
	SWH-C	222	UJ	UJ	J	LC,LM	LM,FB	LM
	FB	322	UJ	J	UJ	LC,LM	LM	LM
12/1-12/2	SWH-1	123	UJ	UJ	J	LC,LM	LM,FB	LM
	SWH-C	223	UJ	J	J	LC,LM	LM,FB	LM
	FB	323	UJ	J	UJ	LC,LM	LM	LM
12/2-12/3	SWH-1	124	J	UJ	J	LC,LM	LM,FB	LM
	SWH-C	224	J	UJ	J	LC,LM	LM,FB	LM
	FB	324	UJ	J	UJ	LC,LM	LM	LM
12/3-12/4	SWH-1	125	J	UJ	J	LC,LM	LM,FB	LM
	SWH-C	225	UJ	UJ	J	LC,LM	LM,FB	LM
	FB	325	UJ	J	J	LC,LM	LM	LM
12/5-12/6	SWH-1	126	J	UJ	J	LC,LM	LM,FB	LM
	SWH-C	226	J	UJ	J	LC,LM	LM,FB	LM
	FB	326	UJ	J	UJ	LC,LM	LM	LM
12/6-12/7	SWH-1	127	UJ	UJ	UJ	LM,FB	LM,FB	LM,FB,FD
	SWH-C	227	UJ	UJ	UJ	LM,FB	LM,FB	LM,FB,FD
	FB	327	J	J	J	LM	LM	LM
12/9-12/10	SWH-1	128	UJ	UJ	UJ	LM,FB	LM,FB	LM,FB
	SWH-C	228	UJ	UJ	UJ	LM,FB	LM,FB	LM,FB
	FB	328	UJ	J	UJ	LM	LM	LM
12/10-12/11	SWH-1	129	UJ	UJ	UJ	LM,FB	LM,FB	LM,FB
	SWH-C	229	UJ	UJ	UJ	LM,FB	LM,FB	LM,FB
	FB	329	UJ	J	UJ	LM	LM	LM

TABLE B-2 (cont'd)

Date	Location	Sample No.	Qualifier Cd	Qualifier Cr	Qualifier Pb	Comments Cd	Comments Cr	Comments Pb
12/11-12/12	SWH-1	130	UJ	UJ	UJ	LM,FB	LM,FB	LM,FB
	SWH-C	230	UJ	UJ	UJ	LM,FB	LM,FB	LM,FB
	FB	330	UJ	J	UJ	LM	LM	LM
12/12-12/13	SWH-1	131	UJ	UJ	UJ	LM,FB	LM,FB	LM,FB
	SWH-C	231	UJ	UJ	UJ	LM,FB	LM,FB	LM,FB
	FB	331	UJ	J	UJ	LM	LM	LM
12/13-12/14	SWH-1	132	UJ	J	J	LM	LM	LM
	SWH-C	232	UJ	J	J	LM	LM	LM
	FB	332	UJ	J	UJ	LM	LM	LM
12/16-12/17	SWH-1	133	UJ	UJ	J	LM	LM,FB	LM
	SWH-C	233	UJ	UJ	J	LM	LM,FB	LM
	FB	333	UJ	J	UJ	LM	LM	LM
12/17-12/18	SWH-1	134	J	UJ	J	LM	LM,FB	LM
	SWH-C	234	UJ	UJ	J	LM	LM,FB	LM
	FB	334	UJ	J	UJ	LM	LM	LM
12/18-12/19	SWH-1	135	J	UJ	J	LM	LM,FB	LM
	SWH-C	235	UJ	UJ	J	LM	LM,FB	LM
	FB	335	UJ	J	UJ	LM	LM	LM
12/19-12/20	SWH-1	136	UJ	UJ	J	LM	LM,FB	LM
	SWH-C	236	UJ	UJ	J	LM	LM,FB	LM
	FB	336	UJ	J	UJ	LM	LM	LM
12/21-12/22	SWH-1	137	R	R	R	LM	LM,FB	LM
	SWH-C	237	R	R	R	LM	LM,FB	LM
	FB	337	R	R	R	LM	LM	LM
12/27-12/28	SWH-1	138	R	R	R	LM	LM,FB,FD	LM
	SWH-C	238	R	R	R	LM	LM,FB,FD	LM
	FB	338	R	R	R	LM	LM	LM
1/7-1/8	SWH-1	139	UJ	UJ	J	LM	LM,FB	LM
	SWH-C	239	J	UJ	J	LM	LM,FB	LM
	FB	339	UJ	J	UJ	LM	LM	LM
1/8-1/9	SWH-1	140	J	UJ	J	LM	LM,FB	LM
	SWH-C	240	J	UJ	J	LM	LM,FB	LM
	FB	340	UJ	J	UJ	LM	LM	LM
1/9-1/10	SWH-1	141	J	UJ	J	LM	LM,FB	LM
	SWH-C	241	J	UJ	J	LM	LM,FB	LM
	FB	341	UJ	J	UJ	LM	LM	LM
1/10-1/11	SWH-1	142	J	UJ	J	LM	LM,FB	LM
	SWH-C	242	J	UJ	J	LM	LM,FB	LM
	FB	342	UJ	J	UJ	LM	LM	LM
1/11-1/12	SWH-1	143	J	UJ	J	LM	LM,FB	LM
	SWH-C	243	J	UJ	J	LM	LM,FB	LM
	FB	343	UJ	J	UJ	LM	LM	LM
1/12-1/13	SWH-1	144	UJ	A	A	LM		
	SWH-C	244	UJ	A	A	LM		
	FB	344	UJ	A	A	LM		

TABLE B-2 (cont'd)

Date	Location	Sample No.	Qualifier Cd	Qualifier Cr	Qualifier Pb	Comments Cd	Comments Cr	Comments Pb
1/18-1/19	SWH-1	145	UJ	U	A	LM	LM,FB	
	SWH-C	245	UJ	U	A	LM	LM,FB	
	FB	345	UJ	A	A	LM	LM	
1/19-1/20	SWH-1	146	UJ	A	A	LM		
	SWH-C	246	UJ	U	A	LM	LM,FB	
	FB	346	UJ	A	A	LM		
1/20-1/21	SWH-1	147	UJ	U	J	LM	LM,FB	FD
	SWH-C	247	U	U	J	LM	LM,FB	FD
	FB	347	J	A	A	LM		
4/3-4/4	SWH-1	148	A	A	A			
	SWH-C	248	A	A	A			
	FB	348	A	A	A			
4/4-4/5	SWH-1	149	A	A	U			FB
	SWH-C	249G	A	U	U		LM,FB	FB
	FB	349	A	A	A			
	FB	349G	J	J	A	LM	LM	
4/5-4/6	SWH-1	150G	A	UJ	U		LM,FB,FD	FB
	SWH-C	250G	A	UJ	U		LM,FB,FD	FB
	FB	350G	J	A	A			
4/6-4/7	SWH-1	151	A	UJ	J		FD	FB,FD
	SWH-C	251G	U	UJ	UJ	LM,FB	LM,FB,FD	FB,FD
	FB	351	A	A	A			
	FB	351G	A	A	A			
4/10-4/11	SWH-1	152	U	A	A	FB		
	SWH-C	252	U	A	A	FB		
	FB	352	A	A	A			
4/11-4/12	SWH-1	153	U	A	A	FB		
	SWH-C	253G	A	A	A			
	FB	353	J	A	A	LM		
	FB	353G	A	A	A			
4/12-4/13	SWH-1	154	U	A	A	FB		
	SWH-C	254	U	A	A	FB		
	FB	354	A	A	A			
4/13-4/14	SWH-1	155	A	J	A		FD	
	SWH-C	255G	A	J	A		FD	
	FB	355	A	A	A			
	FB	355G	A	A	A			
4/17-4/18	SWH-1	156	UJ	UJ	A	LM	LM,FB,FD	
	SWH-C	256	UJ	UJ	A	LM	LM,FB,FD	
	FB	356	UJ	J	A	LM	LM	
4/18-4/19	SWH-1	157	UJ	UJ	A	LM	LM,FB	
	SWH-C	257G	UJ	UJ	A	LM	LM,FB	
	FB	357	UJ	UJ	A	LM	LM	
	FB	357G	UJ	J	A	LM	LM	

TABLE B-2 (cont'd)

Date	Location	Sample No.	Qualifier Cd	Qualifier Cr	Qualifier Pb	Comments Cd	Comments Cr	Comments Pb
4/19-4/20	SWH-1	158G	UJ	UJ	J	LM	LM,FB,FD	FD
	SWH-C	258G	UJ	UJ	J	LM	LM,FB,FD	FD
	FB	358G	UJ	J	A	LM	LM	
4/20-4/21	SWH-1	159	J	UJ	J	LM	LM,FB,FD	FD
	SWH-C	259G	UJ	UJ	J	LM	LM,FB,FD	FD
	FB	359	UJ	J	A	LM	LM	
	FB	359G	UJ	A	A	LM	LM	
4/24-4/25	SWH-1	160	UJ	UJ	J	LM	LM,FB,FD	FD
	SWH-C	260	UJ	UJ	J	LM	LM,FB,FD	FD
	FB	360	UJ	J	A	LM	LM	
4/25-4/26	SWH-1	161	UJ	UJ	A	LM	LM,FB,FD	
	SWH-C	261G	UJ	UJ	A	LM	LM,FB	
	SWH-C	261	J	UJ	A	LM	LM,FB,FD	
	FB	361	UJ	J	A	LM	LM	
	FB	361G	UJ	J	A	LM	LM	
4/26-4/27	SWH-1	162	J	UJ	A	LM	LM,FB	
	SWH-C	262	J	UJ	A	LM	LM,FB	
	FB	362	UJ	J	A	LM	LM	
4/27-4/28	SWH-1	163	UJ	UJ	J	LM	LM,FB,FD	FD
	SWH-C	263G	UJ	UJ	J	LM	LM,FB,FD	FD
	FB	363	UJ	J	A	LM	LM	
	FB	363G	UJ	J	A	LM	LM	

Comments

Primary

F Result qualified due to field error
L Result qualified due to laboratory error

Secondary

B Data approximated due to blank contamination
D Data approximated to duplicate precision error(s)
M Data approximated due to spike recovery
T Data approximated due to high standard recovery
C Data approximated due to low CRDL standard recovery

Qualifiers

A Data meets the data validation (DV) requirements and it is therefore accepted.
J Data does not meet the DV requirements. Therefore, this positive result should be considered approximate.
U Data does not meet the DV requirements for blanks. Therefore, the detection limit (DL) has been raised and this result is below the adjusted DL.
UJ Data does not meet the DV requirements. Therefore, this result at or below the DL should be considered approximate (i.e., analyte could be present).
R Data has been rejected due to gross deviation from DV requirements.

APPENDIX C

APPENDIX C

DATA TABLES

TABLE C-1

VOC Concentration Summary
Pre-Dredge Sampling

Run Date	HNU	SWC OVA	Diff.	HNU	NWC OVA	Diff.	HNU	NEC OVA	Diff.	HNU	SEC OVA	Diff.	HNU	BG OVA	Diff.
11/7-8	1.6														
11/8-9	0.8	2.8	2.0												
11/9-10	0.8	2.8	2.0												
11/10-11	0.8	3.5	2.7												
11/11-12	0.7	3.2	2.5												
11/12-13	0.7	3.3	2.6												
11/13-14	0.9	2.8	1.9	0.9	2.7	1.8	1.4	3.1	1.7	1.1	3.0	1.9			
11/14-15	1.0	2.9	1.9	1.0	3.0	2.0	0.9	2.9	2.0	0.9	2.8	1.9			
11/15-16	1.3	2.0	0.7	0.9	2.5	1.6	0.6	2.8	2.2	0.6	2.9	2.3			
11/16-17	0.7	2.5	1.8	0.7	2.5	1.8	0.9	2.6	1.7	0.8	2.6	1.8			
11/17-18	0.9	2.6	1.7	0.9	2.8	1.9	0.8	2.9	2.1	0.7	2.8	2.1			
11/18-19	0.8	2.1	1.3	0.5	2.2	1.7	0.6	2.3	1.7	0.7	2.3	1.6			
Mean	0.9	2.8	1.9	0.8	2.6	1.8	0.9	2.8	1.9	0.8	2.7	1.9	0.0	0.0	0.0
Max	1.6	3.5	2.7	1.0	3.0	2.0	1.4	3.1	2.2	1.1	3.0	2.3	0.0	0.0	0.0
Min	0.7	2.0	0.7	0.5	2.2	1.6	0.6	2.3	1.7	0.6	2.3	1.6	0.0	0.0	0.0

TABLE C-2

VOC Concentration Summary
During Dredge Sampling

Run Date	SWC HNU	SWC OVA	SWC Diff.	NWC HNU	NWC OVA	NWC Diff.	NEC HNU	NEC OVA	NEC Diff.	SEC HNU	SEC OVA	SEC Diff.	BG HNU	BG OVA	BG Diff.
11/19-20	0.8	2.3	1.5	0.7	2.1	1.4	0.7	2.2	1.5	0.8	2.3	1.5			
11/21-22	0.9	2.3	1.4				1.0	2.6	1.6	0.8	2.5	1.7			
11/22-23	0.7	2.6	1.9				0.7	2.4	1.7	0.6	2.4	1.8			
11/23-24	0.8	2.8	2.0	0.6	2.8	2.2	0.7	2.8	2.1	0.7	2.8	2.1			
11/25-26	0.6	2.4	1.8	0.6	2.4	1.8	0.7	2.6	1.9	0.6	2.6	2.0			
11/26-27	0.5	2.9	2.4	0.5	2.9	2.4	0.9	2.8	1.9	0.7	3.0	2.3			
11/27-28	0.6	2.6	2.0	0.5	2.7	2.2	0.9	2.8	1.9	0.8	2.9	2.1			
11/28-29	0.7	2.7	2.0	0.7	2.7	2.0	0.7	2.8	2.1	0.6	2.9	2.3			
11/29-30	0.8	2.7	1.9	0.7	2.8	2.1	0.8	2.8	2.0	0.8	2.9	2.1			
12/1-2	0.7	2.5	1.8	0.8	2.5	1.7	0.7	2.9	2.2	0.9	2.7	1.8			
12/2-3	0.6	2.3	1.7	0.5	2.2	1.7	0.7	2.3	1.6	0.7	2.5	1.8			
12/3-4	0.6	2.4	1.8	0.6	2.3	1.7	0.7	2.5	1.8	0.6	2.5	1.9			
12/4-5	0.6	2.5	1.9	0.6	2.4	1.8	0.7	2.8	2.1	0.6	2.7	2.1			
12/5-6	0.6	2.5	1.9	0.6	2.4	1.8	0.5	2.7	2.2	0.6	2.5	1.9			
12/6-7	0.7	2.2	1.5	0.6	2.2	1.6	0.5	2.5	2.0	0.6	2.5	1.9			
12/9-10	0.4	1.7	1.3	0.4	1.8	1.4	0.6	2.1	1.5	0.5	1.9	1.4			
12/10-11	0.6	2.4	1.8	0.4	2.5	2.1	0.6	2.7	2.1	0.6	2.6	2.0			
12/11-12	0.4	2.6	2.2	0.3	2.6	2.3	0.3	2.7	2.4	0.4	2.7	2.3			
12/12-13	0.3	2.6	2.3	0.3	2.7	2.4	0.4	2.7	2.3	0.4	2.7	2.3			
12/13-14	0.5	2.2	1.7	0.5	2.1	1.6	0.5	2.4	1.9	0.5	2.5	2.0			
12/16-17	0.6	2.9	2.3	0.5	2.6	2.1	0.5	2.6	2.1	0.8	2.2	1.4			
12/17-18	0.4	2.8	2.4	0.6	2.7	2.1	0.6	2.7	2.1	0.5	2.8	2.3			
12/18-19	0.9	2.8	1.9	0.6	3.0	2.4	0.6	2.9	2.3	0.8	2.9	2.1			
12/19-20	0.9	2.6	1.7	0.8	2.6	1.8	0.8	2.6	1.8	0.8	2.7	1.9			
12/21-22	0.9	2.2	1.3	1.0	2.3	1.3	0.8	2.6	1.8	0.7	2.6	1.9			
12/27-28	1.2	2.6	1.4	1.4	2.7	1.3	1.5	2.7	1.2	1.3	2.7	1.4	1.1	2.1	1.0
12/28-29															
12/29-30															
1/7-8	0.8	2.5	1.7	0.6	2.1	1.5	0.7	2.4	1.7	0.8	2.5	1.7	0.7	2.5	1.8
1/8-9	0.8	2.5	1.7	0.5	1.7	1.2	0.9	2.5	1.6	1.0	2.6	1.6	0.8	2.6	1.8
1/9-10	0.4	2.0	1.6	0.4	2.4	2.0	0.8	2.5	1.7	0.6	2.5	1.9			
1/10-11	0.5	2.1	1.6	0.5	2.2	1.7	0.5	2.2	1.7	0.5	2.4	1.9	0.5	2.2	1.7
1/11-12	0.6	2.2	1.6	0.5	2.2	1.7	0.6	2.4	1.8	0.6	2.5	1.9	0.5	2.2	1.7
1/12-13	0.6	2.5	1.9	0.4	2.0	1.6	0.6	2.5	1.9	0.6	2.5	1.9			
1/18-19	0.6	2.3	1.7	0.6	2.2	1.6	0.5	2.3	1.8	0.5	2.4	1.9			
1/19-20	0.4	2.1	1.7	0.3	1.8	1.5	0.4	2.2	1.8	0.4	2.2	1.8			
1/20-21	0.3	1.7	1.4	0.3	2.3	2.0	0.4	1.7	1.3	0.4	1.7	1.3			
MEAN	0.6	2.4	1.8	0.6	2.4	1.8	0.7	2.5	1.9	0.7	2.6	1.9	0.7	2.3	1.6
MAX	1.2	2.9	2.4	1.4	3.0	2.4	1.5	2.9	2.4	1.3	3.0	2.3	1.1	2.6	1.8
MIN	0.3	1.7	1.3	0.3	1.7	1.2	0.3	1.7	1.2	0.4	1.7	1.3	0.5	2.1	1.0

TABLE C-3

PCB Concentration Summary
Pre-Dredge Sampling

Run	SOUTHWEST CORNER				NORTHWEST CORNER				NORTHEAST CORNER				SOUTHEAST CORNER					BACKGROUND			
Date	Conc. 1016 $\mu g/m^3$	Conc. 1242 $\mu g/m^3$	Conc. 1254 $\mu g/m^3$	Conc. Total $\mu g/m^3$	Conc. 1016 $\mu g/m^3$	Conc. 1242 $\mu g/m^3$	Conc. 1254 $\mu g/m^3$	Conc. Total $\mu g/m^3$	Conc. 1016 $\mu g/m^3$	Conc. 1242 $\mu g/m^3$	Conc. 1254 $\mu g/m^3$	Conc. Total $\mu g/m^3$	Conc. 1016 $\mu g/m^3$	Conc. 1242 $\mu g/m^3$	Conc. 1254 $\mu g/m^3$	Conc. 1248 $\mu g/m^3$	Conc. Total $\mu g/m^3$	Conc. 1016 $\mu g/m^3$	Conc. 1242 $\mu g/m^3$	Conc. 1254 $\mu g/m^3$	Conc. Total $\mu g/m^3$
11/7-8	ND	ND	ND	ND																	
11/8-9	ND	ND	ND	ND																	
11/9-10	ND	ND	ND	ND																	
11/10-11	ND	ND	ND	ND																	
11/11-12	ND	ND	ND	ND																	
11/12-13	ND	ND	ND	ND																	
11/13-14	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND				
11/14-15	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND				
11/15-16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND				
11/16-17	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND				
11/17-18	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0055	0.0006	0.0061	ND	ND	ND	ND	ND				
11/18-19	0.0013	ND	ND	0.0013	0.0019	ND	ND	0.0019	0.0037	ND	ND	0.0018	0.0018	ND	ND	ND	0.0018				
Mean	0.0013	0.0000	0.0000	0.0013	0.0018	0.0000	0.0000	0.0018	0.0037	0.0055	0.0006	0.0049	0.0018	0.0000	0.0000	0.0000	0.0018				
Maximum	0.0013	0.0000	0.0000	0.0013	0.0018	0.0000	0.0000	0.0018	0.0037	0.0055	0.0006	0.0061	0.0018	0.0000	0.0000	0.0000	0.0018				
Minimum	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000				

TABLE C-4

PCB Concentration Summary
During Dredge Sampling

Run Date	SOUTHWEST CORNER Conc. 1016 µg/m³	Conc. 1242 µg/m³	Conc. 1254 µg/m³	Conc. Total µg/m³	NORTHWEST CORNER Conc. 1016 µg/m³	Conc. 1242 µg/m³	Conc. 1254 µg/m³	Conc. Total µg/m³	NORTHEAST CORNER Conc. 1016 µg/m³	Conc. 1242 µg/m³	Conc. 1254 µg/m³	Conc. Total µg/m³	SOUTHEAST CORNER Conc. 1016 µg/m³	Conc. 1242 µg/m³	Conc. 1254 µg/m³	Conc. 1248 µg/m³	Conc. Total µg/m³	BACKGROUND Conc. 1016 µg/m³	Conc. 1242 µg/m³	Conc. 1254 µg/m³	Conc. Total µg/m³
11/19-20	0.0043	ND	ND	0.0043	0.0053	ND	ND	0.0053	0.0049	ND	ND	0.0049	0.0039	ND	ND	ND	0.0039				
11/21-22	0.0006	ND	ND	0.0006	VOID	VOID	VOID	VOID	0.0052	ND	ND	0.0052	0.0024	ND	ND	ND	0.0024				
11/22-23	0.0129	ND	ND	0.0129	NO RUN	NO RUN	NO RUN	NO RUN	0.0165	ND	ND	0.0165	0.0143	ND	ND	ND	0.0143				
11/23-24	0.0043	ND	ND	0.0043	0.0044	ND	ND	0.0044	0.0050	ND	ND	0.0050	0.0054	ND	ND	ND	0.0054				
11/25-26	ND	ND	ND	ND	ND	ND	ND	ND	0.0084	ND	ND	0.0084	0.0090	ND	ND	ND	0.0090				
11/26-27	0.0230	ND	ND	0.0230	0.0026	ND	ND	0.0026	0.0184	ND	ND	0.0184	0.0229	ND	ND	ND	0.0229				
11/27-28	0.0021	ND	ND	0.0021	0.0024	ND	ND	0.0024	0.0067	ND	ND	0.0067	0.0104	ND	ND	ND	0.0104				
11/28-29	ND	ND	0.0004	0.0004	0.0020	ND	ND	0.0020	ND	0.0098	ND	0.0098	ND	0.0073	ND	ND	0.0073				
11/29-30	ND	0.0114	ND	0.0114	ND	0.0100	ND	0.0100	ND	0.0196	ND	0.0196	ND	0.0144	0.0004	ND	0.0192				
12/1-2	ND	0.0021	ND	0.0021	ND	0.0026	ND	0.0026	ND	0.0066	ND	0.0066	ND	0.0030	ND	ND	0.0030				
12/2-3	ND	0.0007	ND	0.0007	ND	0.0012	ND	0.0012	ND	0.0088	ND	0.0088	ND	0.0048	ND	ND	0.0049				
12/3-4	VOID	VOID	VOID	VOID	ND	0.0027	ND	0.0027	ND	0.0093	ND	0.0093	VOID	VOID	VOID	VOID	VOID				
12/4-5	ND	0.0016	ND	0.0016	ND	0.0018	ND	0.0018	ND	0.0069	ND	0.0069	ND	0.0053	ND	ND	0.0053				
12/5-6	ND	0.0050	0.0002	0.0052	ND	0.0060	0.0004	0.0064	ND	0.0084	0.0010	0.0094	ND	0.0093	0.0007	ND	0.0100				
12/6-7	ND	0.0023	0.0003	0.0026	ND	0.0005	0.0016	0.0066	ND	0.0069	ND	0.0069	ND	0.0055	0.0003	ND	0.0058				
12/9-10	ND	0.0083	0.0019	0.0102	ND	0.0054	0.0006	0.0060	ND	0.0048	0.0003	0.0051	ND	0.0065	0.0009	ND	0.0052				
12/10-11	ND	0.0040	ND	0.0040	ND	0.0047	0.0003	0.0047	ND	0.0051	ND	0.0051	ND	0.0044	ND	ND	0.0044				
12/11-12	ND	0.0010	ND	0.0010	ND	0.0019	ND	0.0019	ND	0.0032	ND	0.0032	ND	0.0023	ND	ND	0.0023				
12/12-13	ND	0.0050	0.0002	0.0052	ND	0.0052	0.0003	0.0055	ND	0.0066	0.0003	0.0069	ND	0.0051	0.0006	ND	0.0057				
12/13-14	ND	0.0064	ND	0.0064	ND	0.0063	ND	0.0063	ND	0.0084	ND	0.0084	ND	0.0061	ND	ND	0.0061				
12/16-17	0.0010	ND	ND	0.0010	0.0060	ND	0.0020	0.0080	0.0020	ND	ND	0.0020	0.0057	ND	0.0020	ND	0.0074				
12/17-18	0.0013	ND	ND	0.0013	0.0022	ND	ND	0.0022	0.0038	ND	0.0011	0.0049	0.0040	ND	0.0020	ND	0.0050				
12/18-19	0.0049	ND	0.0005	0.0054	0.0104	ND	0.0028	0.0132	0.0070	ND	0.0014	0.0084	0.0058	ND	0.0023	ND	0.0081				
12/19-20	0.0064	ND	0.0014	0.0078	0.0091	ND	ND	0.0091	0.0033	ND	0.0014	0.0047	ND	ND	ND	ND	ND				
12/21-22	0.0024	ND	ND	0.0024	0.0020	ND	ND	0.0020	0.0062	ND	0.0010	0.0072	ND	ND	ND	0.0004	0.0004				
12/27-28	0.0021	ND	ND	0.0021	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0012	ND	0.0006	0.0018
12/28-29																		0.0013	ND	ND	0.0013
12/29-30																		ND	ND	ND	ND
1/7-8	0.0039	ND	0.0001	0.0040	0.0045	ND	0.0009	0.0054	0.0094	ND	ND	0.0094	0.0086	ND	0.0011	ND	0.0097	0.0063	ND	0.0004	0.0067
1/8-9	0.0025	ND	0.0003	0.0028	0.0024	ND	ND	0.0024	0.0047	ND	0.0010	0.0057	0.0049	ND	ND	ND	0.0049	0.0079	ND	0.0020	0.0144
1/9-10	0.0005	ND	ND	0.0005	0.0012	ND	ND	0.0012	0.0057	ND	ND	0.0057	0.0019	ND	ND	ND	0.0019	0.0014	ND	ND	0.0014
1/10-11	0.0030	ND	ND	0.0030	0.0038	ND	0.0013	0.0051	0.0049	ND	0.0005	0.0054	0.0044	ND	ND	ND	0.0044	0.0090	ND	ND	0.0090
1/11-12	0.0092	ND	0.0015	0.0107	0.0098	ND	0.0017	0.0058	0.0151	ND	0.0008	0.0159	0.0077	ND	ND	ND	0.0077	0.0068	ND	0.0014	0.0082
1/12-13	0.0065	ND	0.0009	0.0074	0.0044	ND	0.0004	0.0044	0.0094	ND	0.0011	0.0105	0.0059	ND	0.0008	ND	0.0067	0.0098	ND	0.0004	0.0102
1/18-19	0.0096	ND	ND	0.0096	0.0087	ND	ND	0.0087	0.0158	ND	ND	0.0158	0.0138	ND	ND	ND	0.0138	0.0171	ND	ND	0.0171
1/19-20	0.0043	ND	0.0007	0.0049	0.0048	ND	0.0009	0.0057	0.0075	ND	0.001	0.0085	ND	0.0059	0.0014	ND	0.0014	VOID	VOID	VOID	VOID
1/20-21	0.0013	ND	ND	0.0013	0.0013	ND	ND	0.0012	0.0028	ND	ND	0.0028	ND	0.0026	ND	ND	0.0026	0.0056	ND	ND	0.0056
Mean	0.0050	0.0044	0.0008	0.0049	0.0046	0.0044	0.0013	0.0047	0.0077	0.0080	0.0009	0.0082	0.0077	0.0061	0.0012	0.0004	0.0071	0.0065	0.0000	0.0027	0.0076
Maximum	0.0230	0.0114	0.0019	0.0230	0.0104	0.0100	0.0028	0.0132	0.0184	0.0196	0.0014	0.0196	0.0229	0.0189	0.0023	0.0004	0.0229	0.0171	0.0000	0.0079	0.0171
Minimum	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

TABLE C-5

PCB Concentration Summary
Post-Dredge Sampling

Run Date	SOUTHWEST CORNER Conc. 1016 µg/m³	Conc. 1242 µg/m³	Conc. 1254 µg/m³	Conc. Total µg/m³	NORTHWEST CORNER Conc. 1016 µg/m³	Conc. 1242 µg/m³	Conc. 1254 µg/m³	Conc. Total µg/m³	NORTHEAST CORNER Conc. 1016 µg/m³	Conc. 1242 µg/m³	Conc. 1254 µg/m³	Conc. Total µg/m³	SOUTHEAST CORNER Conc. 1016 µg/m³	Conc. 1242 µg/m³	Conc. 1254 µg/m³	Conc. 1248 µg/m³	Conc. Total µg/m³	BACKGROUND Conc. 1016 µg/m³	Conc. 1242 µg/m³	Conc. 1254 µg/m³	Conc. Total µg/m³
4/3-4	0.0049	ND	0.0006	0.0055	0.0053	ND	0.0007	0.0060	0.0102	ND	0.0007	0.0109	0.0081	ND	0.0006	ND	0.0087	0.0137	ND	0.0010	0.0147
4/4-5	0.0026	ND	0.0003	0.0029	0.0028	ND	0.0002	0.0030	0.0057	ND	0.0002	0.0059	0.0054	ND	ND	ND	0.0054	0.0136	ND	0.0002	0.0138
4/5-6	0.0034	ND	ND	0.0034	0.0037	ND	ND	0.0037	0.0079	ND	ND	0.0079	0.0076	ND	ND	ND	0.0076	0.0177	ND	ND	0.0177
4/6-7	0.0025	ND	0.0003	0.0028	0.0028	ND	0.0006	0.0034	0.0048	ND	0.0005	0.0053	0.0045	ND	0.0004	ND	0.0049	VOID	VOID	VOID	VOID
4/10-11	0.0011	ND	ND	0.0011	0.0016	ND	0.0003	0.0019	0.0029	ND	0.0002	0.0031	0.0025	ND	0.0002	ND	0.0027	0.0016	ND	0.0002	0.0018
4/11-12	0.0019	ND	0.0002	0.0021	0.0022	ND	ND	0.0022	0.0048	ND	ND	0.0048	0.0033	ND	0.0002	ND	0.0035	0.0030	ND	ND	0.0030
4/12-13	0.0022	ND	ND	0.0022	0.0025	ND	ND	0.0025	0.0026	ND	0.0002	0.0028	0.0047	ND	0.0002	ND	0.0049	0.0065	ND	0.0004	0.0069
4/13-14	0.0023	ND	0.0002	0.0025	0.0020	ND	0.0003	0.0023	0.0059	ND	0.0003	0.0062	0.0065	ND	0.0003	ND	0.0068	0.0060	ND	0.0005	0.0065
4/17-18	0.0037	ND	0.0011	0.0048	0.0051	ND	0.0014	0.0065	0.0110	ND	0.0014	0.0124	0.0078	ND	0.0011	ND	0.0089	0.0172	ND	0.0018	0.0190
4/18-19	0.0061	ND	0.0011	0.0072	0.0092	ND	0.0005	0.0097	0.0117	ND	0.0013	0.0130	0.0112	ND	0.0013	ND	0.0125	0.0084	ND	0.0009	0.0093
4/19-20	0.0038	ND	0.0011	0.0049	0.0057	ND	0.0012	0.0069	0.0090	ND	0.0011	0.0101	0.0069	ND	0.0010	ND	0.0079	0.0051	ND	0.0007	0.0058
4/20-21	0.0052	ND	0.0015	0.0067	0.0091	ND	0.0015	0.0106	0.0111	ND	0.0020	0.0131	0.0094	ND	0.0018	ND	0.0112	0.0047	ND	0.0012	0.0059
4/24-25	0.0024	ND	0.0009	0.0033	0.0031	ND	0.0013	0.0044	0.0068	ND	0.0017	0.0085	0.0045	ND	0.0016	ND	0.0061	0.0027	ND	0.0010	0.0037
4/25-26	0.0137	ND	0.0032	0.0169	0.0160	ND	0.0031	0.0191	0.0193	ND	0.0034	0.0227	0.0185	ND	0.0036	ND	0.0221	0.0183	ND	0.0040	0.0223
4/26-27	0.0130	ND	0.0029	0.0159	0.0144	ND	0.0031	0.0175	0.0197	ND	0.0038	0.0235	0.0212	ND	0.0039	ND	0.0251	0.0219	ND	0.0048	0.0267
4/27-28	0.0043	ND	0.0016	0.0059	0.0043	ND	0.0024	0.0067	0.0072	ND	0.0020	0.0092	0.0090	ND	0.0024	ND	0.0114	0.0040	ND	0.0015	0.0055
Mean	0.0046	0.0000	0.0012	0.0055	0.0056	0.0000	0.0013	0.0067	0.0088	0.0000	0.0013	0.0100	0.0082	0.0000	0.0013	0.0000	0.0094	0.0096	0.0000	0.0014	0.0108
Maximum	0.0137	0.0000	0.0032	0.0169	0.0160	0.0000	0.0031	0.0191	0.0197	0.0000	0.0038	0.0235	0.0212	0.0000	0.0039	0.0000	0.0251	0.0219	0.0000	0.0048	0.0267
Minimum	0.0011	0.0000	0.0000	0.0011	0.0016	0.0000	0.0000	0.0019	0.0026	0.0000	0.0002	0.0028	0.0025	0.0000	0.0000	0.0000	0.0027	0.0000	0.0000	0.0002	0.0008

TABLE C-6

PUF/Filter Breakout by Concentration ($\mu g/m^3$)
SWC - Primary

Date	Sample No.	PUF 1016	PUF 1242	PUF 1248	PUF 1254	FILTER 1016	FILTER 1242	FILTER 1248	FILTER 1254
11/7-8	101	ND	ND	ND	ND	ND	ND	ND	ND
11/8-9	103	ND	ND	ND	ND	ND	ND	ND	ND
11/9-10	105	ND	ND	ND	ND	ND	ND	ND	ND
11/10-11	107	ND	ND	ND	ND	ND	ND	ND	ND
11/11-12	109	ND	ND	ND	ND	ND	ND	ND	ND
11/12-13	111	ND	ND	ND	ND	ND	ND	ND	ND
11/13-14	113	ND	ND	ND	ND	ND	ND	ND	ND
11/14-15	115	ND	ND	ND	ND	ND	ND	ND	ND
11/15-16	117	ND	ND	ND	ND	ND	ND	ND	ND
11/16-17	119	ND	ND	ND	ND	ND	ND	ND	ND
11/17-18	121	ND	ND	ND	ND	ND	ND	ND	ND
11/18-19	123	0.0013	ND	ND	ND	ND	ND	ND	ND
11/19-20	125	0.0043	ND	ND	ND	ND	ND	ND	ND
11/21-22	127	0.0006	ND	ND	ND	ND	ND	ND	ND
11/22-23	129	0.0129	ND	ND	ND	ND	ND	ND	ND
11/23-24	131	0.0043	ND	ND	ND	ND	ND	ND	ND
11/25-26	133	ND	ND	ND	ND	ND	ND	ND	ND
11/26-27	135	0.0230	ND	ND	ND	ND	ND	ND	ND
11/27-28	137	0.0021	ND	ND	ND	ND	ND	ND	ND
11/28-29	139	ND	ND	ND	0.0004	ND	ND	ND	ND
11/29-30	141	ND	0.0114	ND	ND	ND	ND	ND	ND
12/1-2	143	ND	0.0021	ND	ND	ND	ND	ND	ND
12/2-3	145	ND	0.0007	ND	ND	ND	ND	ND	ND
12/3-4	147	VOID	VOID	VOID	VOID	VOID	VOID	VOID	VOID
12/4-5	149	ND	0.0016	ND	ND	ND	ND	ND	ND
12/5-6	151	ND	0.0052	ND	ND	ND	ND	ND	0.0002
12/6-7	153	ND	0.0023	ND	ND	ND	ND	ND	0.0003
12/9-10	155	ND	0.0083	ND	0.0015	ND	ND	ND	0.0004
12/10-11	157	ND	0.0040	ND	ND	ND	ND	ND	ND
12/11-12	159	ND	0.0010	ND	0.0002	ND	ND	ND	ND
12/12-13	161	ND	0.0047	ND	ND	ND	0.0003	ND	0.0002
12/13-14	163	ND	0.0064	ND	ND	ND	ND	ND	ND
12/16-17	165	0.0010	ND	ND	ND	ND	ND	ND	ND
12/17-18	167	0.0013	ND	ND	ND	ND	ND	ND	ND
12/18-19	169	0.0047	ND	ND	ND	0.0002	ND	ND	0.0005
12/19-20	171	0.0064	ND	ND	0.0014	ND	ND	ND	ND
12/21-22	173	0.0024	ND	ND	ND	ND	ND	ND	ND
12/27-28	175	0.0021	ND	ND	ND	ND	ND	ND	ND
1/7-8/89	177	0.0039	ND	ND	ND	ND	ND	ND	0.0001

TABLE C-6 (cont'd)

Date	Sample No.	PUF 1016	PUF 1242	PUF 1248	PUF 1254	FILTER 1016	FILTER 1242	FILTER 1248	FILTER 1254
1/8-9	179	0.0025	ND	ND	ND	ND	ND	ND	0.0003
1/9-10	181	0.0005	ND	ND	ND	ND	ND	ND	ND
1/10-11	183	0.0030	ND	ND	ND	ND	ND	ND	ND
1/11-12	185	0.0087	ND	ND	0.0014	0.0005	ND	ND	0.0002
1/12-13	187	0.0065	ND	ND	0.0009	ND	ND	ND	ND
1/18-19	189	0.0094	ND	ND	ND	ND	ND	ND	ND
1/19-20	191	0.0042	ND	ND	0.0007	ND	ND	ND	0.0001
1/20-21	193	0.0012	ND	ND	ND	ND	ND	ND	ND
4/3-4	195	0.0049	ND	ND	0.0006	ND	ND	ND	ND
4/4-5	197	0.0026	ND	ND	0.0003	ND	ND	ND	ND
4/5-6	199	0.0034	ND	ND	ND	ND	ND	ND	ND
4/6-7	1101	0.0025	ND	ND	0.0003	ND	ND	ND	ND
4/10-11	1103	0.0011	ND	ND	ND	ND	ND	ND	ND
4/11-12	1105	0.0019	ND	ND	0.0002	ND	ND	ND	ND
4/12-13	1107	0.0022	ND	ND	ND	ND	ND	ND	ND
4/13-14	1109	0.0023	ND	ND	0.0002	ND	ND	ND	ND
4/17-18	1111	0.0037	ND	ND	0.0011	ND	ND	ND	ND
4/18-19	1113	0.0061	ND	ND	0.0011	ND	ND	ND	ND
4/19-20	1115	0.0038	ND	ND	0.0011	ND	ND	ND	ND
4/20-21	1117	0.0052	ND	ND	0.0015	ND	ND	ND	ND
4/24-25	1119	0.0024	ND	ND	0.0009	ND	ND	ND	ND
4/25-26	1121	0.0137	ND	ND	0.0032	ND	ND	ND	ND
4/26-27	1123	0.0130	ND	ND	0.0029	ND	ND	ND	ND
4/27-28	1125	0.0043	ND	ND	0.0016	ND	ND	ND	ND

TABLE C-7

PUF/Filter Breakout by Concentration ($\mu g/m^3$)
SWC - Collocated

Date	Sample No.	PUF 1016	PUF 1242	PUF 1248	PUF 1254	FILTER 1016	FILTER 1242	FILTER 1248	FILTER 1254
11/7-8	102	ND	ND	ND	ND	ND	ND	ND	ND
11/8-9	104	ND	ND	ND	ND	ND	ND	ND	ND
11/9-10	106	ND	ND	ND	ND	ND	ND	ND	ND
11/10-11	108	ND	ND	ND	ND	ND	ND	ND	ND
11/11-12	110	ND	ND	ND	ND	ND	ND	ND	ND
11/12-13	112	ND	ND	ND	ND	ND	ND	ND	ND
11/13-14	114	ND	ND	ND	ND	ND	ND	ND	ND
11/14-15	116	ND	ND	ND	ND	ND	ND	ND	ND
11/15-16	118	ND	ND	ND	ND	ND	ND	ND	ND
11/16-17	120	ND	ND	ND	ND	ND	ND	ND	ND
11/17-18	122	ND	ND	ND	ND	ND	ND	ND	ND
11/18-19	124	0.0008	ND	ND	ND	ND	ND	ND	ND
11/19-20	126	0.0038	ND	ND	ND	ND	ND	ND	ND
11/21-22	128	0.0009	ND	ND	ND	ND	ND	ND	ND
11/22-23	130	0.0124	ND	ND	ND	ND	ND	ND	ND
11/23-24	132	0.0036	ND	ND	ND	ND	ND	ND	ND
11/25-26	134	ND	ND	ND	ND	ND	ND	ND	ND
11/26-27	136	0.0229	ND	ND	ND	ND	ND	ND	ND
11/27-28	138	0.0029	ND	ND	ND	ND	ND	ND	ND
11/28-29	140	ND	ND	ND	0.0011	ND	ND	ND	ND
11/29-30	142	ND	0.0114	ND	ND	ND	ND	ND	ND
12/1-2	144	ND	0.0017	ND	ND	ND	ND	ND	ND
12/2-3	146	ND	0.0008	ND	ND	ND	ND	ND	ND
12/3-4	148	ND	0.0016	ND	ND	ND	ND	ND	ND
12/4-5	150	ND	0.0004	ND	ND	ND	ND	ND	ND
12/5-6	152	ND	0.0047	ND	ND	ND	ND	ND	0.0003
12/6-7	154	ND	ND	ND	0.0004	ND	0.0017	ND	0.0007
12/9-10	156	ND	0.0096	ND	0.0020	ND	ND	ND	ND
12/10-11	158	ND	0.0072	ND	ND	ND	ND	ND	ND
12/11-12	160	ND	0.0009	ND	ND	ND	ND	ND	ND
12/12-13	162	ND	0.0055	ND	ND	ND	.0002	ND	.0002
12/13-14	164	ND	0.0062	ND	ND	ND	ND	ND	ND
12/16-17	166	0.0014	ND	ND	ND	ND	ND	ND	ND
12/17-18	168	0.0012	ND	ND	ND	ND	ND	ND	ND
12/18-19	170	0.0044	ND	ND	ND	0.0003	ND	ND	0.0004
12/19-20	172	0.0082	ND	ND	0.0010	ND	ND	ND	ND
12/21-22	174	0.0012	ND	ND	ND	ND	ND	ND	ND
12/27-28	176	ND	ND	ND	ND	ND	ND	ND	ND

TABLE C-7 (cont'd)

Date	Sample No.	Flow Rate	PUF 1016	PUF 1242	PUF 1248	PUF 1254	FILTER 1016	FILTER 1242	FILTER 1248	FILTER 1254
1/7-8/89	178		0.0036	ND	ND	ND	ND	ND	ND	0.0010
1/8-9	180		0.0025	ND	ND	ND	ND	ND	ND	0.0005
1/9-10	182		0.0005	ND	ND	ND	ND	ND	ND	ND
1/10-11	184		0.0030	ND	ND	ND	ND	ND	ND	ND
1/11-12	186		0.0089	ND	ND	0.0005	0.0002	ND	ND	0.0002
1/12-13	188		0.0062	ND	ND	0.0004	ND	ND	ND	ND
1/18-19	190		0.0077	ND	ND	ND	ND	ND	ND	ND
1/19-20	192		0.0048	ND	ND	0.0011	ND	ND	ND	0.0001
1/20-21	194		0.0013	ND	ND	ND	ND	ND	ND	ND
4/3-4	196		0.0036	ND	ND	0.0004	ND	ND	ND	ND
4/4-5	198		0.0029	ND	ND	0.0003	ND	ND	ND	ND
4/5-6	1100		0.0029	ND	ND	ND	ND	ND	ND	ND
4/6-7	1102		0.0026	ND	ND	0.0003	ND	ND	ND	ND
4/10-11	1104		0.0013	ND	ND	0.0002	ND	ND	ND	ND
4/11-12	1106		0.0017	ND	ND	ND	ND	ND	ND	ND
4/12-13	1108		0.0024	ND	ND	ND	ND	ND	ND	ND
4/13-14	1110		0.0030	ND	ND	0.0003	ND	ND	ND	ND
4/17-18	1112		0.0037	ND	ND	0.0011	ND	ND	ND	ND
4/18-19	1114		0.0041	ND	ND	0.0011	ND	ND	ND	ND
4/19-20	1116		0.0079	ND	ND	0.0010	ND	ND	ND	ND
4/20-21	1118		0.0058	ND	ND	0.0017	ND	ND	ND	ND
4/24-25	1120		0.0026	ND	ND	0.0011	ND	ND	ND	ND
4/25-26	1122		0.0180	ND	ND	0.0038	ND	ND	ND	ND
4/26-27	1124		0.0152	ND	ND	0.0034	ND	ND	ND	ND
4/27-28	1126		0.0046	ND	ND	0.0017	ND	ND	ND	ND

TABLE C-8

PUF/Filter Breakout by Concentration ($\mu g/m^3$)
NWC

Date	Sample No.	PUF 1016	PUF 1242	PUF 1248	PUF 1254	FILTER 1016	FILTER 1242	FILTER 1248	FILTER 1254
11/13-14	201	ND	ND	ND	ND	ND	ND	ND	ND
11/14-15	202	ND	ND	ND	ND	ND	ND	ND	ND
11/15-16	203	ND	ND	ND	ND	ND	ND	ND	ND
11/16-17	204	ND	ND	ND	ND	ND	ND	ND	ND
11/17-18	205	ND	ND	ND	ND	ND	ND	ND	ND
11/18-19	206	0.0018	ND	ND	ND	ND	ND	ND	ND
11/19-20	207	0.0052	ND	ND	ND	ND	ND	ND	ND
11/21-22	208	VOID	VOID	VOID	VOID	VOID	VOID	VOID	VOID
11/22-23									
11/23-24	209	0.0043	ND	ND	ND	ND	ND	ND	ND
11/25-26	210	ND	ND	ND	ND	ND	ND	ND	ND
11/26-27	211	0.0025	ND	ND	ND	ND	ND	ND	ND
11/27-28	212	0.0024	ND	ND	ND	ND	ND	ND	ND
11/28-29	213	0.0020	ND	ND	ND	ND	ND	ND	ND
11/29-30	214	ND	0.0100	ND	ND	ND	ND	ND	ND
12/1-2	215	ND	0.0026	ND	ND	ND	ND	ND	ND
12/2-3	216	ND	0.0011	ND	ND	ND	ND	ND	ND
12/3-4	217	ND	0.0027	ND	ND	ND	ND	ND	ND
12/4-5	218	ND	0.0017	ND	ND	ND	ND	ND	ND
12/5-6	219	ND	0.0060	ND	ND	ND	ND	ND	0.0004
12/6-7	220	ND	0.0050	ND	ND	ND	ND	ND	0.0016
12/9-10	221	ND	0.0054	ND	ND	ND	ND	ND	0.0006
12/10-11	222	ND	0.0047	ND	ND	ND	ND	ND	0.0003
12/11-12	223	ND	0.0019	ND	ND	ND	ND	ND	ND
12/12-13	224	ND	0.0052	ND	ND	ND	ND	ND	0.0003
12/13-14	225	ND	0.0063	ND	ND	ND	ND	ND	ND
12/16-17	226	0.0060	ND	ND	0.0018	ND	ND	ND	0.0002
12/17-18	227	0.0022	ND	ND	ND	ND	ND	ND	ND
12/18-19	228	0.0092	ND	ND	0.0015	0.0012	ND	ND	0.0013
12/19-20	229	0.0091	ND	ND	ND	ND	ND	ND	ND
12/21-22	230	0.0020	ND	ND	ND	ND	ND	ND	ND
12/27-28	231	ND	ND	ND	ND	ND	ND	ND	ND
1/7-8/89	232	0.0045	ND	ND	0.0007	ND	ND	ND	0.0002
1/8-9	233	0.0024	ND	ND	ND	ND	ND	ND	ND
1/9-10	234	0.0012	ND	ND	ND	ND	ND	ND	ND
1/10-11	235	0.0037	ND	ND	0.0013	ND	ND	ND	ND
1/11-12	236	0.0098	ND	ND	0.0014	ND	ND	ND	0.0003
1/12-13	237	0.0044	ND	ND	0.0004	ND	ND	ND	ND
1/18-19	238	0.0087	ND	ND	ND	ND	ND	ND	ND

TABLE C-8 (cont'd)

Date	Sample No.	PUF 1016	PUF 1242	PUF 1248	PUF 1254	FILTER 1016	FILTER 1242	FILTER 1248	FILTER 1254
1/19-20	239	0.0048	ND	ND	0.0009	ND	ND	ND	ND
1/20-21	240	0.0012	ND	ND	ND	ND	ND	ND	ND
4/3-4	241	0.0053	ND	ND	0.0007	ND	ND	ND	ND
4/4-5	242	0.0028	ND	ND	0.0002	ND	ND	ND	ND
4/5-6	243	0.0037	ND	ND	ND	ND	ND	ND	ND
4/6-7	244	0.0028	ND	ND	0.0006	ND	ND	ND	ND
4/10-11	245	0.0016	ND	ND	0.0003	ND	ND	ND	ND
4/11-12	246	0.0022	ND	ND	ND	ND	ND	ND	ND
4/12-13	247	0.0025	ND	ND	ND	ND	ND	ND	ND
4/13-14	248	0.0020	ND	ND	0.0003	ND	ND	ND	ND
4/17-18	249	0.0051	ND	ND	0.0014	ND	ND	ND	ND
4/18-19	250	0.0092	ND	ND	0.0005	ND	ND	ND	ND
4/19-20	251	0.0057	ND	ND	0.0012	ND	ND	ND	ND
4/20-21	252	0.0091	ND	ND	0.0015	ND	ND	ND	ND
4/24-25	253	0.0031	ND	ND	0.0013	ND	ND	ND	ND
4/25-26	254	0.0160	ND	ND	0.0031	ND	ND	ND	ND
4/26-27	255	0.0144	ND	ND	0.0031	ND	ND	ND	ND
4/27-28	256	0.0043	ND	ND	0.0024	ND	ND	ND	ND

TABLE C-9

PUF/Filter Breakout by Concentration ($\mu g/m^3$)
NEC

Date	Sample No.	PUF 1016	PUF 1242	PUF 1248	PUF 1254	FILTER 1016	FILTER 1242	FILTER 1248	FILTER 1254
11/13-14	301	ND	ND	ND	ND	ND	ND	ND	ND
11/14-15	302	ND	ND	ND	ND	ND	ND	ND	ND
11/15-16	303	ND	ND	ND	ND	ND	ND	ND	ND
11/16-17	304	ND	ND	ND	ND	ND	ND	ND	ND
11/17-18	305	ND	0.0055	ND	0.0006	ND	ND	ND	ND
11/18-19	306	0.0037	ND	ND	ND	ND	ND	ND	ND
11/19-20	307	0.0049	ND	ND	ND	ND	ND	ND	ND
11/21-22	308	0.0052	ND	ND	ND	ND	ND	ND	ND
11/22-23	309	0.0165	ND	ND	ND	ND	ND	ND	ND
11/23-24	310	0.0050	ND	ND	ND	ND	ND	ND	ND
11/25-26	311	0.0084	ND	ND	ND	ND	ND	ND	ND
11/26-27	312	0.0184	ND	ND	ND	ND	ND	ND	ND
11/27-28	313	0.0067	ND	ND	ND	ND	ND	ND	ND
11/28-29	314	ND	0.0098	ND	ND	ND	ND	ND	ND
11/29-30	315	ND	0.0196	ND	ND	ND	ND	ND	0.0003
12/1-2	316	ND	0.0066	ND	ND	ND	ND	ND	ND
12/2-3	317	ND	0.0088	ND	ND	ND	ND	ND	ND
12/3-4	318	ND	0.0068	ND	ND	ND	ND	ND	ND
12/4-5	319	ND	0.0069	ND	ND	ND	ND	ND	ND
12/5-6	320	ND	0.0084	ND	ND	ND	ND	ND	0.0010
12/6-7	321	ND	0.0069	ND	ND	ND	ND	ND	ND
12/9-10	322	ND	0.0048	ND	ND	ND	ND	ND	0.0003
12/10-11	323	ND	0.0051	ND	ND	ND	ND	ND	ND
12/11-12	324	ND	0.0032	ND	ND	ND	ND	ND	ND
12/12-13	325	ND	0.0066	ND	ND	ND	ND	ND	0.0003
12/13-14	326	ND	0.0084	ND	ND	ND	ND	ND	ND
12/16-17	327	0.0020	ND	ND	ND	ND	ND	ND	ND
12/17-18	328	0.0038	ND	ND	0.0011	ND	ND	ND	ND
12/18-19	329	0.0070	ND	ND	0.0014	ND	ND	ND	ND
12/19-20	330	0.0033	ND	ND	0.0014	ND	ND	ND	ND
12/21-22	331	0.0062	ND	ND	0.0010	ND	ND	ND	ND
12/27-28	332	ND	ND	ND	ND	ND	ND	ND	ND
1/7-8/89	333	0.0094	ND	ND	ND	ND	ND	ND	ND
1/8-9	334	0.0047	ND	ND	0.0010	ND	ND	ND	ND
1/9-10	335	0.0057	ND	ND	ND	ND	ND	ND	ND
1/10-11	336	0.0049	ND	ND	0.0005	ND	ND	ND	ND
1/11-12	337	0.0151	ND	ND	0.0008	0.0005	ND	ND	0.0002
1/12-13	338	0.0094	ND	ND	0.0011	ND	ND	ND	ND
1/18-19	339	0.0158	ND	ND	ND	ND	ND	ND	ND

TABLE C-9 (cont'd)

Date	Sample No.	PUF 1016	PUF 1242	PUF 1248	PUF 1254	FILTER 1016	FILTER 1242	FILTER 1248	FILTER 1254
1/19-20	340	0.0075	ND	ND	0.0010	ND	ND	ND	0.0001
1/20-21	341	0.0028	ND	ND	ND	ND	ND	ND	ND
4/3-4	342	0.0102	ND	ND	0.0007	ND	ND	ND	ND
4/4-5	343	0.0057	ND	ND	0.0002	ND	ND	ND	ND
4/5-6	344	0.0079	ND	ND	ND	ND	ND	ND	ND
4/6-7	345	0.0048	ND	ND	0.0005	ND	ND	ND	ND
4/10-11	346	0.0029	ND	ND	0.0002	ND	ND	ND	ND
4/11-12	347	0.0048	ND	ND	ND	ND	ND	ND	ND
4/12-13	348	0.0026	ND	ND	0.0002	ND	ND	ND	ND
4/13-14	349	0.0059	ND	ND	0.0003	ND	ND	ND	ND
4/17-18	350	0.0110	ND	ND	0.0014	ND	ND	ND	ND
4/18-19	351	0.0117	ND	ND	0.0013	ND	ND	ND	ND
4/19-20	352	0.0090	ND	ND	0.0011	ND	ND	ND	ND
4/20-21	353	0.0111	ND	ND	0.0020	ND	ND	ND	ND
4/24-25	354	0.0068	ND	ND	0.0017	ND	ND	ND	ND
4/25-26	355	0.0193	ND	ND	0.0034	ND	ND	ND	ND
4/26-27	356	0.0197	ND	ND	0.0038	ND	ND	ND	ND
4/27-28	357	0.0072	ND	ND	0.0020	ND	ND	ND	ND

TABLE C-10

PUF/Filter Breakout by Concentration ($\mu g/m^3$)
SEC

Date	Sample No.	PUF 1016	PUF 1242	PUF 1248	PUF 1254	FILTER 1016	FILTER 1242	FILTER 1248	FILTER 1254
11/13-14	401	ND	ND	ND	ND	ND	ND	ND	ND
11/14-15	402	ND	ND	ND	ND	ND	ND	ND	ND
11/15-16	403	ND	ND	ND	ND	ND	ND	ND	ND
11/16-17	404	ND	ND	ND	ND	ND	ND	ND	ND
11/17-18	405	ND	ND	ND	ND	ND	ND	ND	ND
11/18-19	406	0.0018	ND	ND	ND	ND	ND	ND	ND
11/19-20	407	0.0039	ND	ND	ND	ND	ND	ND	ND
11/21-22	408	0.0024	ND	ND	ND	ND	ND	ND	ND
11/22-23	409	0.0143	ND	ND	ND	0.0005	ND	ND	ND
11/23-24	410	0.0054	ND	ND	ND	ND	ND	ND	ND
11/25-26	411	0.0090	ND	ND	ND	ND	ND	ND	ND
11/26-27	412	0.0229	ND	ND	ND	ND	ND	ND	ND
11/27-28	413	0.0104	ND	ND	ND	ND	ND	ND	ND
11/28-29	414	ND	0.0073	ND	ND	ND	ND	ND	ND
11/29-30	415	ND	0.0189	ND	ND	ND	0.0050	ND	0.0003
12/1-2	416	ND	0.0003	ND	ND	ND	ND	ND	ND
12/2-3	417	ND	0.0049	ND	ND	ND	ND	ND	ND
12/3-4	418	VOID	VOID	VOID	VOID	VOID	VOID	VOID	VOID
12/4-5	419	ND	0.0053	ND	ND	ND	ND	ND	ND
12/5-6	420	ND	0.0093	ND	ND	ND	ND	ND	0.0007
12/6-7	421	ND	0.0055	ND	ND	ND	ND	ND	0.0003
12/9-10	422	ND	0.0049	ND	ND	ND	ND	ND	0.0003
12/10-11	423	ND	0.0044	ND	ND	ND	ND	ND	ND
12/11-12	424	ND	0.0023	ND	ND	ND	ND	ND	ND
12/12-13	425	ND	0.0051	ND	ND	ND	ND	ND	0.0006
12/13-14	426	ND	0.0061	ND	ND	ND	ND	ND	ND
12/16-17	427	0.0057	ND	ND	0.0017	ND	ND	ND	ND
12/17-18	428	0.0040	ND	ND	0.0008	ND	ND	ND	0.0002
12/18-19	429	0.0056	ND	ND	0.0018	0.0002	ND	ND	0.0004
12/19-20	430	ND	ND	ND	ND	ND	ND	ND	ND
12/21-22	431	ND	ND	0.0004	ND	ND	ND	ND	ND
12/27-28	432	ND	ND	ND	ND	ND	ND	ND	ND
1/7-8/89	433	0.0086	ND	ND	0.0011	ND	ND	ND	ND
1/8-9	434	0.0049	ND	ND	0.0000	ND	ND	ND	ND
1/9-10	435	0.0019	ND	ND	ND	ND	ND	ND	ND
1/10-11	436	0.0044	ND	ND	0.0010	ND	ND	ND	ND
1/11-12	437	0.0071	ND	ND	0.0000	0.0006	ND	ND	0.0000
1/12-13	438	ND	ND	ND	0.0008	ND	ND	ND	ND
1/18-19	439	0.0138	ND	ND	ND	ND	ND	ND	ND

TABLE C-10 (cont'd)

Date	Sample No.	PUF 1016	PUF 1242	PUF 1248	PUF 1254	FILTER 1016	FILTER 1242	FILTER 1248	FILTER 1254
1/19-20	440	0.0059	ND	ND	0.0014	ND	ND	ND	0.0001
1/20-21	441	0.0026	ND	ND	ND	ND	ND	ND	ND
4/3-4	442	0.0081	ND	ND	0.0006	ND	ND	ND	ND
4/4-5	443	0.0054	ND	ND	ND	ND	ND	ND	ND
4/5-6	444	0.0076	ND	ND	ND	ND	ND	ND	ND
4/6-7	445	0.0045	ND	ND	0.0004	ND	ND	ND	ND
4/10-11	446	0.0025	ND	ND	0.0002	ND	ND	ND	ND
4/11-12	447	0.0033	ND	ND	0.0002	ND	ND	ND	ND
4/12-13	448	0.0047	ND	ND	0.0002	ND	ND	ND	ND
4/13-14	449	0.0065	ND	ND	0.0003	ND	ND	ND	ND
4/17-18	450	0.0078	ND	ND	0.0011	ND	ND	ND	ND
4/18-19	451	0.0112	ND	ND	0.0013	ND	ND	ND	ND
4/19-20	452	0.0069	ND	ND	0.0010	ND	ND	ND	ND
4/20-21	453	0.0094	ND	ND	0.0018	ND	ND	ND	ND
4/24-25	454	0.0045	ND	ND	0.0016	ND	ND	ND	ND
4/25-26	455	0.0185	ND	ND	0.0036	ND	ND	ND	ND
4/26-27	456	0.0212	ND	ND	0.0039	ND	ND	ND	ND
4/27-28	457	0.0090	ND	ND	0.0024	ND	ND	ND	ND

TABLE C-11

PUF/Filter Breakout by Concentration ($\mu g/m^3$)
BG

Date	Sample No.	PUF 1016	PUF 1242	PUF 1248	PUF 1254	FILTER 1016	FILTER 1242	FILTER 1248	FILTER 1254
12/27-28	501	0.0012	ND	ND	0.0006		LAB LOST SAMPLE		
12/28-29	502	0.0013	ND	ND	ND	ND	ND	ND	ND
12/29-30	503	ND	ND	ND	ND	ND	ND	ND	ND
1/7-8/89	504	0.0063	ND	ND	0.0004	ND	ND	ND	0.0001
1/8-9	505	0.0080	ND	ND	0.0020	ND	ND	ND	ND
1/9-10	506	0.0014	ND	ND	ND	ND	ND	ND	ND
1/10-11	507	0.0091	ND	ND	ND	ND	ND	ND	ND
1/11-12	508	0.0068	ND	ND	0.0012	0.0003	ND	ND	0.0002
1/12-13	509	0.0098	ND	ND	0.0004	ND	ND	ND	ND
1/18-19	510	0.0171	ND	ND	ND	ND	ND	ND	ND
1/19-20	511	CARTRIDGE DAMAGED AT LAB				0.0002	ND	ND	0.0001
1/20-21	512	0.0056	ND	ND	ND	ND	ND	ND	ND
4/3-4	513	0.0137	ND	ND	0.0010	ND	ND	ND	ND
4/4-5	514	0.0136	ND	ND	0.0002	ND	ND	ND	ND
4/5-6	515	0.0177	ND	ND	0.0000	ND	ND	ND	ND
4/6-7	516	SAMPLE VOIDED: NOT A COMPLETE RUN							
4/10-11	517	0.0016	ND	ND	.0002	ND	ND	ND	ND
4/11-12	518	0.0030	ND	ND	ND	ND	ND	ND	ND
4/12-13	519	0.0065	ND	ND	0.0004	ND	ND	ND	ND
4/13-14	520	0.0060	ND	ND	0.0005	ND	ND	ND	ND
4/17-18	521	0.0172	ND	ND	0.0018	ND	ND	ND	ND
4/18-19	522	0.0084	ND	ND	0.0009	ND	ND	ND	ND
4/19-20	523	0.0051	ND	ND	0.0007	ND	ND	ND	ND
4/20-21	524	0.0047	ND	ND	0.0012	ND	ND	ND	ND
4/24-25	525	0.0027	ND	ND	0.0010	ND	ND	ND	ND
4/25-26	526	0.0183	ND	ND	0.0040	ND	ND	ND	ND
4/26-27	527	0.0219	ND	ND	0.0048	ND	ND	ND	ND
4/27-28	528	0.0040	ND	ND	0.0015	ND	ND	ND	ND

TABLE C-12

Daily Meteorological Data

Date	Julian Calendar	Sample Day (*)	Resultant Wind Direction (°)	Sigma Theta (°)	Resultant Wind Speed (mph)	Ambient Air Temp. (°F)	Soil Temp. (°F)	Total Daily Precip. (in)	Solar Radiation (Llys/24-hr)
11/14/88	319	*	9999.0	9999.0	9999.0	9999.0	9999.0	0.00	9999.00
11/15/88	320	*	167.8	9.3	9.2	51.6	54.1	0.00	68.34
11/16/88	321	*	9999.0	9999.0	9999.0	9999.0	9999.0	0.25	9999.00
11/17/88	322	*	293.4	10.4	8.0	42.4	42.2	0.95	137.10
11/18/88	323	*	56.7	18.1	2.4	41.9	41.2	0.04	125.28
11/19/88	324	*	9999.0	9999.0	9999.0	9999.0	9999.0	0.99	9999.00
11/20/88	325		306.4	10.1	15.4	41.3	40.9		98.58
11/21/88	326	*	331.3	17.0	3.8	38.3	37.5	2.01	118.68
11/22/88	327	*	313.8	10.4	7.0	38.6	38.4	0.00	83.46
11/23/88	328	*	325.5	9.5	9.8	35.9	34.7	0.00	105.12
11/24/88	329		305.3	11.1	7.5	38.2	39.6		111.60
11/25/88	330	*	176.6	25.7	1.2	43.4	46.9	0.00	95.10
11/26/88	331	*	9999.0	9999.0	9999.0	9999.0	9999.0	0.00	9999.00
11/27/88	332	*	9999.0	9999.0	9999.0	9999.0	9999.0	2.00	9999.00
11/28/88	333	*	9999.0	9999.0	9999.0	9999.0	9999.0	2.60	9999.00
11/29/88	334	*	218.4	12.6	6.7	43.6	45.7	0.00	72.90
11/30/88	335		283.1	13.4	5.6	40.5	40.5	0.00	96.42
12/1/88	336	*	266.3	11.8	8.4	37.9	38.0	0.00	84.18
12/2/88	337	*	256.6	10.6	9.3	41.1	43.0	0.00	92.84
12/3/88	338	*	295.2	11.1	10.5	33.6	32.8	0.00	106.74
12/4/88	339	*	320.9	13.8	4.0	30.1	29.2	0.00	96.96
12/5/88	340	*	209.1	11.9	9.2	38.5	42.4	0.00	68.22
12/6/88	341	*	262.8	11.4	5.2	43.3	46.2	0.00	95.58
12/7/88	342		328.7	13.8	5.9	36.4	36.0		59.34
12/8/88	343		330.1	14.2	3.1	29.8	29.0		38.82
12/9/88	344	*	311.7	20.4	2.5	30.2	29.7	0.00	107.40
12/10/88	345	*	329.5	9.5	11.4	19.1	19.6	0.00	106.98
12/11/88	346	*	345.7	10.7	5.2	20.8	20.8	0.00	147.36
12/12/88	347	*	53.2	8.1	8.5	33.9	35.8	0.00	43.26
12/13/88	348	*	271.7	14.2	3.3	35.1	37.2	0.21	23.88
12/14/88	349		284.2	11.5	12.4	33.9	34.7		81.00
12/15/88	350		318.9	10.0	7.5	24.9	24.2		96.18
12/16/88	351	*	330.0	7.8	8.9	24.1	23.6	0.00	28.80
12/17/88	352	*	284.5	15.2	3.3	25.8	25.5	0.00	90.42
12/18/88	353	*	175.7	21.9	3.7	31.8	33.3	0.00	78.48
12/19/88	354	*	215.8	10.1	13.0	38.3	44.3	0.00	49.74
12/20/88	355		277.0	10.0	5.5	38.3	41.1		27.90
12/21/88	356	*	342.3	9.6	6.9	31.6	31.2	0.00	96.00
12/22/88	357		164.9	14.1	3.6	35.0	37.0		12.06
12/23/88	358		222.1	10.6	5.8	41.5	43.9		17.76

Note: 9999.0 data not recovered

TABLE C-12 (cont'd)

Date	Julian Calendar	Sample Day (*)	Resultant Wind Direction (°)	Sigma Theta (°)	Resultant Wind Speed (mph)	Ambient Air Temp. (°F)	Soil Temp. (°F)	Total Daily Precip. (in)	Solar Radiation (Llys/24-hr)
12/24/88	359		281.4	12.1	9.3	37.8	38.4		70.56
12/25/88	360		314.3	11.3	9.5	31.0	30.2		72.30
12/26/88	361		200.6	11.9	8.7	35.6	38.4		37.44
12/27/88	362	*	258.9	10.1	11.0	41.3	43.2	0.00	28.74
12/28/88	363	*	314.9	14.2	4.3	33.6	33.1	0.00	95.82
12/29/88	364	*	216.9	14.2	3.5	34.0	33.9	0.00	97.86
12/30/88	365		308.4	12.4	6.6	33.8	33.9		98.16
12/31/88	366		65.4	10.9	4.2	32.7	32.6		73.98
1/ 1/89	1		263.8	12.1	3.1	35.1	36.1		29.70
1/ 2/89	2		330.0	10.8	10.3	32.4	31.9		58.62
1/ 3/89	3		315.9	9.5	18.2	20.8	20.5		107.40
1/ 4/89	4		310.9	10.2	11.3	22.2	22.0		104.46
1/ 5/89	5		40.9	10.7	7.2	28.9	28.9		32.40
1/ 6/89	6		359.9	12.1	6.1	32.0	32.4		33.48
1/ 7/89	7	*	224.4	10.0	9.7	36.8	41.3	0.00	4.80
1/ 8/89	8	*	299.3	12.2	6.4	32.3	32.7	0.00	23.28
1/ 9/89	9	*	207.4	15.7	3.2	32.0	32.2	0.00	58.80
1/10/89	10	*	342.0	14.5	5.8	31.0	31.3	0.00	102.84
1/11/89	11	*	201.3	9.4	5.0	35.9	39.3	0.00	13.20
1/12/89	12	*	296.3	15.5	8.2	32.1	31.9	0.00	57.66
1/13/89	13		188.6	11.2	9.4	35.5	37.7		110.28
1/14/89	14		258.2	11.6	4.9	40.1	41.2		79.56
1/15/89	15		278.8	15.0	4.8	35.7	35.9		81.12
1/16/89	16		215.3	13.7	7.7	36.2	37.6		108.42
1/17/89	17		179.7	14.6	1.8	37.0	37.4		110.40
1/18/89	18	*	273.7	14.4	3.2	38.0	39.0	0.00	83.04
1/19/89	19	*	268.8	10.0	10.1	37.0	37.6	0.00	93.12
1/20/89	20	*	305.4	12.9	10.0	25.8	24.6	0.00	133.08
1/21/89	21		220.2	11.7	7.5	32.6	33.4		183.00
1/22/89	22		183.2	24.6	2.3	33.4	35.0		92.04
1/23/89	23		341.6	14.1	4.3	35.8	38.6		123.54
1/24/89	24		58.5	9.7	5.0	32.4	31.8		125.88
4/3/89	93	*	192.4	10.2	9.3	50.6	51.1	0.19	91.68
4/4/89	94	*	177.0	11.3	7.8	53.4	51.8	0.20	205.86
4/5/89	95	*	208.4	13.1	8.3	47.9	46.8	0.65	117.36
4/6/89	96	*	275.8	12.4	1.8	47.5	44.9	0.79	262.44
4/7/89	97		261.1	15.9	4.4	43.3	42.51		24.14
4/8/89	98		232.1	22.9	2.6	41.9	41.2		100.26
4/9/89	99		265.0	10.4	3.9	41.6	39.1		265.98
4/10/89	100	*	253.8	23.8	3.7	42.4	39.8	0.48	262.26
4/11/89	101	*	179.9	17.0	5.9	44.8	42.9	0.03	248.76

Note: 9999.0 data not recovered

TABLE C-12 (cont'd)

Date	Julian Calendar	Sample Day (*)	Resultant Wind Direction (°)	Sigma Theta (°)	Resultant Wind Speed (mph)	Ambient Air Temp. (°F)	Soil Temp. (°F)	Total Daily Precip. (in)	Solar Radiation (Llys/24-hr)
4/12/89	102	*	128.4	14.8	5.8	45.8	43.0	0.00	322.50
4/13/89	103	*	156.3	10.2	7.1	45.1	43.5	0.00	329.64
4/14/89	104		89.5	7.4	11.7	45.9	45.0		80.04
4/15/89	105		335.8	9.0	12.3	43.3	42.7		122.22
4/16/89	106		167.1	18.9	4.8	53.0	51.5		198.12
4/17/89	107	*	10.6	15.2	4.7	52.8	51.3	1.76	179.10
4/18/89	108	*	294.6	23.8	2.6	46.1	44.7	0.12	190.14
4/19/89	109	*	286.7	29.6	4.3	50.8	49.7	0.07	312.42
4/20/89	110	*	185.7	10.4	2.4	49.9	47.8	0.00	368.60
4/21/89	111		298.5	12.2	10.8	42.7	39.4		298.26
4/22/89	112		306.4	11.5	9.4	46.1	43.7		293.58
4/23/89	113		295.8	21.4	6.6	48.0	47.2		370.74
4/24/89	114	*	324.1	18.3	2.4	50.0	47.9	0.00	368.40
4/25/89	115	*	150.2	36.0	3.9	54.2	49.7	0.00	303.96
4/26/89	116	*	318.5	16.0	4.2	53.8	52.2	0.00	371.00
4/27/89	117	*	160.2	29.2	7.4	49.4	47.3	0.00	362.46
4/28/89	118		156.8	14.1	4.3	52.9	50.4		116.82
4/29/89	119		351.4	11.5	8.3	50.3	48.7		113.70

Note: 9999.0 data not recovered

TABLE C-13

Heavy Metals Concentration Summary
Pre-Dredge Sampling

Date	PRIMARY SAMPLER Pb $\mu g/m^3$	Cd $\mu g/m^3$	Cr $\mu g/m^3$
11/7-8	0.0072	0.0003	0.0012
11/8-9	0.0112	0.0004	0.0013
11/9-10	0.0286	0.0004	0.0018
11/10-11	0.0136	0.0003	0.0011
11/11-12	0.0065	0.0003	ND
11/12-13	0.0131	0.0003	0.0011
11/13-14	0.0051	0.0003	0.0005
11/14-15	0.0096	0.0003	0.0014
11/15-16	0.0205	0.0007	0.0026
11/16-17	0.0035	0.0003	0.0011
11/17-18	0.0199	0.0005	0.0014
11/18-19	0.0091	0.0003	0.0005
MEAN	0.0123	0.0004	0.0012
MAX	0.0286	0.0007	0.0026
MIN	0.0035	0.0003	ND

TABLE C-14

Heavy Metals Concentration Summary
During Dredge Sampling

Date	PRIMARY SAMPLER Pb $\mu g/m^3$	Cd $\mu g/m^3$	Cr $\mu g/m^3$
11/19-20	0.0082	ND	0.0005
11/21-22	0.0063	0.0004	0.0010
11/22-23	0.0273	0.0006	0.0014
11/23-24	0.0176	0.0004	0.0005
11/25-26	0.0464	0.0013	0.0006
11/26-27	0.0474	0.0003	0.0005
11/27-28	0.0052	ND	0.0007
11/28-29	0.0058*	ND*	0.0042*
11/29-30	0.0294*	0.0004*	0.0050*
12/1-2	0.0166*	ND*	0.0042*
12/2-3	0.0154*	ND*	0.0038*
12/3-4	0.0288*	0.0004*	0.0040*
12/4-5	0.0126*	ND*	0.0040*
12/5-6	0.0222*	0.0004*	0.0086*
12/6-7	0.0108*	ND*	0.0014*
12/9-10	0.0208*	ND*	0.0036*
12/10-11	0.0110*	ND*	0.0014*
12/11-12	0.0102*	ND*	0.0012*
12/12-13	0.0276*	ND*	0.0036*
12/13-14	0.0066*	ND*	0.0052*
12/16-17	0.0137*	ND*	0.0018*
12/17-18	0.0152*	ND*	0.0012*
12/18-19	0.0303*	ND*	0.0024*
12/19-20	0.0129*	ND*	0.0014*
12/21-22	sample contaminated by lab		
12/27-28	sample contaminated by lab		
1/7-8	0.0086*	ND*	0.0034*
1/8-9	0.0142*	ND*	0.0016*
1/9-10	0.0156*	0.0004*	0.0018*
1/10-11	0.0222*	ND*	0.0016*
1/11-12	0.0106*	ND*	0.0012*
1/12-13	0.0052	ND	ND
1/18-19	0.0085	ND	0.0013
1/19-20	0.0069	ND	ND
1/20-21	0.0154	ND	0.0012
MEAN	0.0168	0.0001	0.0023
MAX	0.0474	0.0013	0.0086
MIN	0.0052	ND	ND

* Laboratory mistakenly reported half-filter weight. Weight was doubled to obtain correct concentration.

TABLE C-15

Heavy Metals Concentration Summary
Post-Dredge Sampling

Date	PRIMARY SAMPLER Pb $\mu g/m^3$	Cd $\mu g/m^3$	Cr $\mu g/m^3$
4/3-4	0.0040*	0.0004*	0.0010*
4/4-5	0.0030*	0.0004*	0.0008*
4/5-6**	0.0062*	0.0004*	0.0020*
4/6-7	0.0048*	0.0004*	0.0014*
4/10-11	0.0084*	0.0006*	0.0006*
4/11-12	0.0156*	0.0010*	0.0006*
4/12-13	0.0150*	0.0006*	0.0064*
4/13-14	0.0048*	0.0004*	0.0026*
4/17-18	0.0059	0.0003	0.0009
4/18-19	0.0084	0.0003	0.0006
4/19-20**	0.0163	0.0007	0.0025
4/20-21	0.0247	0.0007	0.0018
4/24-25	0.0271	0.0007	0.0034
4/25-26	0.0097	ND	0.0011
4/26-27	0.0136	0.0003	0.0007
4/27-28	0.0207	0.0007	0.0026
MEAN	0.0118	0.0005	0.0018
MAX	0.0271	0.0010	0.0064
MIN	0.0030	ND	0.0006

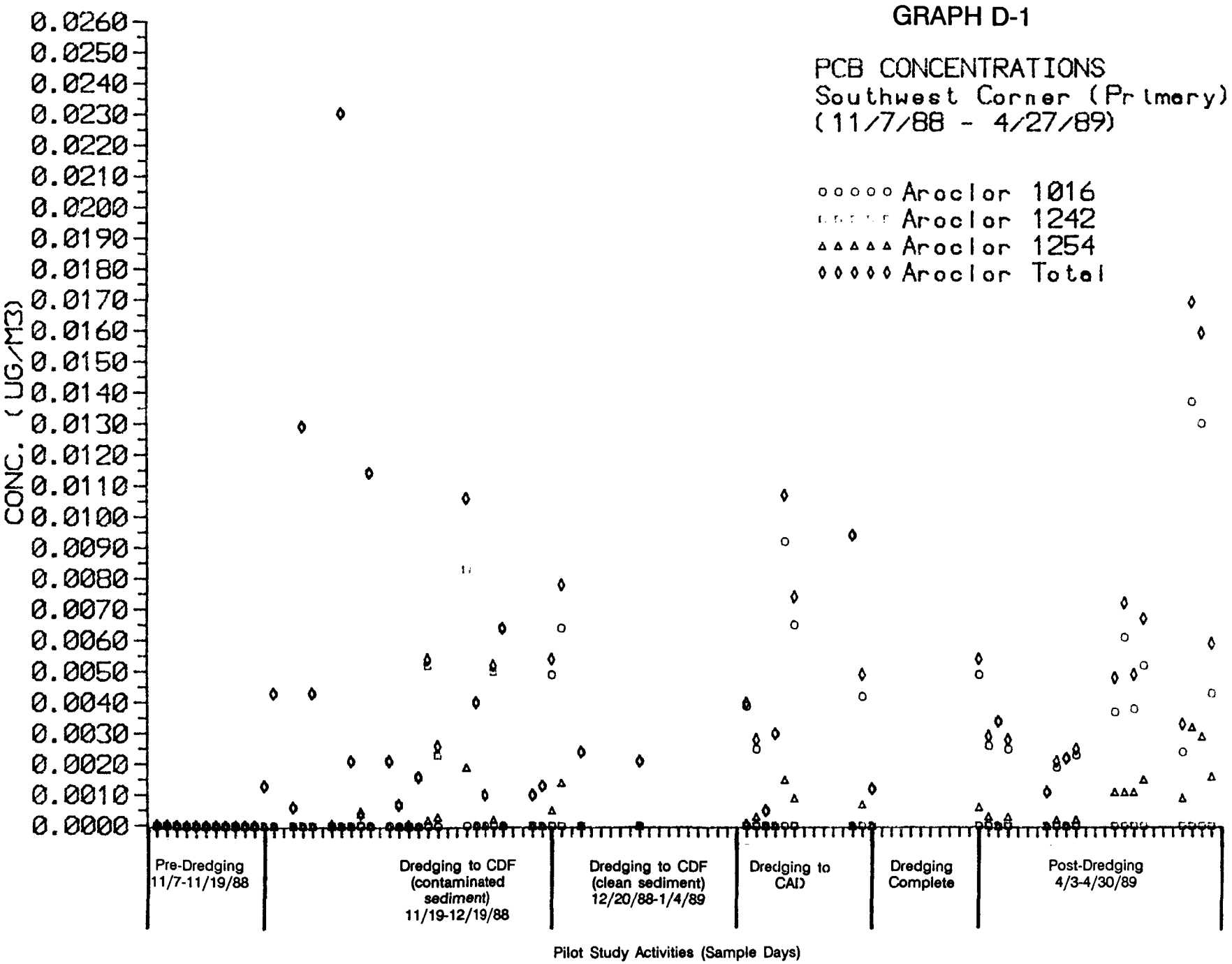
* Laboratory mistakenly reported half-filter weight. Weight was doubled to obtain correct concentration.
** Glass fiber filter

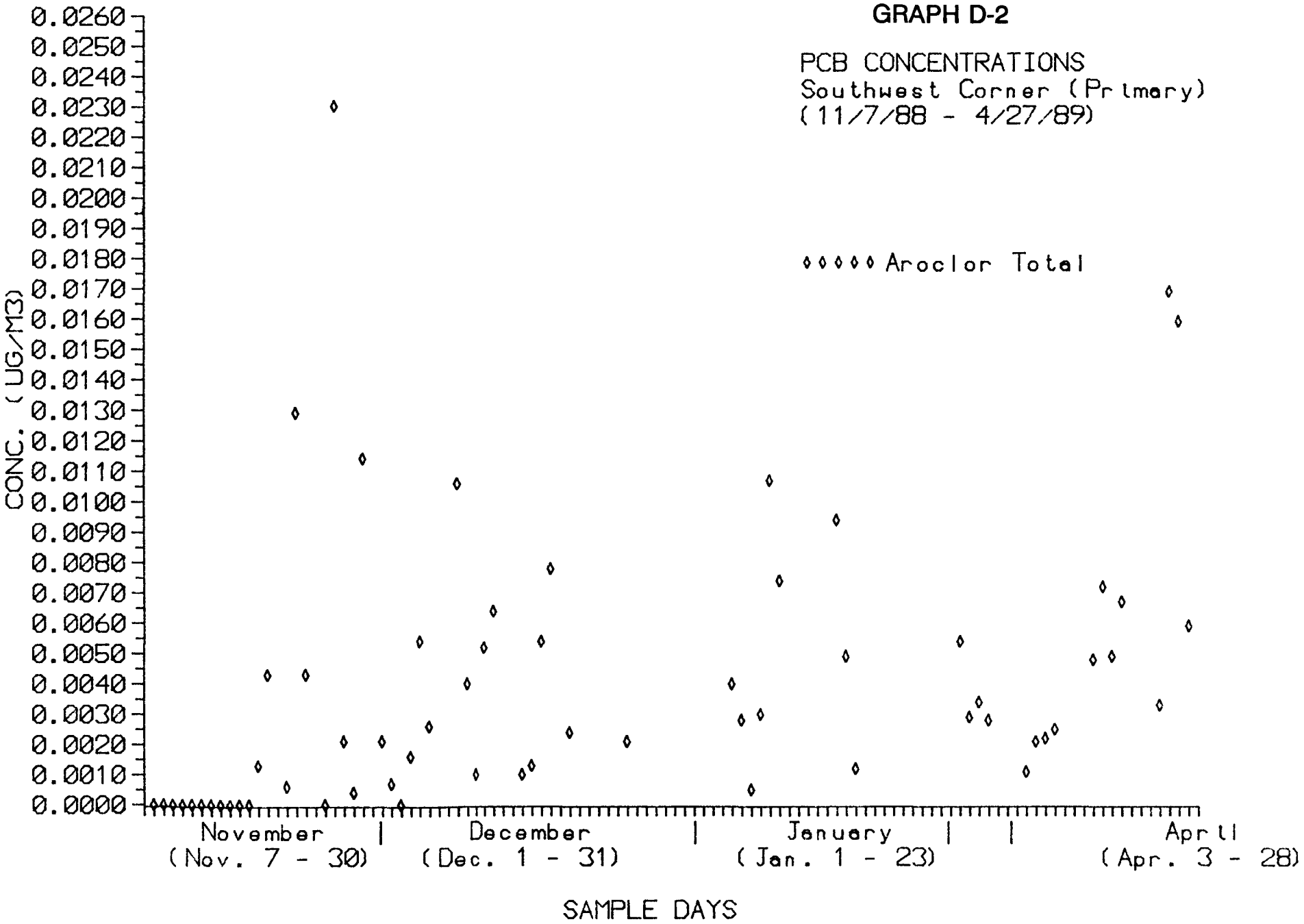
APPENDIX D

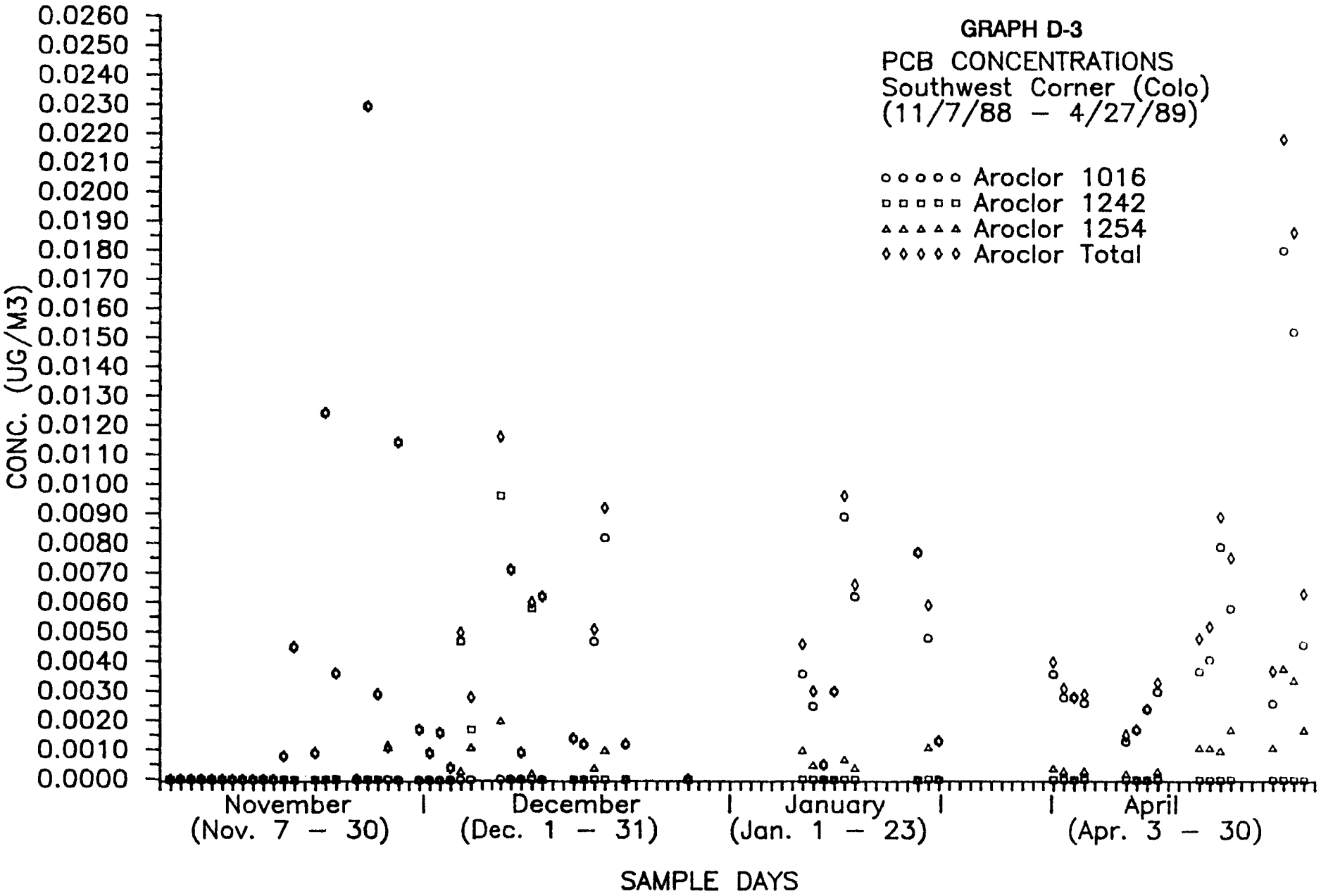
APPENDIX D

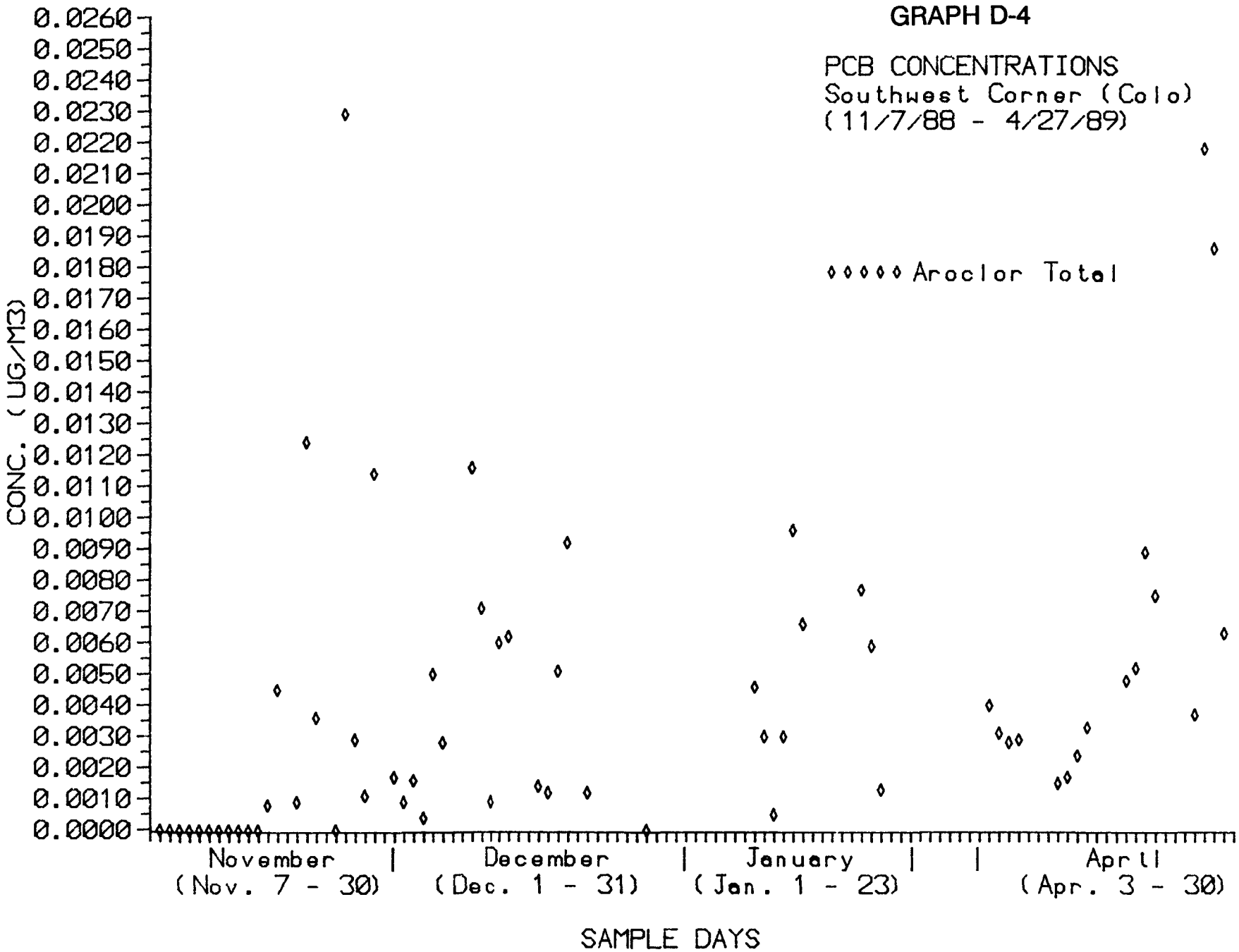
GRAPHICAL DATA SUMMARIES

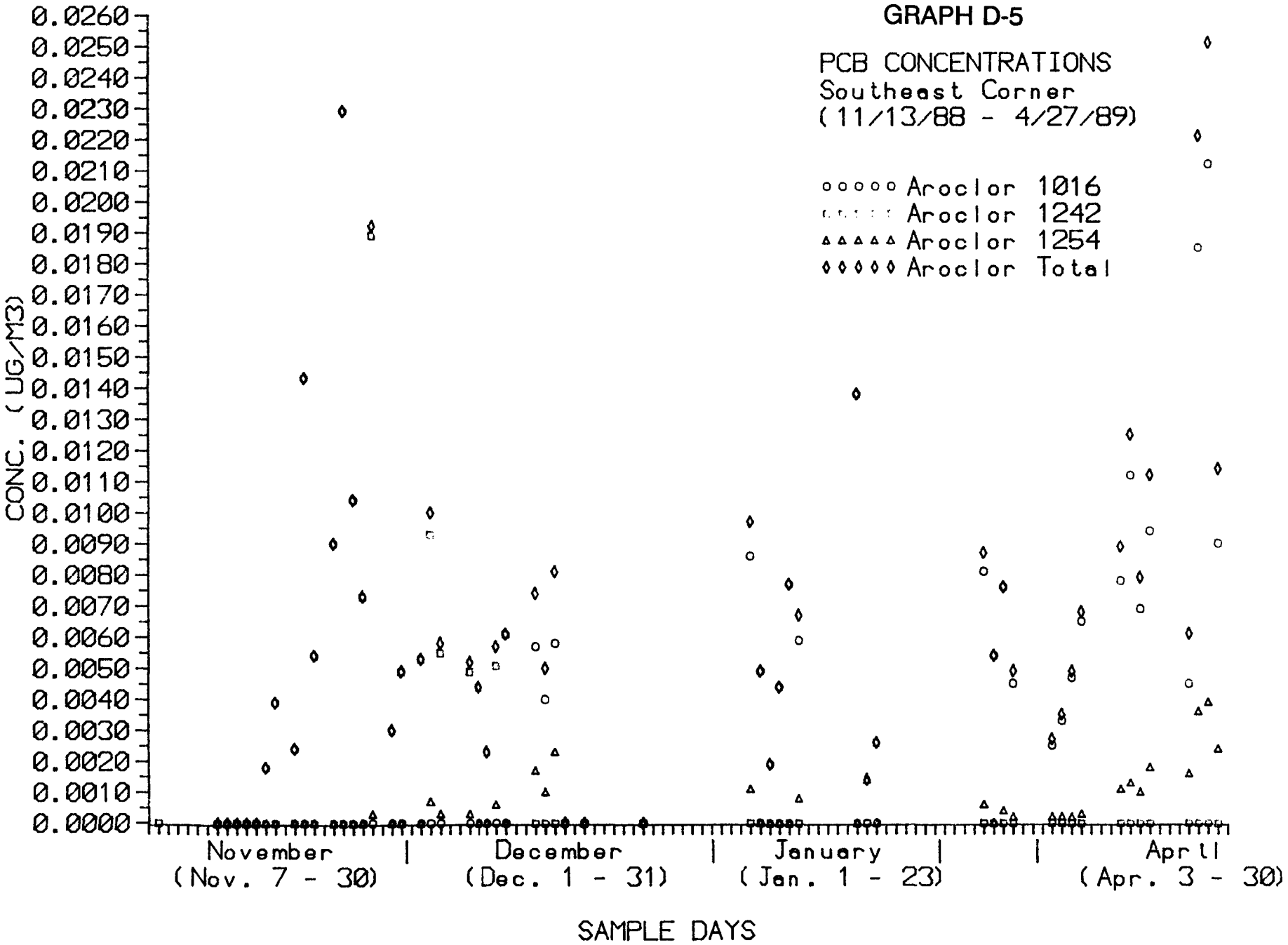
Graph #	Graph Title
D-1	PCB Concentration (SWC Primary) All Aroclors
D-2	PCB Concentration (SWC Primary) Total Only
D-3	PCB Concentration (SWC Collocated) All Aroclors
D-4	PCB Concentration (SWC Collocated) Total Only
D-5	PCB Concentration (SEC) All Aroclors
D-6	PCB Concentration (SEC) Total Only
D-7	PCB Concentration (NEC) All Aroclors
D-8	PCB Concentration (NEC) Total Only
D-9	PCB Concentration (NWC) All Aroclors
D-10	PCB Concentration (NWC) Total Only
D-11	PCB Concentration (BG) All Aroclors
D-12	PCB Concentration (BG) Total Only
D-13	PCB Concentration (All) Total Only
D-14	Metals Concentration (SWC Primary)
D-15	Metals Concentration (SWC Collocated)
D-16	PCB Precision (1016)
D-17	PCB Precision (1242)
D-18	PCB Precision (1252)
D-19	PCB Precision (Total)
D-20	Metals Precision (Pb)
D-21	Metals Precision (Cd)
D-22	Metals Precision (Cr)
D-23	PCB Concentration/Wind Direction (SWC)
D-24	PCB Concentration/Wind Direction (SEC)
D-25	PCB Concentration/Wind Direction (NEC)
D-26	PCB Concentration/Wind Direction (NWC)
D-27	PCB Concentration/Wind Direction (BG)
D-28	PCB Concentration/Wind Direction (All)
D-29	PCB Concentration/Wind Speed (SWC)
D-30	PCB Concentration/Wind Speed (SEC)
D-31	PCB Concentration/Wind Speed (NEC)
D-32	PCB Concentration/Wind Speed (NWC)
D-33	PCB Concentration/Wind Speed (BG)
D-34	PCB Concentration/Wind Speed (All)
D-35	Metals/Wind Direction

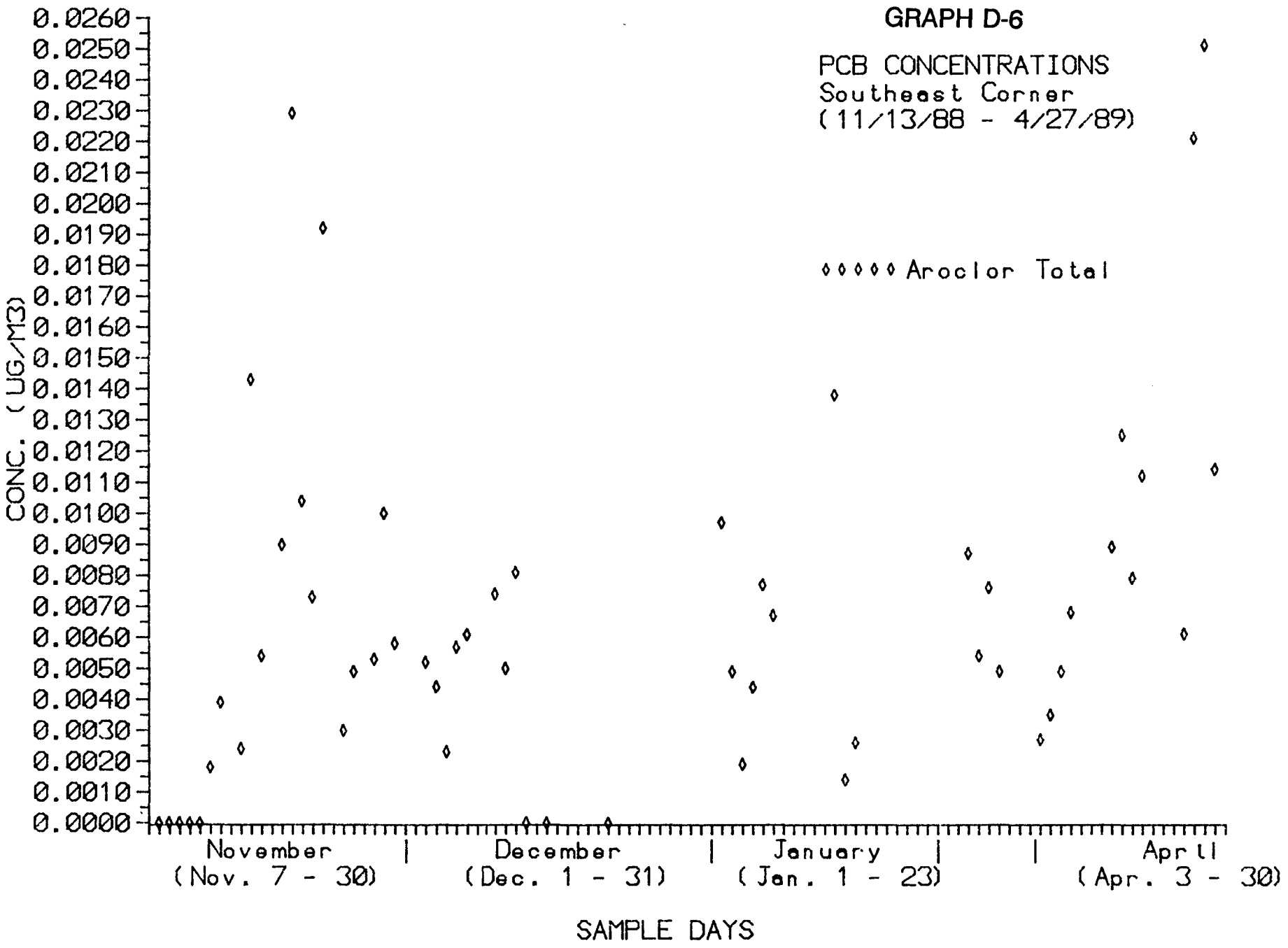

GRAPH D-1
PCB CONCENTRATIONS
Southwest Corner (Primary)
(11/7/88 - 4/27/89)
Aroclor 1016
Aroclor 1242
Aroclor 1254
Aroclor Total
CONC. (UG/M3)
0.0260
0.0250
0.0240
0.0230
0.0220
0.0210
0.0200
0.0190
0.0180
0.0170
0.0160
0.0150
0.0140
0.0130
0.0120
0.0110
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
Pre-Dredging 11/7-11/19/88
Dredging to CDF (contaminated sediment) 11/19-12/19/88
Dredging to CDF (clean sediment) 12/20/88-1/4/89
Dredging to CAD
Dredging Complete
Post-Dredging 4/3-4/30/89
Pilot Study Activities (Sample Days)

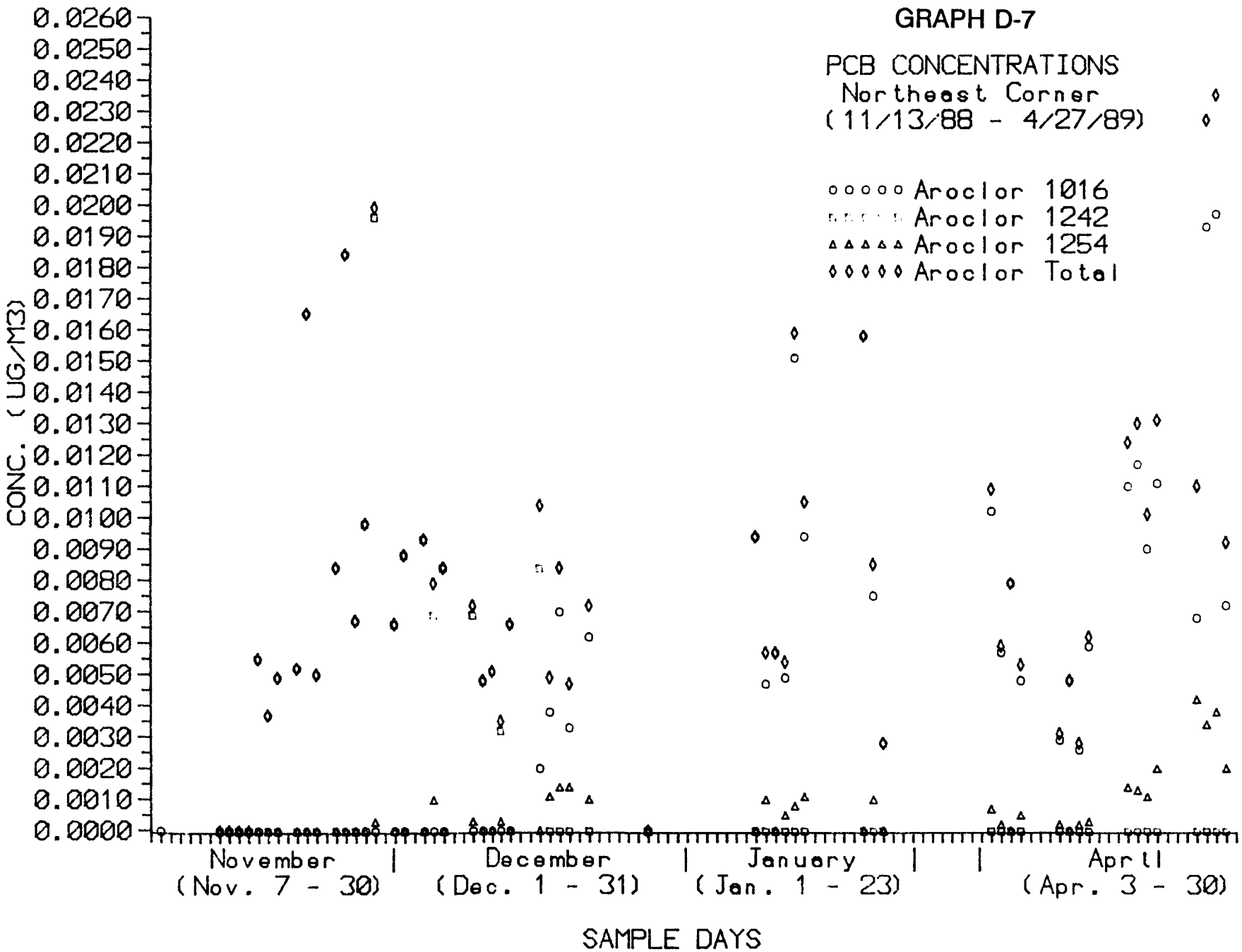

GRAPH D-2
PCB CONCENTRATIONS
Southwest Corner (Primary)
(11/7/88 - 4/27/89)
◊◊◊◊◊ Aroclor Total
CONC. (UG/M3)
0.0260
0.0250
0.0240
0.0230
0.0220
0.0210
0.0200
0.0190
0.0180
0.0170
0.0160
0.0150
0.0140
0.0130
0.0120
0.0110
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
November
(Nov. 7 - 30)
December
(Dec. 1 - 31)
January
(Jan. 1 - 23)
April
(Apr. 3 - 28)
SAMPLE DAYS

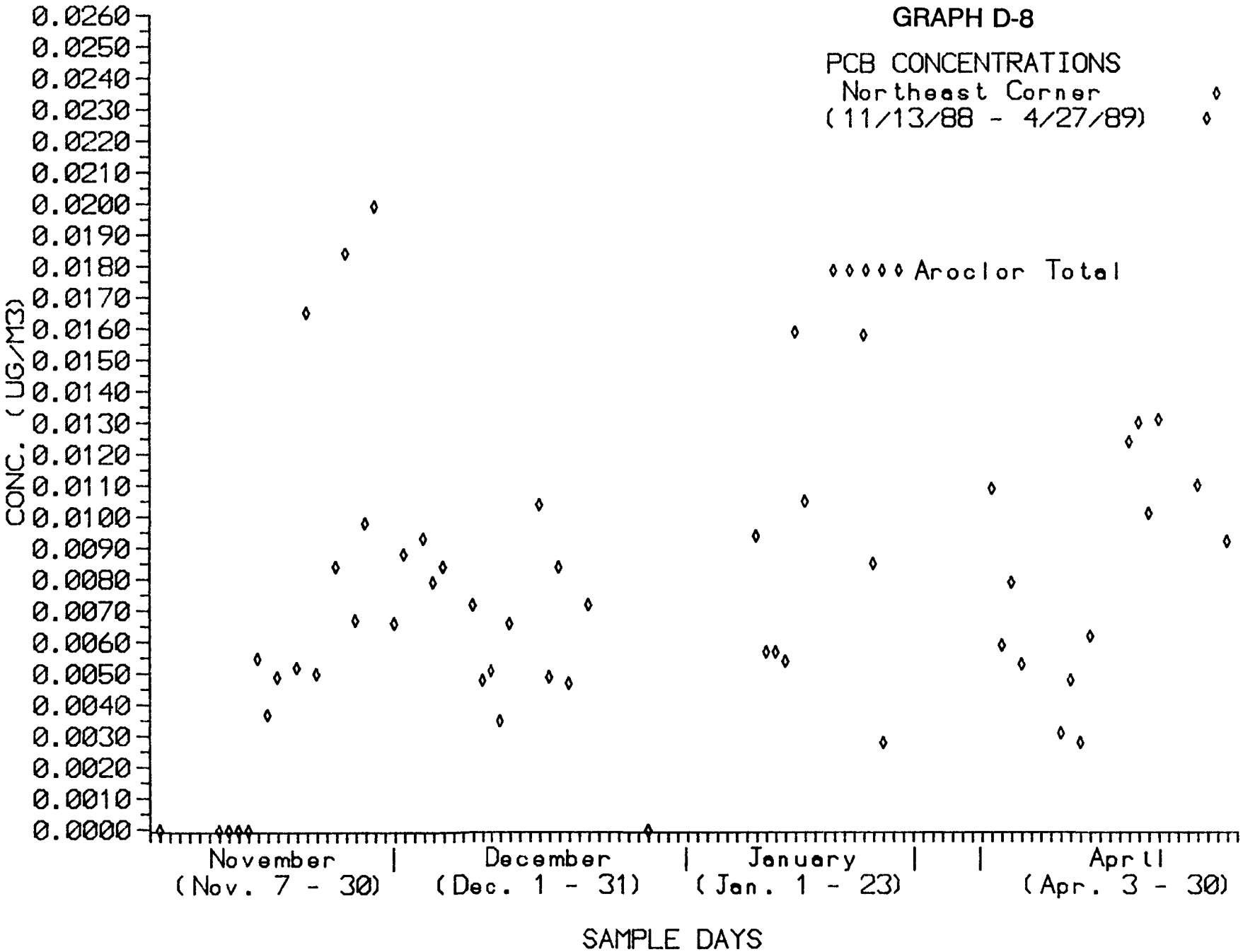

GRAPH D-3
PCB CONCENTRATIONS
Southwest Corner (Colo)
(11/7/88 – 4/27/89)
Aroclor 1016
Aroclor 1242
Aroclor 1254
Aroclor Total
CONC. (UG/M3)
0.0260
0.0250
0.0240
0.0230
0.0220
0.0210
0.0200
0.0190
0.0180
0.0170
0.0160
0.0150
0.0140
0.0130
0.0120
0.0110
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
November
(Nov. 7 – 30)
December
(Dec. 1 – 31)
January
(Jan. 1 – 23)
April
(Apr. 3 – 30)
SAMPLE DAYS

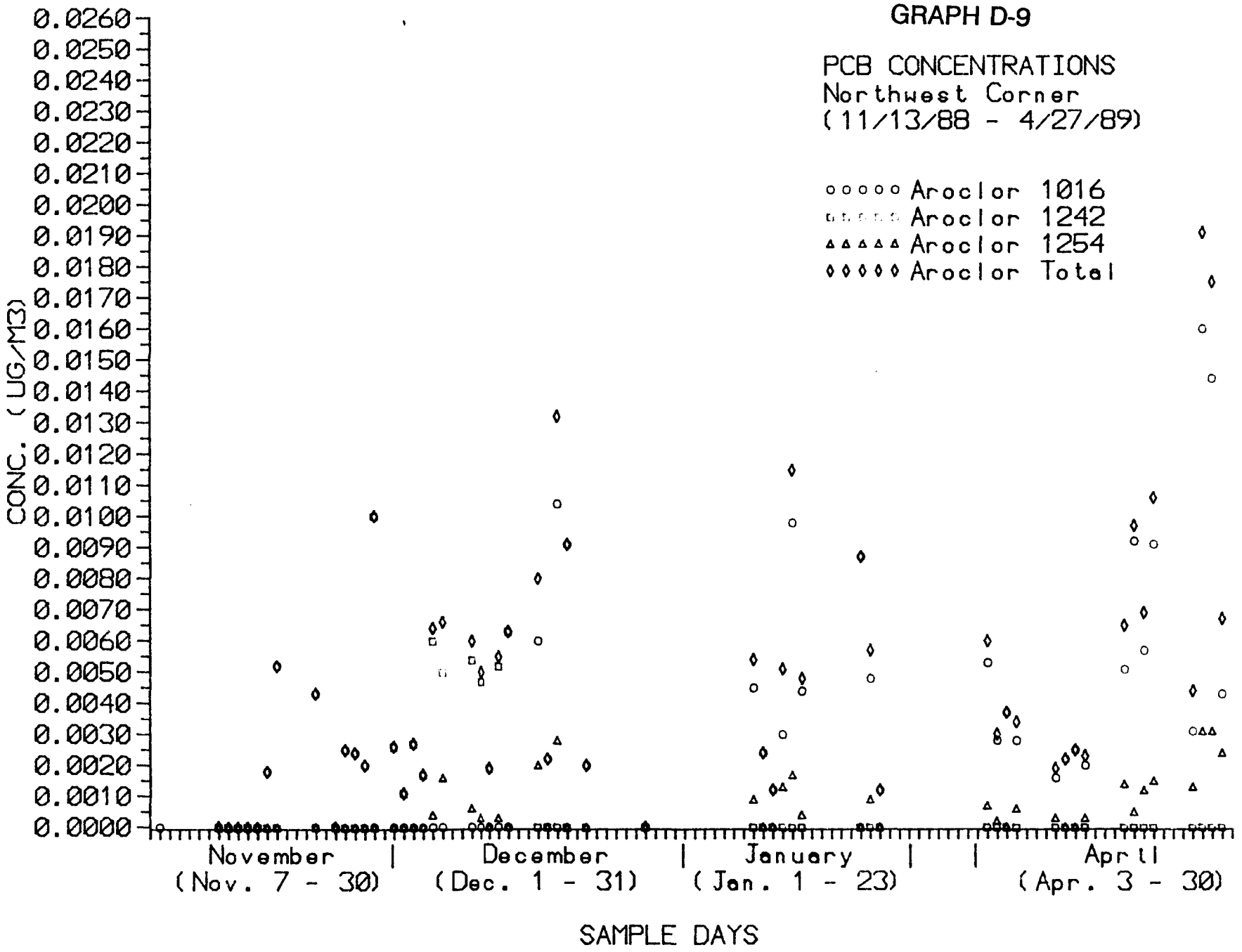

GRAPH D-4
PCB CONCENTRATIONS
Southwest Corner (Colo)
(11/7/88 - 4/27/89)
◊◊◊◊◊ Aroclor Total
CONC. (UG/M3)
0.0260
0.0250
0.0240
0.0230
0.0220
0.0210
0.0200
0.0190
0.0180
0.0170
0.0160
0.0150
0.0140
0.0130
0.0120
0.0110
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
November
(Nov. 7 - 30)
December
(Dec. 1 - 31)
January
(Jan. 1 - 23)
April
(Apr. 3 - 30)
SAMPLE DAYS

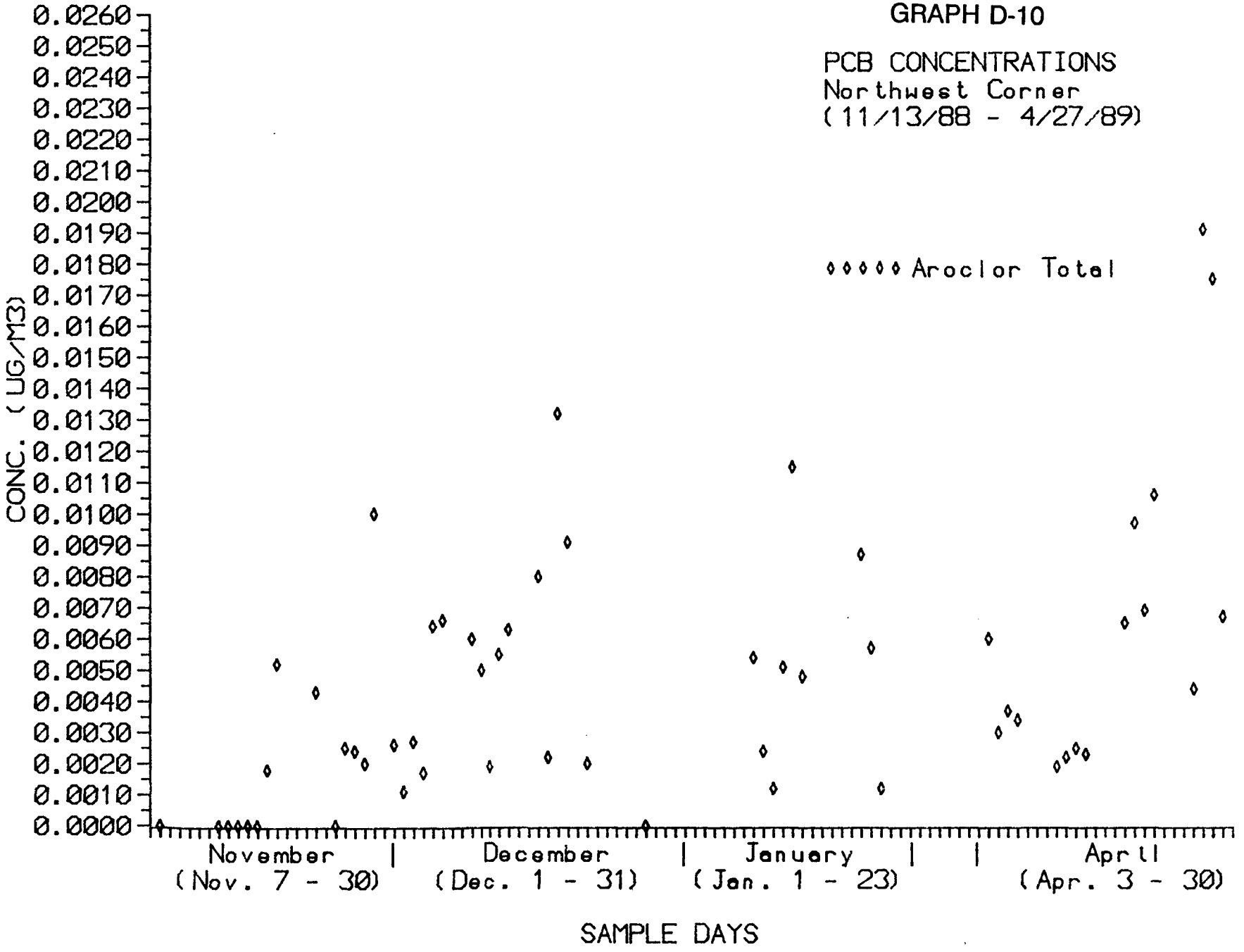

GRAPH D-5
PCB CONCENTRATIONS
Southeast Corner
(11/13/88 - 4/27/89)
Aroclor 1016
Aroclor 1242
Aroclor 1254
Aroclor Total
CONC. (UG/M3)
0.0260
0.0250
0.0240
0.0230
0.0220
0.0210
0.0200
0.0190
0.0180
0.0170
0.0160
0.0150
0.0140
0.0130
0.0120
0.0110
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
November
(Nov. 7 - 30)
December
(Dec. 1 - 31)
January
(Jan. 1 - 23)
April
(Apr. 3 - 30)
SAMPLE DAYS

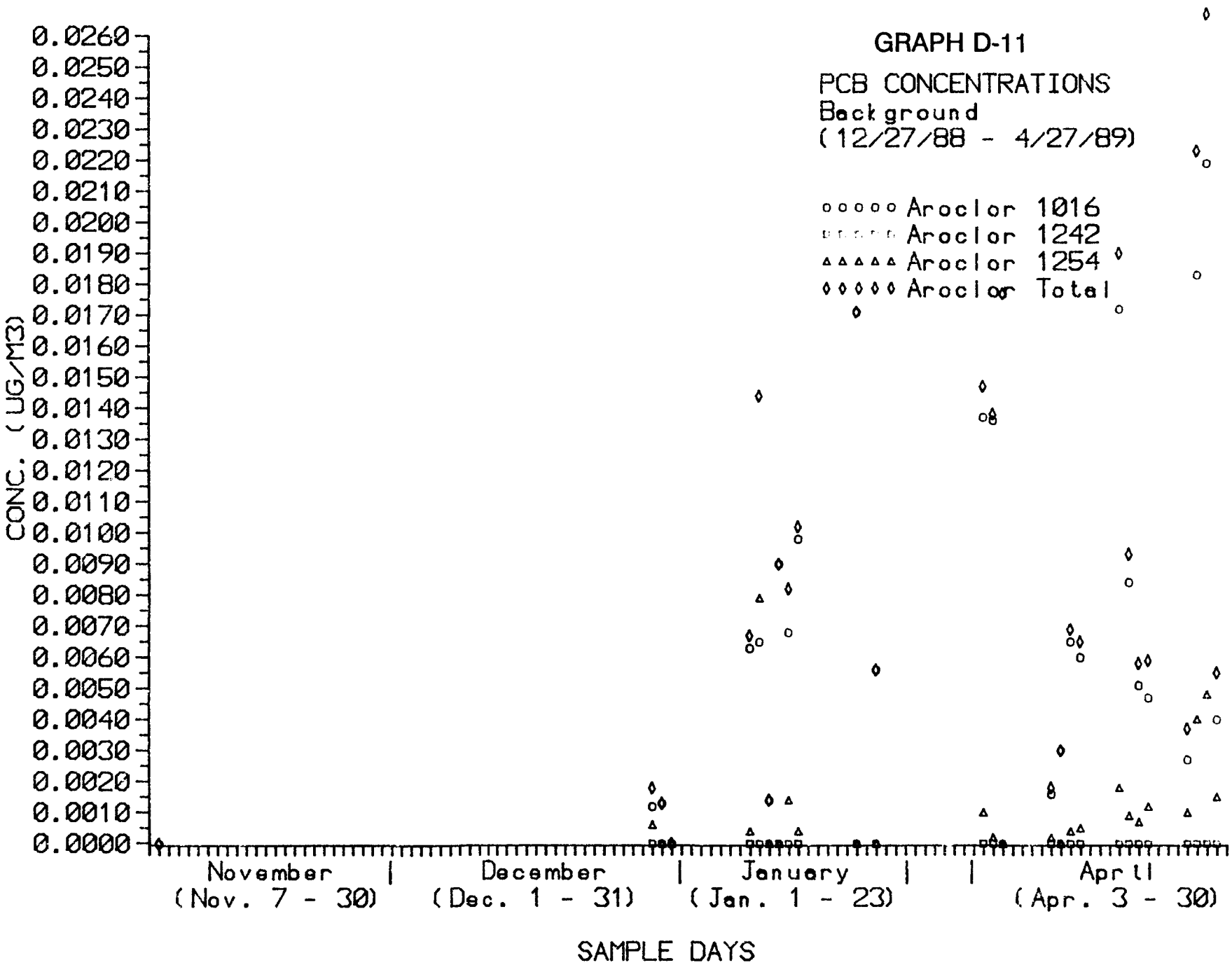

GRAPH D-6
PCB CONCENTRATIONS
Southeast Corner
(11/13/88 - 4/27/89)
◊◊◊◊◊ Aroclor Total
CONC. (UG/M3)
0.0260
0.0250
0.0240
0.0230
0.0220
0.0210
0.0200
0.0190
0.0180
0.0170
0.0160
0.0150
0.0140
0.0130
0.0120
0.0110
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
November
(Nov. 7 - 30)
December
(Dec. 1 - 31)
January
(Jan. 1 - 23)
April
(Apr. 3 - 30)
SAMPLE DAYS

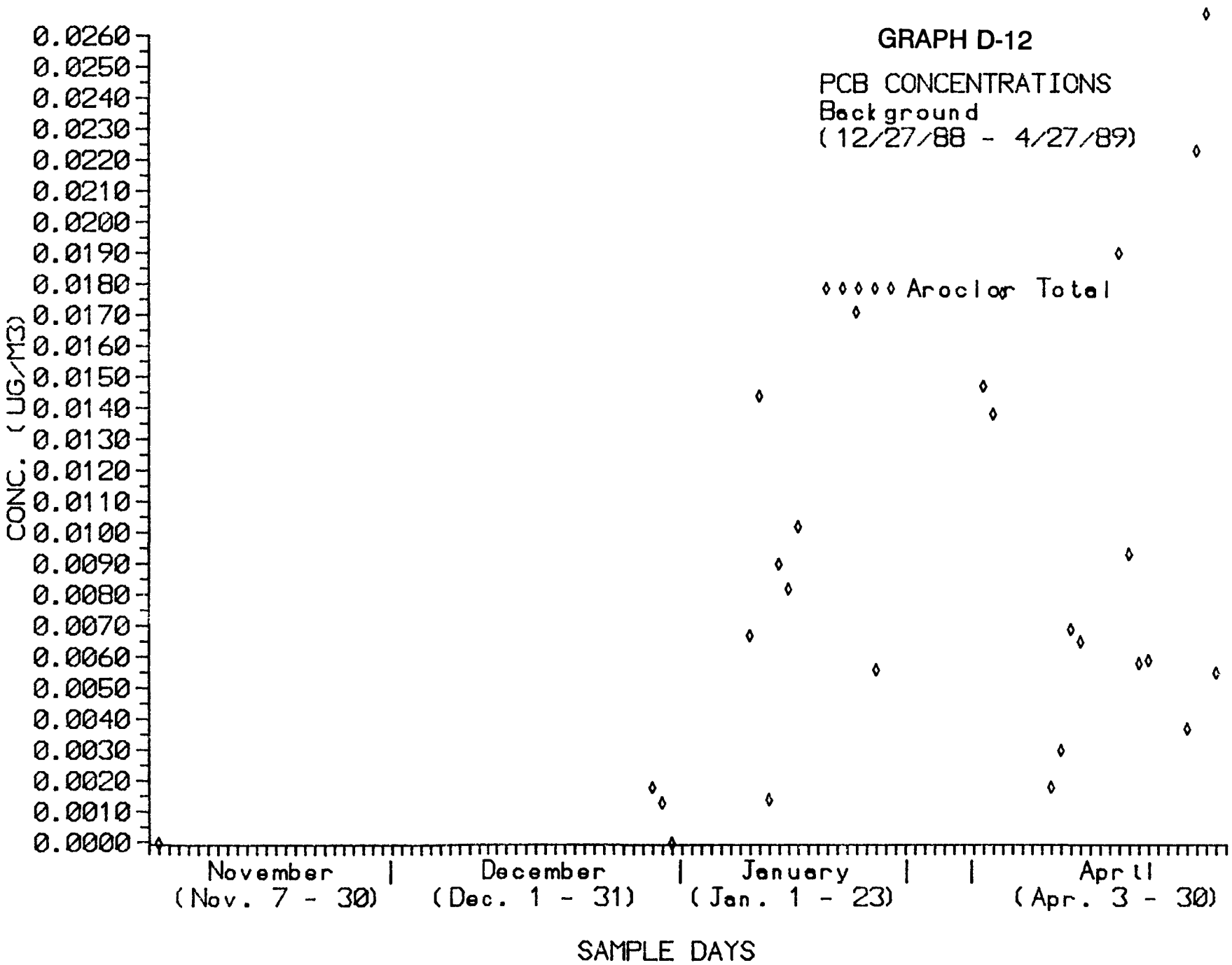

GRAPH D-7
PCB CONCENTRATIONS
Northeast Corner
(11/13/88 - 4/27/89)
Aroclor 1016
Aroclor 1242
Aroclor 1254
Aroclor Total
CONC. (UG/M3)
0.0260
0.0250
0.0240
0.0230
0.0220
0.0210
0.0200
0.0190
0.0180
0.0170
0.0160
0.0150
0.0140
0.0130
0.0120
0.0110
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
November
(Nov. 7 - 30)
December
(Dec. 1 - 31)
January
(Jan. 1 - 23)
April
(Apr. 3 - 30)
SAMPLE DAYS

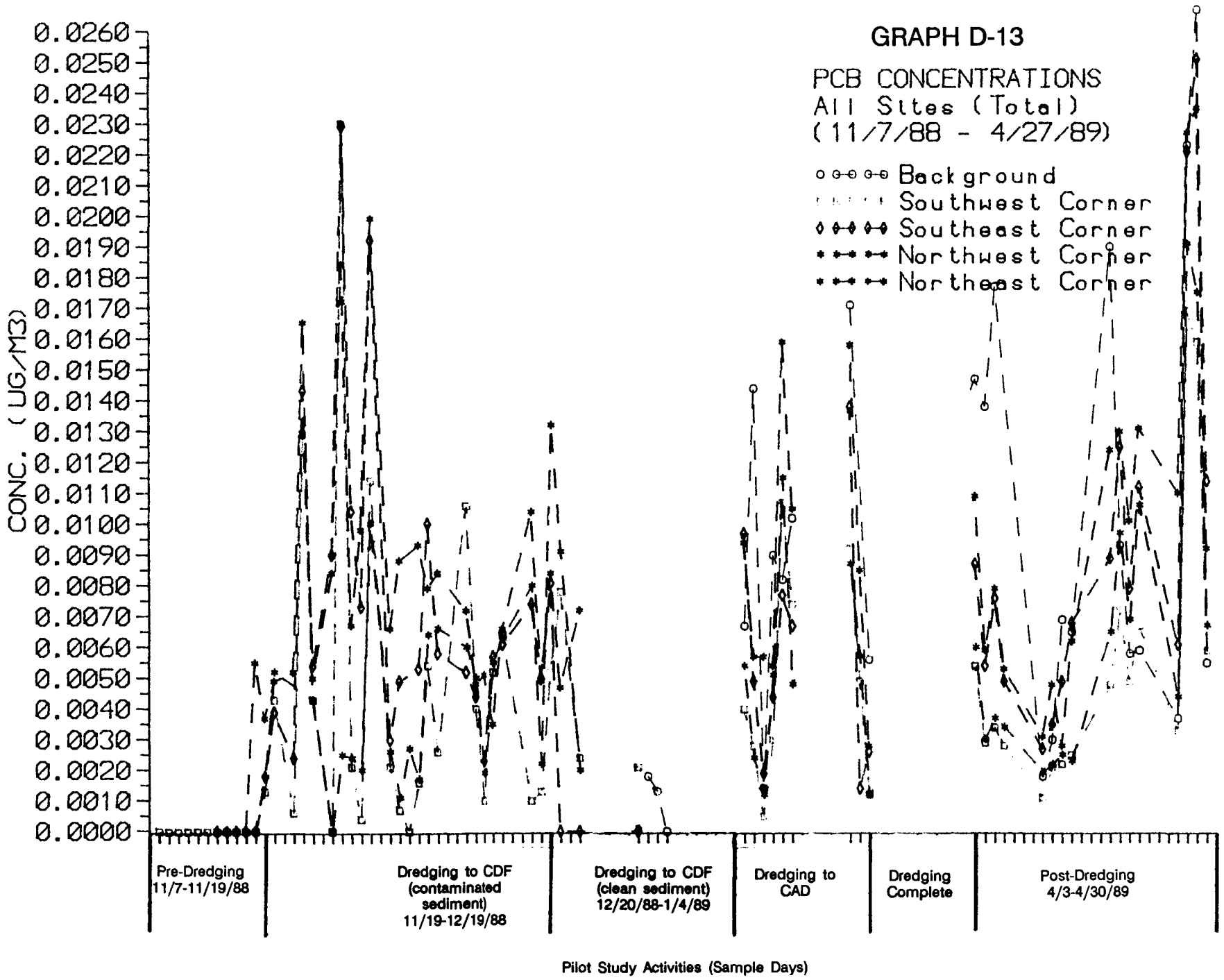

GRAPH D-8
PCB CONCENTRATIONS
Northeast Corner
(11/13/88 - 4/27/89)
Aroclor Total
CONC. (UG/M3)
0.0260
0.0250
0.0240
0.0230
0.0220
0.0210
0.0200
0.0190
0.0180
0.0170
0.0160
0.0150
0.0140
0.0130
0.0120
0.0110
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
November
(Nov. 7 - 30)
December
(Dec. 1 - 31)
January
(Jan. 1 - 23)
April
(Apr. 3 - 30)
SAMPLE DAYS

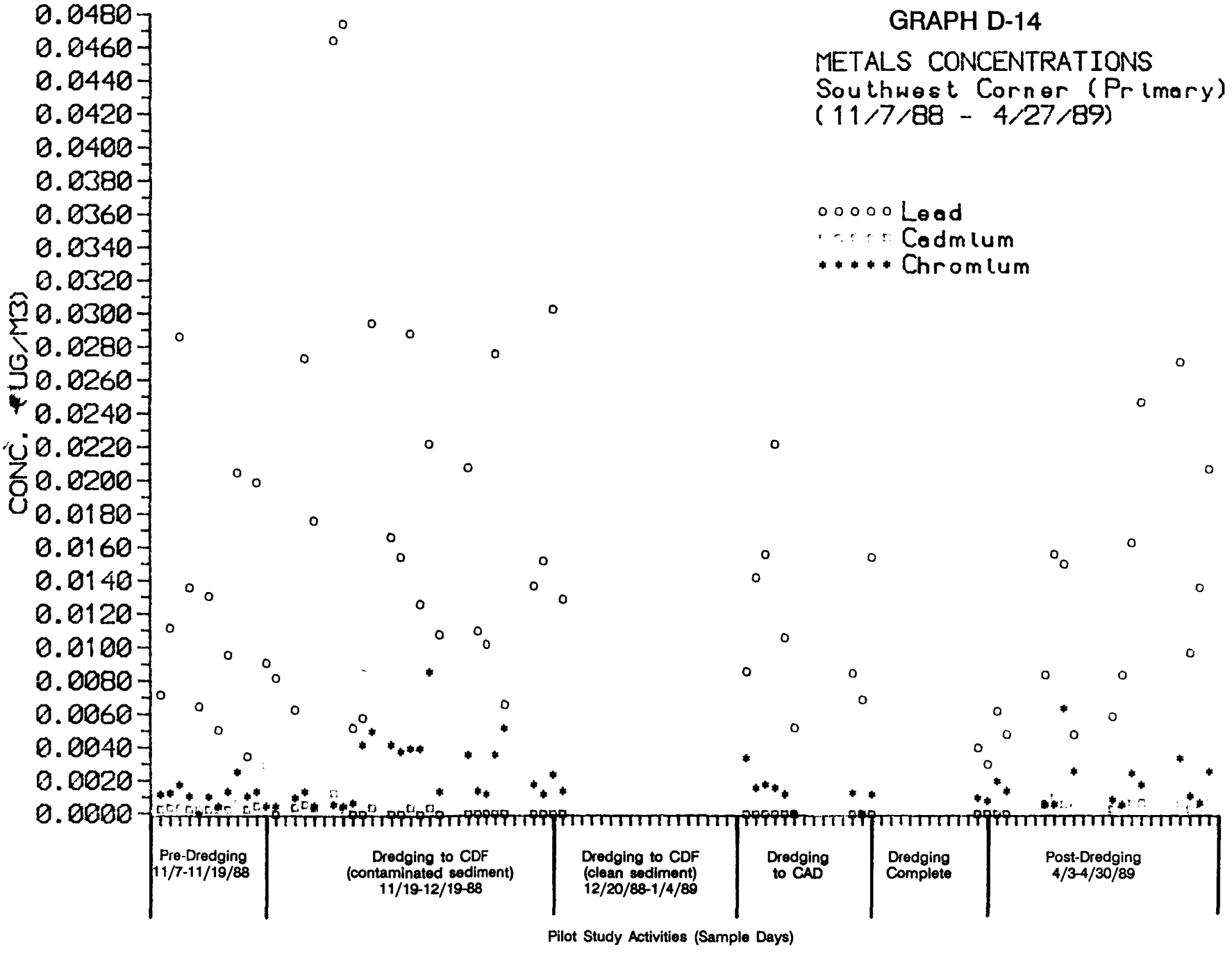

GRAPH D-9
PCB CONCENTRATIONS
Northwest Corner
(11/13/88 - 4/27/89)
Aroclor 1016
Aroclor 1242
Aroclor 1254
Aroclor Total
CONC. (UG/M3)
0.0260
0.0250
0.0240
0.0230
0.0220
0.0210
0.0200
0.0190
0.0180
0.0170
0.0160
0.0150
0.0140
0.0130
0.0120
0.0110
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
November
(Nov. 7 - 30)
December
(Dec. 1 - 31)
January
(Jan. 1 - 23)
April
(Apr. 3 - 30)
SAMPLE DAYS

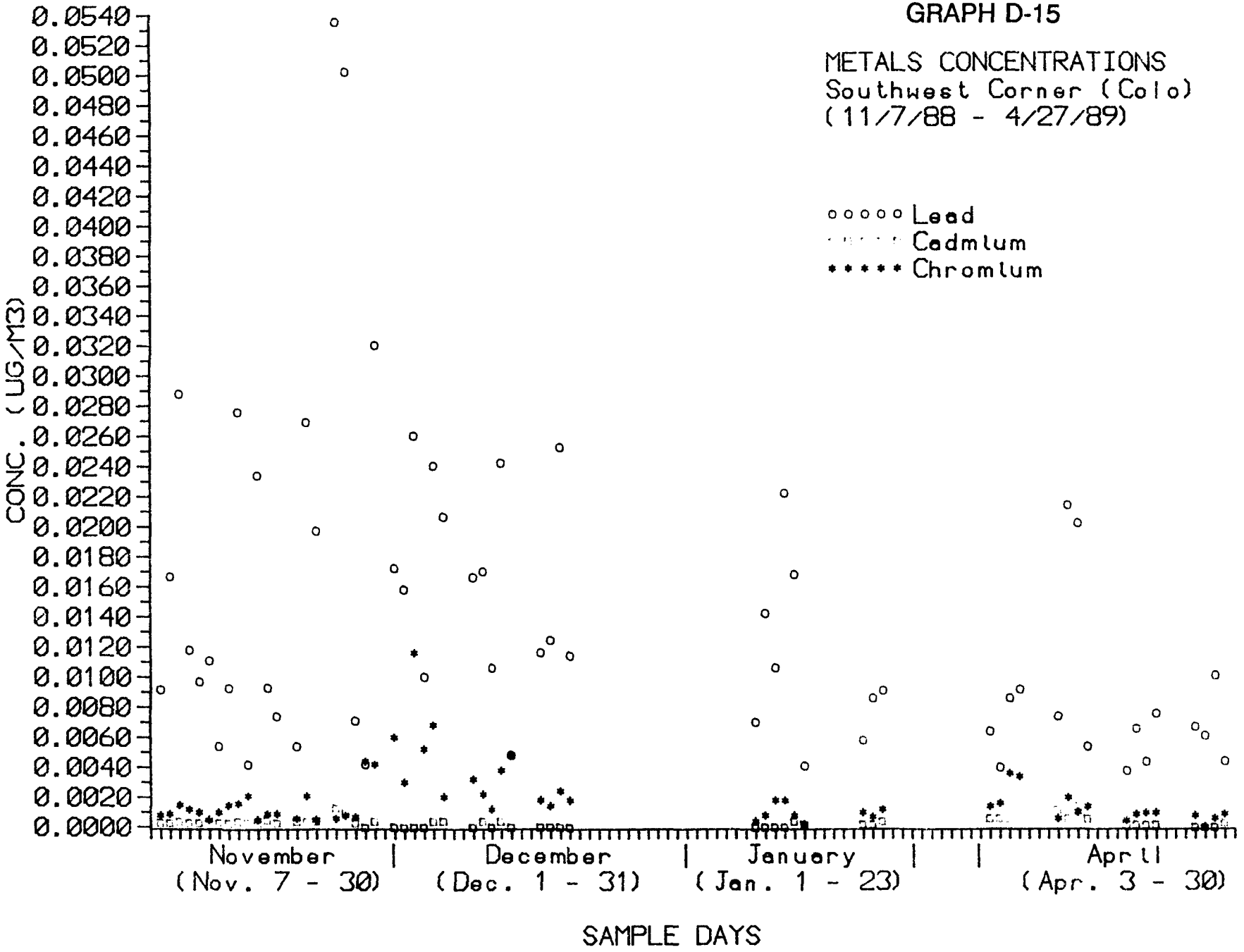

GRAPH D-10
PCB CONCENTRATIONS
Northwest Corner
(11/13/88 - 4/27/89)
◊◊◊◊◊ Aroclor Total
CONC. (UG/M3)
0.0260
0.0250
0.0240
0.0230
0.0220
0.0210
0.0200
0.0190
0.0180
0.0170
0.0160
0.0150
0.0140
0.0130
0.0120
0.0110
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
November
(Nov. 7 - 30)
December
(Dec. 1 - 31)
January
(Jan. 1 - 23)
April
(Apr. 3 - 30)
SAMPLE DAYS

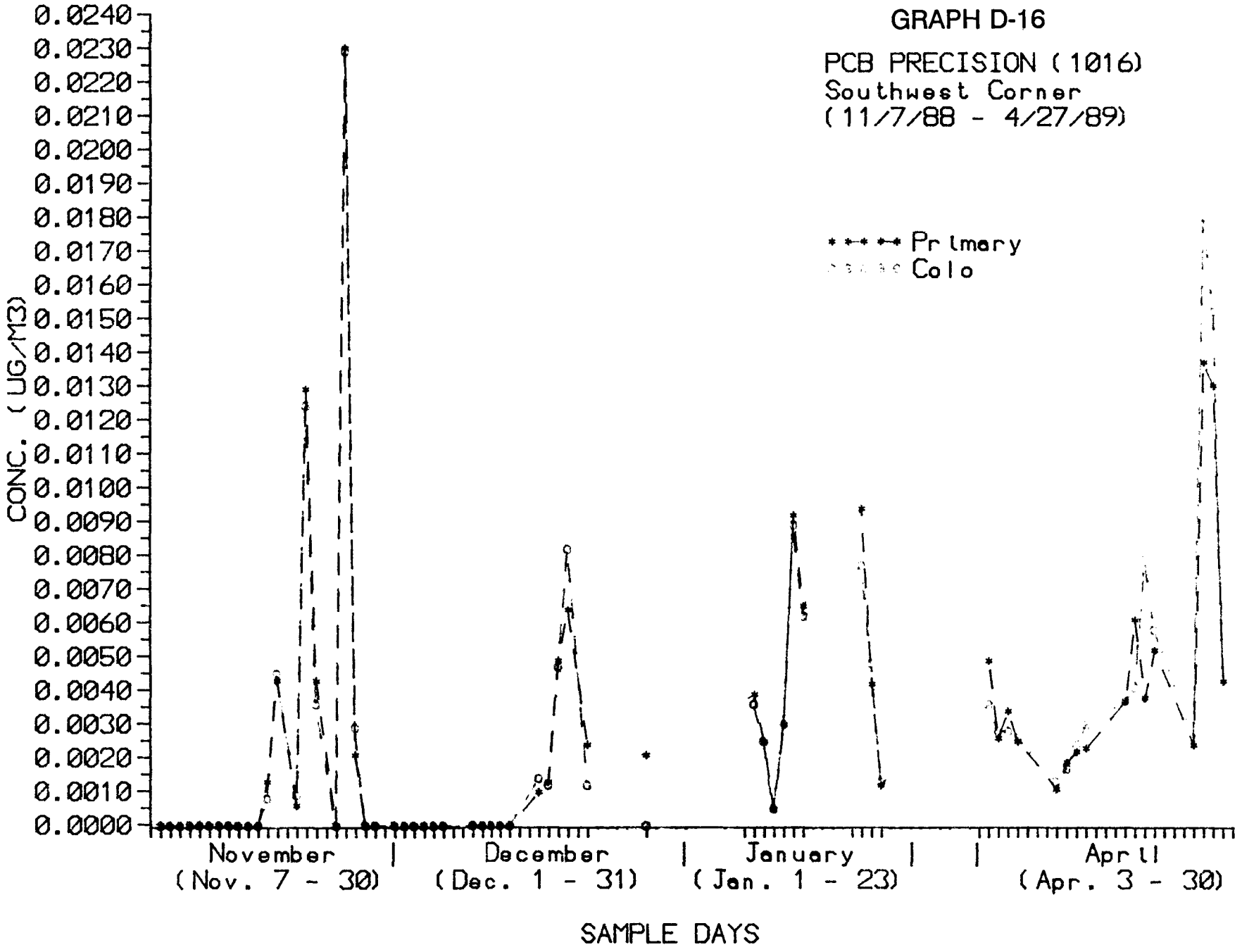

GRAPH D-11
PCB CONCENTRATIONS
Background
(12/27/88 - 4/27/89)
Aroclor 1016
Aroclor 1242
Aroclor 1254
Aroclor Total
CONC. (UG/M3)
0.0260
0.0250
0.0240
0.0230
0.0220
0.0210
0.0200
0.0190
0.0180
0.0170
0.0160
0.0150
0.0140
0.0130
0.0120
0.0110
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
November
(Nov. 7 - 30)
December
(Dec. 1 - 31)
January
(Jan. 1 - 23)
April
(Apr. 3 - 30)
SAMPLE DAYS

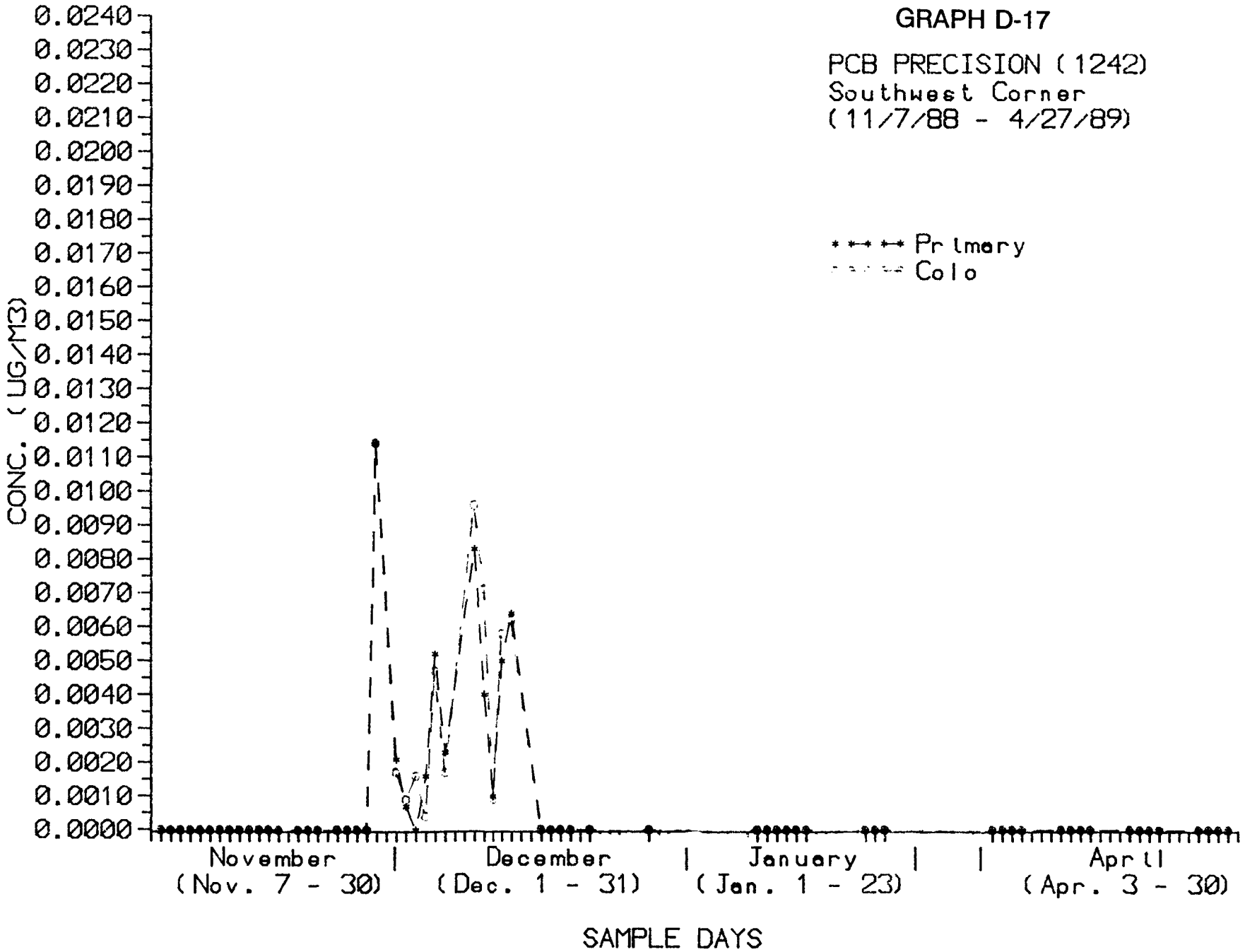

GRAPH D-12
PCB CONCENTRATIONS
Background
(12/27/88 - 4/27/89)
Aroclor Total
CONC. (UG/M3)
0.0260
0.0250
0.0240
0.0230
0.0220
0.0210
0.0200
0.0190
0.0180
0.0170
0.0160
0.0150
0.0140
0.0130
0.0120
0.0110
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
November
(Nov. 7 - 30)
December
(Dec. 1 - 31)
January
(Jan. 1 - 23)
April
(Apr. 3 - 30)
SAMPLE DAYS

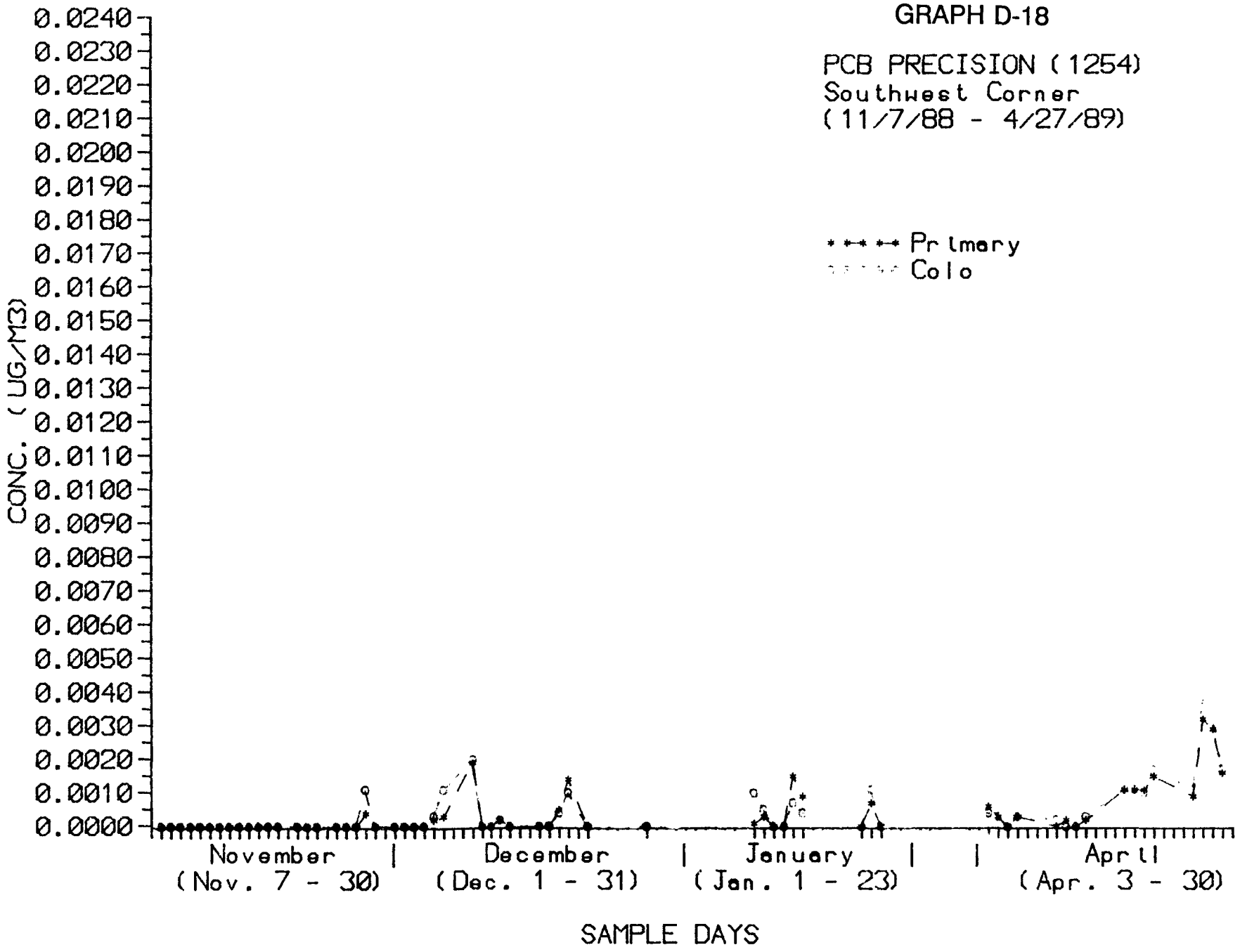

GRAPH D-13
PCB CONCENTRATIONS
All Sites (Total)
(11/7/88 - 4/27/89)
Background
Southwest Corner
Southeast Corner
Northwest Corner
Northeast Corner
CONC. (UG/M3)
0.0260
0.0250
0.0240
0.0230
0.0220
0.0210
0.0200
0.0190
0.0180
0.0170
0.0160
0.0150
0.0140
0.0130
0.0120
0.0110
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
Pre-Dredging 11/7-11/19/88
Dredging to CDF (contaminated sediment) 11/19-12/19/88
Dredging to CDF (clean sediment) 12/20/88-1/4/89
Dredging to CAD
Dredging Complete
Post-Dredging 4/3-4/30/89
Pilot Study Activities (Sample Days)

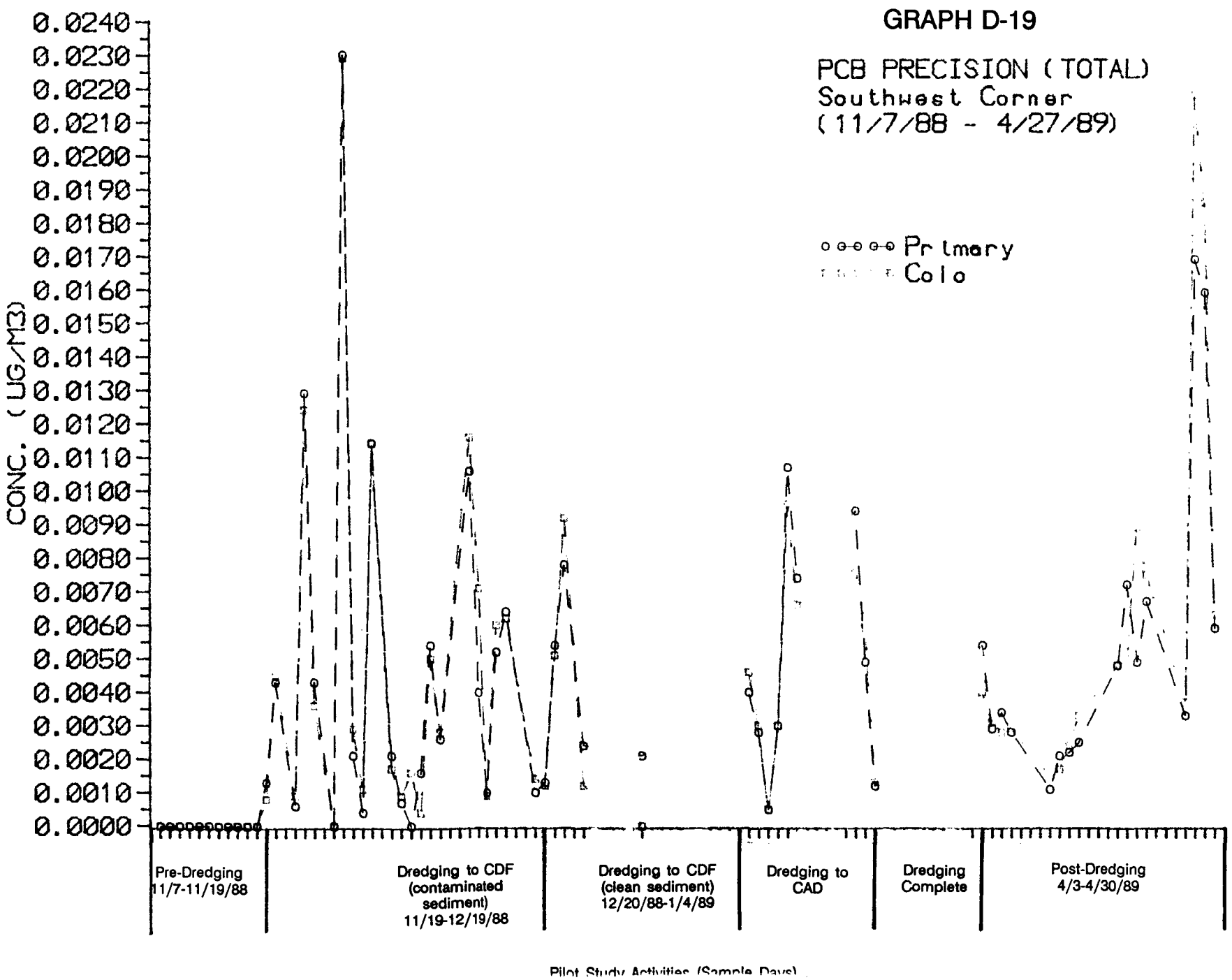

GRAPH D-14
METALS CONCENTRATIONS
Southwest Corner (Primary)
(11/7/88 - 4/27/89)
ooooo Lead
Cadmium
*****Chromium
CONC. (UG/M3)
0.0480
0.0460
0.0440
0.0420
0.0400
0.0380
0.0360
0.0340
0.0320
0.0300
0.0280
0.0260
0.0240
0.0220
0.0200
0.0180
0.0160
0.0140
0.0120
0.0100
0.0080
0.0060
0.0040
0.0020
0.0000
Pre-Dredging 11/7-11/19/88
Dredging to CDF (contaminated sediment) 11/19-12/19-88
Dredging to CDF (clean sediment) 12/20/88-1/4/89
Dredging to CAD
Dredging Complete
Post-Dredging 4/3-4/30/89
Pilot Study Activities (Sample Days)

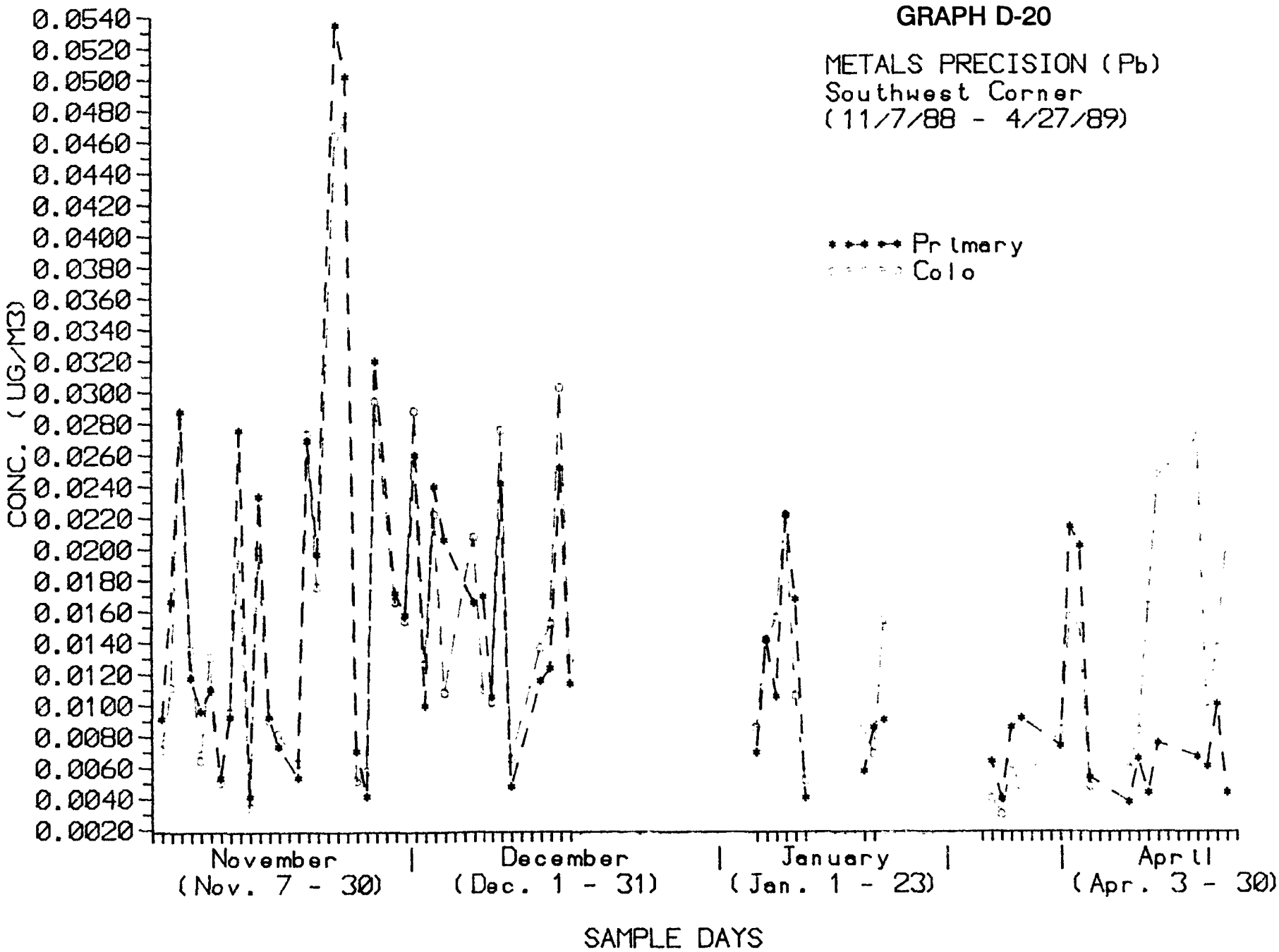

GRAPH D-15
METALS CONCENTRATIONS
Southwest Corner (Colo)
(11/7/88 - 4/27/89)
Lead
Cadmium
Chromium
CONC. (UG/M3)
0.0540
0.0520
0.0500
0.0480
0.0460
0.0440
0.0420
0.0400
0.0380
0.0360
0.0340
0.0320
0.0300
0.0280
0.0260
0.0240
0.0220
0.0200
0.0180
0.0160
0.0140
0.0120
0.0100
0.0080
0.0060
0.0040
0.0020
0.0000
November
(Nov. 7 - 30)
December
(Dec. 1 - 31)
January
(Jan. 1 - 23)
April
(Apr. 3 - 30)
SAMPLE DAYS

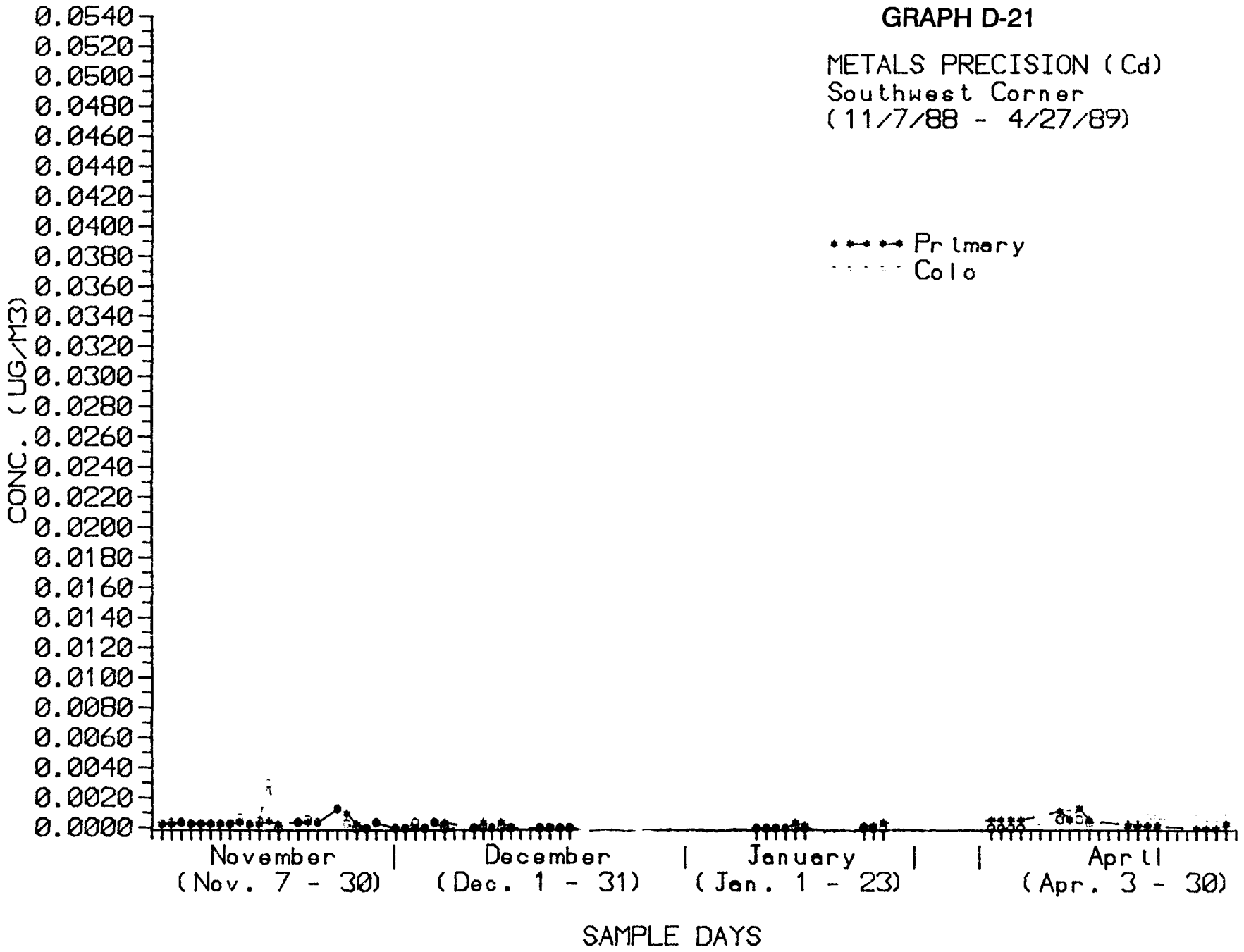

GRAPH D-16
PCB PRECISION (1016)
Southwest Corner
(11/7/88 - 4/27/89)
Primary
Colo
CONC. (UG/M3)
0.0240
0.0230
0.0220
0.0210
0.0200
0.0190
0.0180
0.0170
0.0160
0.0150
0.0140
0.0130
0.0120
0.0110
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
November
(Nov. 7 - 30)
December
(Dec. 1 - 31)
January
(Jan. 1 - 23)
April
(Apr. 3 - 30)
SAMPLE DAYS

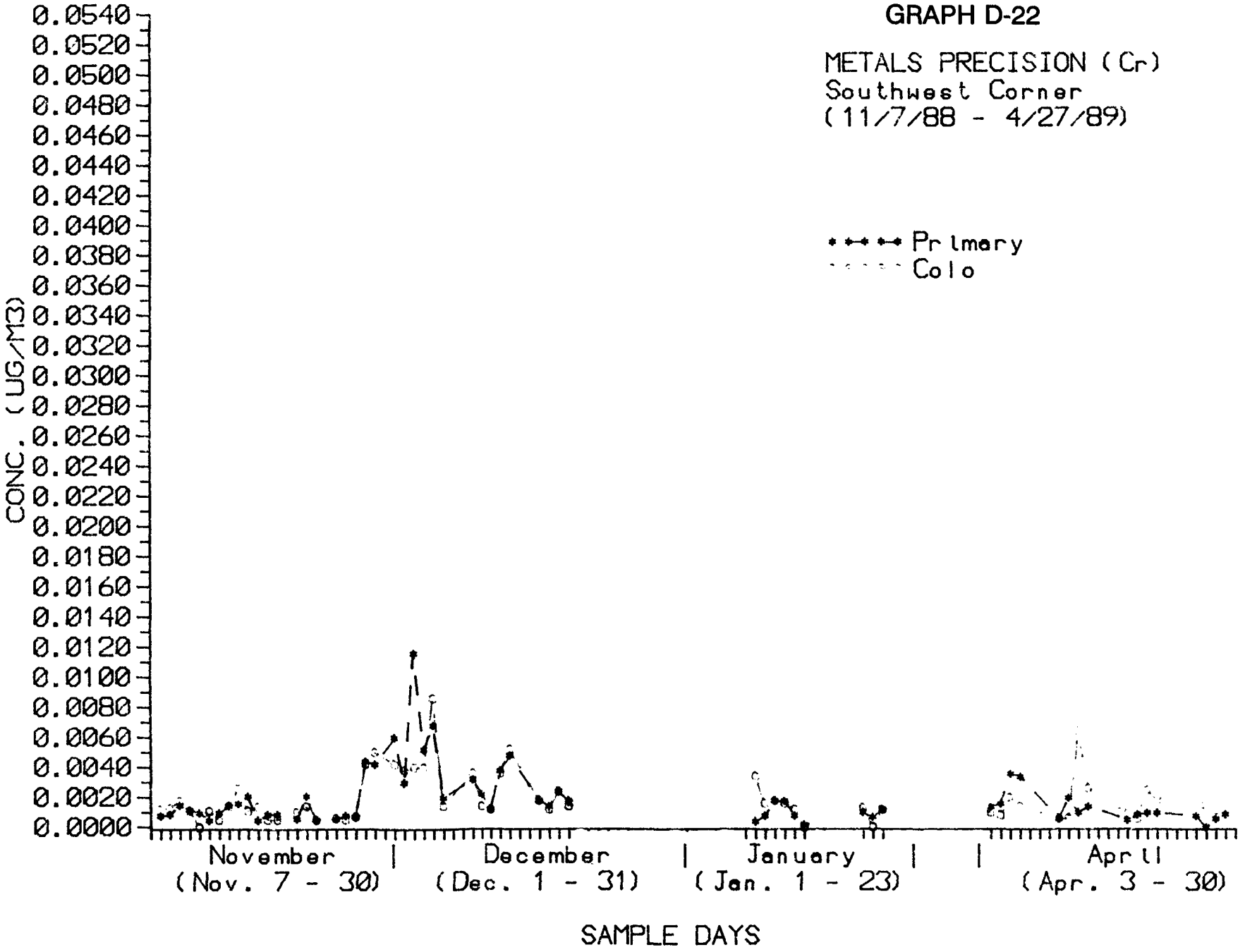

GRAPH D-17
PCB PRECISION (1242)
Southwest Corner
(11/7/88 - 4/27/89)
Primary
Colo
CONC. (UG/M3)
0.0240
0.0230
0.0220
0.0210
0.0200
0.0190
0.0180
0.0170
0.0160
0.0150
0.0140
0.0130
0.0120
0.0110
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
November
(Nov. 7 - 30)
December
(Dec. 1 - 31)
January
(Jan. 1 - 23)
April
(Apr. 3 - 30)
SAMPLE DAYS

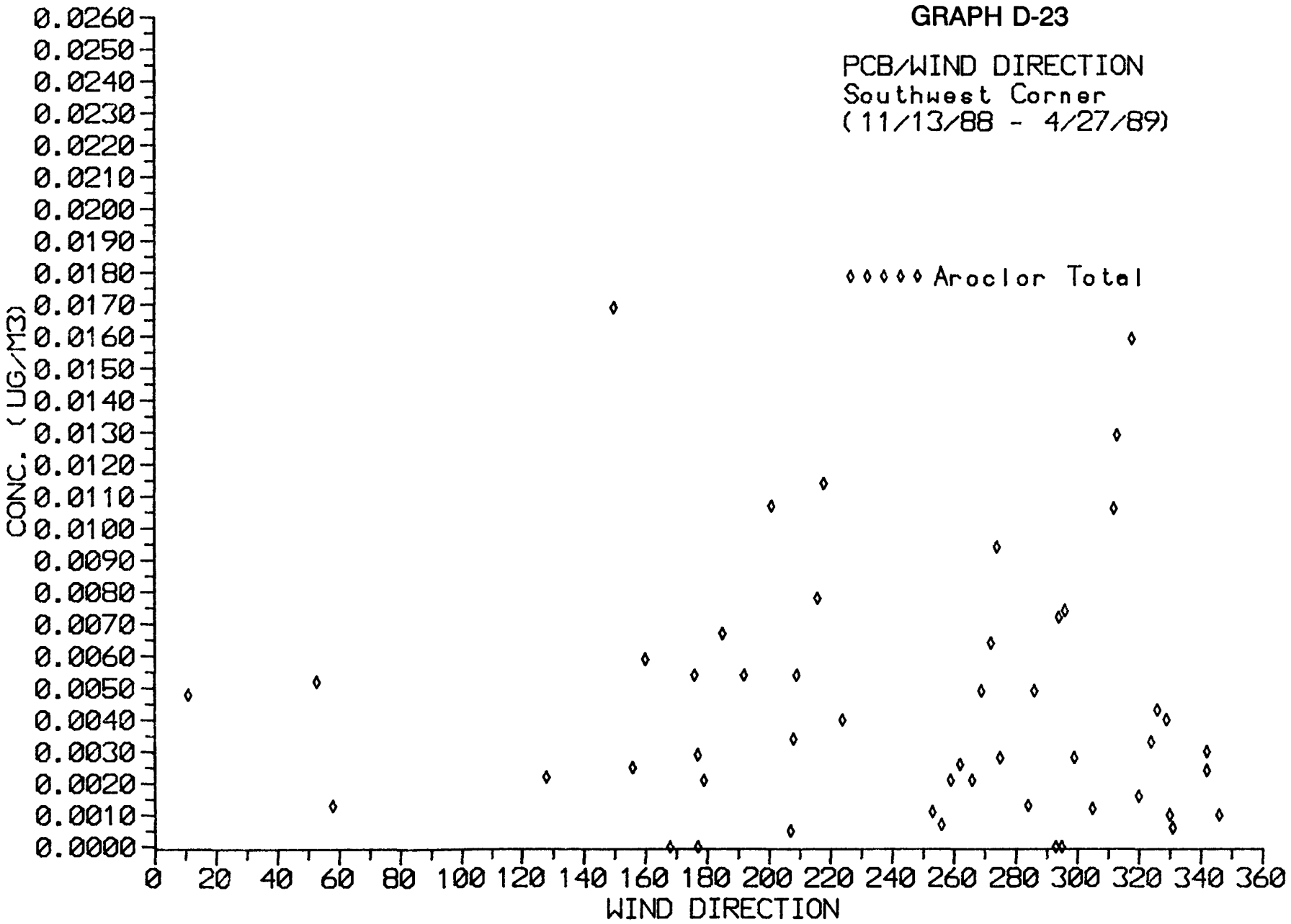

GRAPH D-18
PCB PRECISION (1254)
Southwest Corner
(11/7/88 - 4/27/89)
Primary
Colo
CONC. (UG/M3)
0.0240
0.0230
0.0220
0.0210
0.0200
0.0190
0.0180
0.0170
0.0160
0.0150
0.0140
0.0130
0.0120
0.0110
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
November
(Nov. 7 - 30)
December
(Dec. 1 - 31)
January
(Jan. 1 - 23)
April
(Apr. 3 - 30)
SAMPLE DAYS

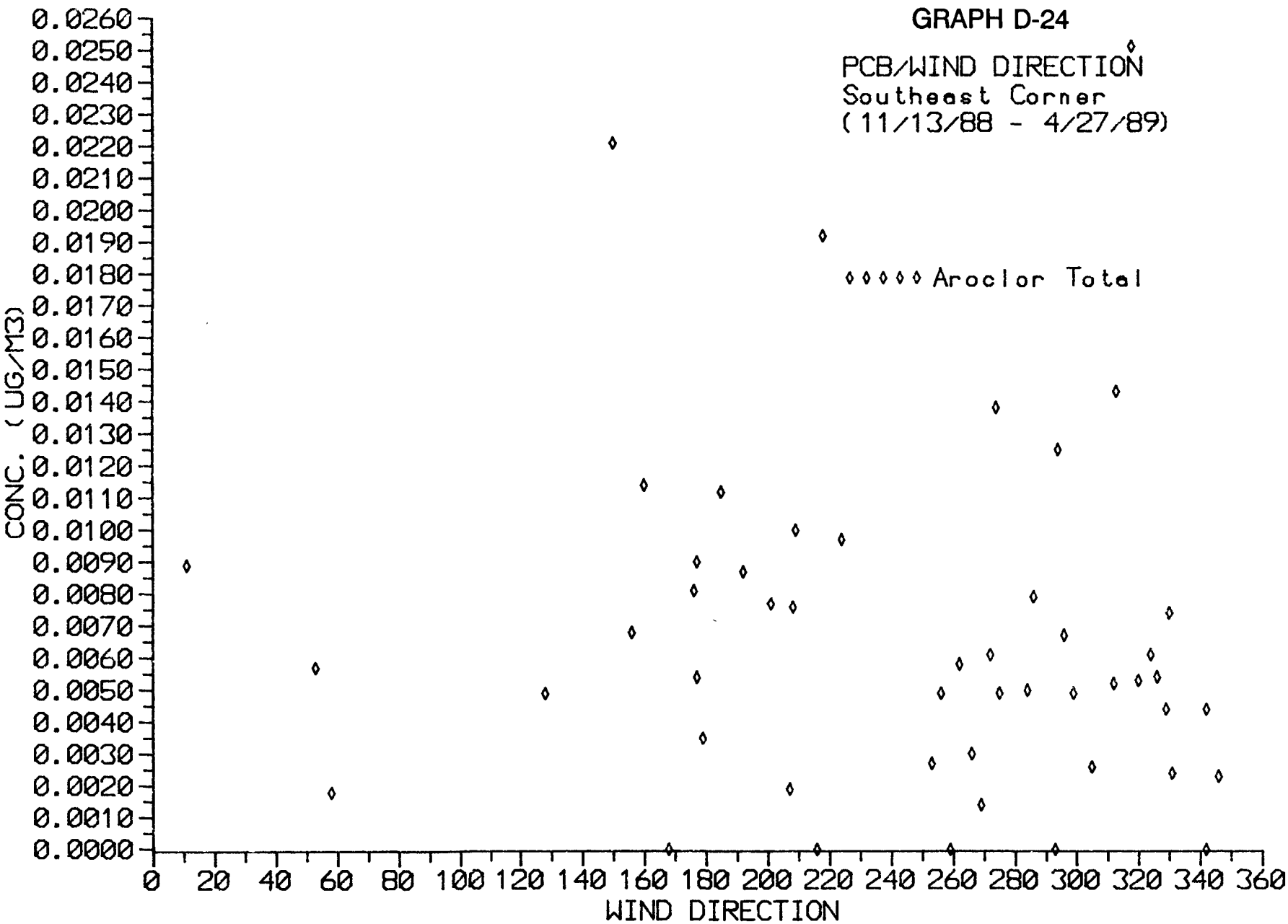

GRAPH D-19
PCB PRECISION (TOTAL)
Southwest Corner
(11/7/88 - 4/27/89)
Primary
Colo
CONC. (UG/M3)
0.0240
0.0230
0.0220
0.0210
0.0200
0.0190
0.0180
0.0170
0.0160
0.0150
0.0140
0.0130
0.0120
0.0110
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
Pre-Dredging 11/7-11/19/88
Dredging to CDF (contaminated sediment) 11/19-12/19/88
Dredging to CDF (clean sediment) 12/20/88-1/4/89
Dredging to CAD
Dredging Complete
Post-Dredging 4/3-4/30/89
Pilot Study Activities (Sample Days)

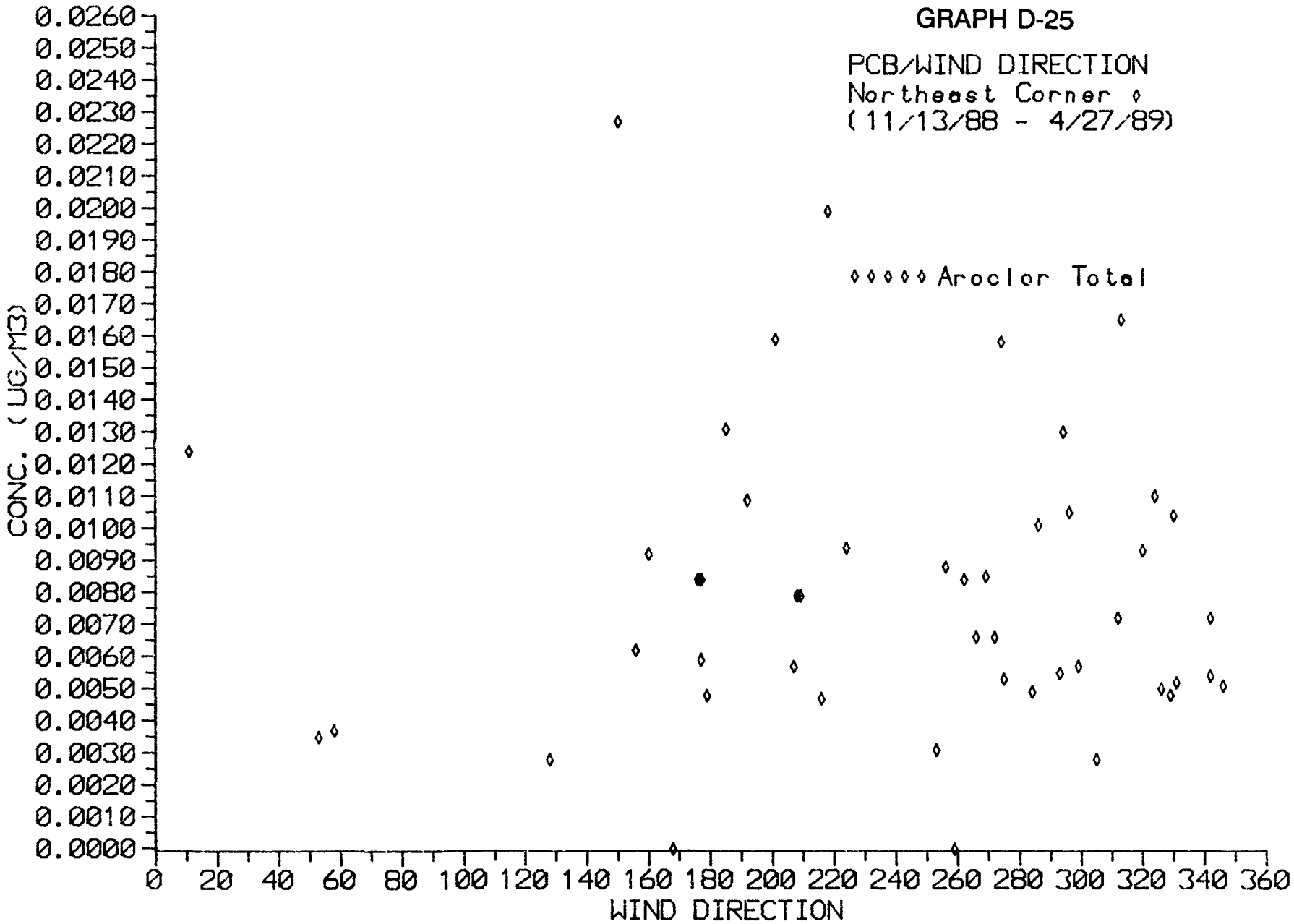

GRAPH D-20
METALS PRECISION (Pb)
Southwest Corner
(11/7/88 - 4/27/89)
Primary
Colo
CONC. (UG/M3)
0.0540
0.0520
0.0500
0.0480
0.0460
0.0440
0.0420
0.0400
0.0380
0.0360
0.0340
0.0320
0.0300
0.0280
0.0260
0.0240
0.0220
0.0200
0.0180
0.0160
0.0140
0.0120
0.0100
0.0080
0.0060
0.0040
0.0020
November
(Nov. 7 - 30)
December
(Dec. 1 - 31)
January
(Jan. 1 - 23)
April
(Apr. 3 - 30)
SAMPLE DAYS

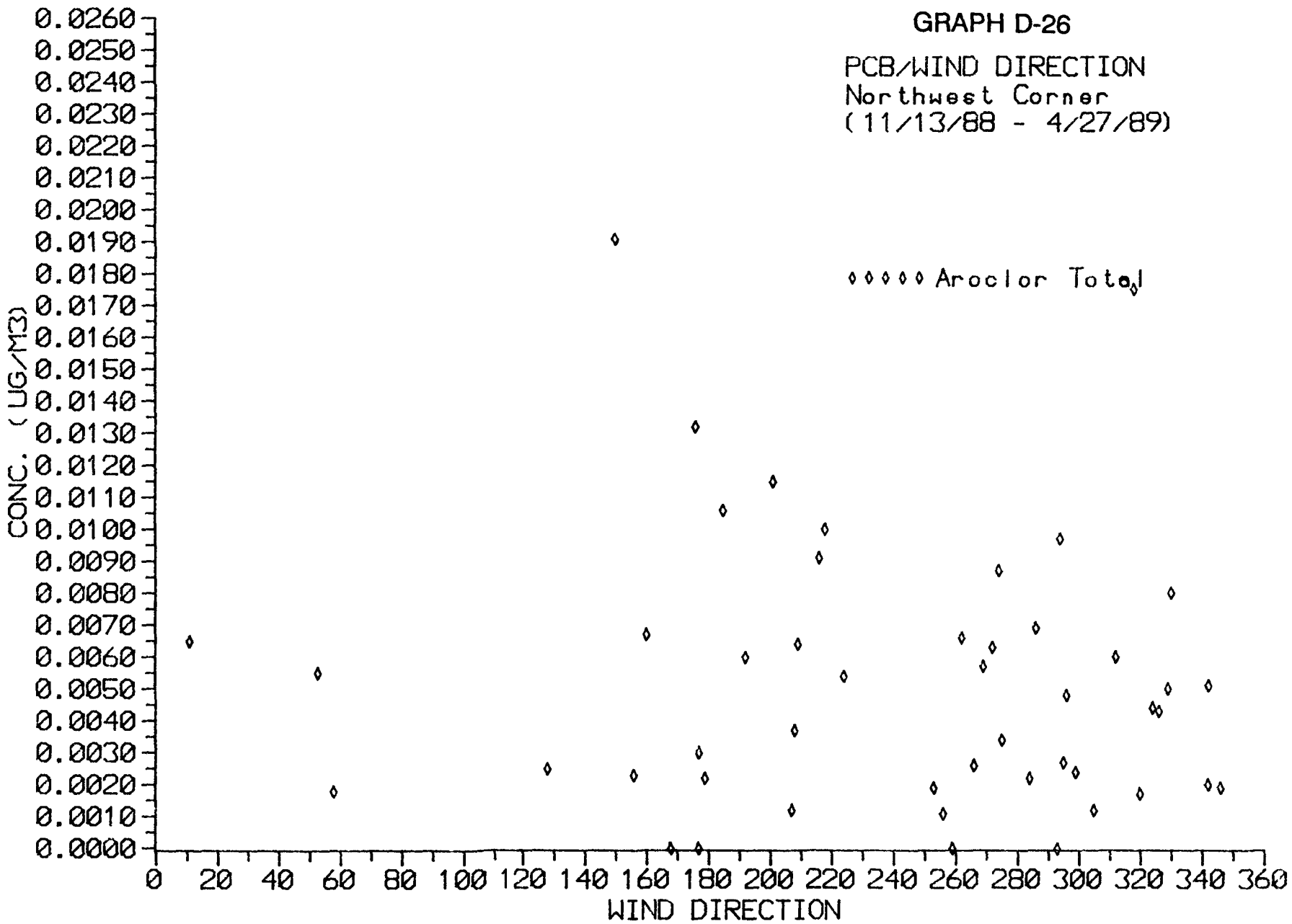

GRAPH D-21
METALS PRECISION (Cd)
Southwest Corner
(11/7/88 - 4/27/89)
Primary
Colo
CONC. (UG/M3)
0.0540
0.0520
0.0500
0.0480
0.0460
0.0440
0.0420
0.0400
0.0380
0.0360
0.0340
0.0320
0.0300
0.0280
0.0260
0.0240
0.0220
0.0200
0.0180
0.0160
0.0140
0.0120
0.0100
0.0080
0.0060
0.0040
0.0020
0.0000
November
(Nov. 7 - 30)
December
(Dec. 1 - 31)
January
(Jan. 1 - 23)
April
(Apr. 3 - 30)
SAMPLE DAYS

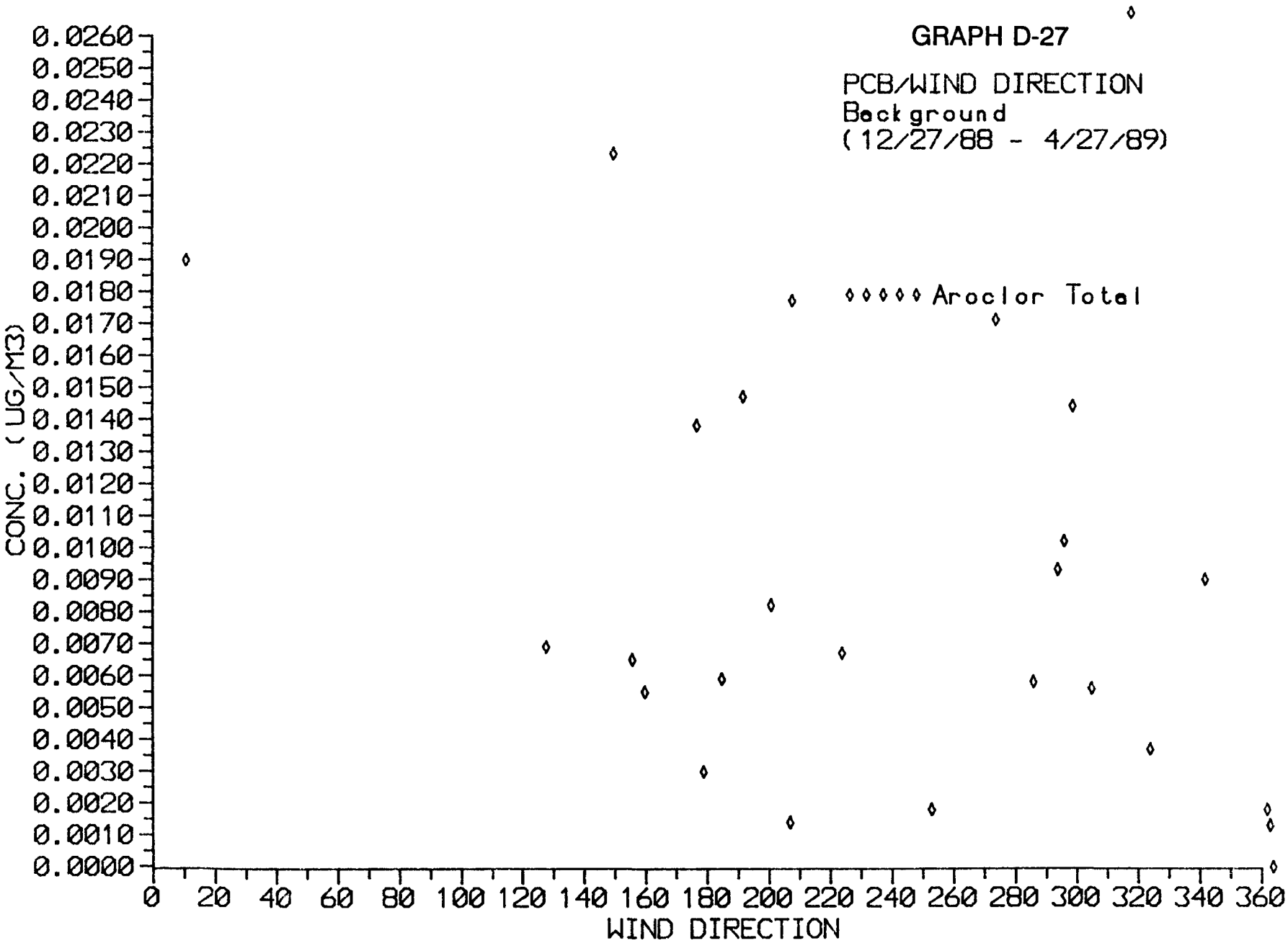

GRAPH D-22
METALS PRECISION (Cr)
Southwest Corner
(11/7/88 - 4/27/89)
Primary
Colo
CONC. (UG/M3)
0.0540
0.0520
0.0500
0.0480
0.0460
0.0440
0.0420
0.0400
0.0380
0.0360
0.0340
0.0320
0.0300
0.0280
0.0260
0.0240
0.0220
0.0200
0.0180
0.0160
0.0140
0.0120
0.0100
0.0080
0.0060
0.0040
0.0020
0.0000
November
(Nov. 7 - 30)
December
(Dec. 1 - 31)
January
(Jan. 1 - 23)
April
(Apr. 3 - 30)
SAMPLE DAYS

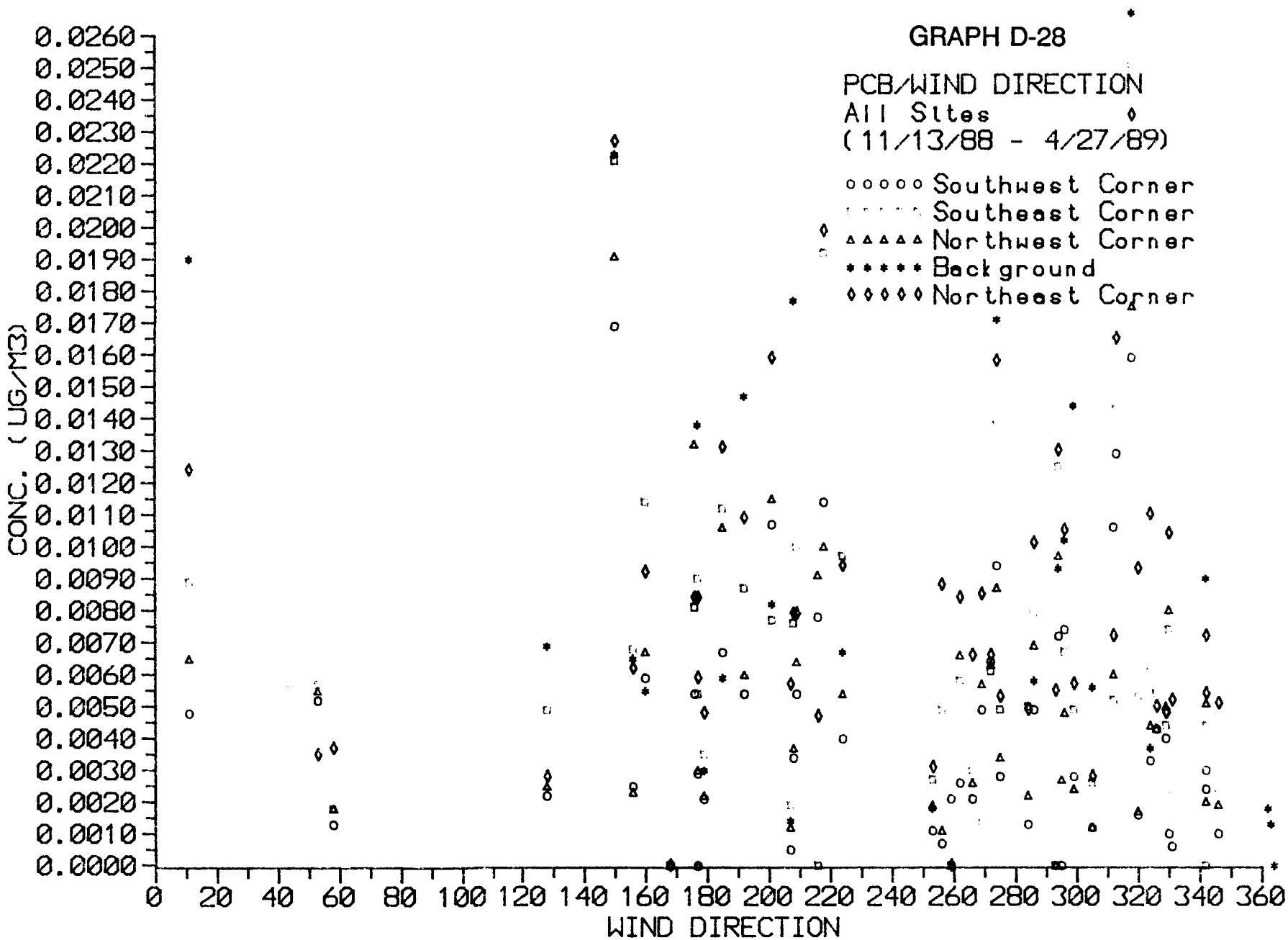

GRAPH D-23
PCB/WIND DIRECTION
Southwest Corner
(11/13/88 - 4/27/89)
◊◊◊◊◊ Aroclor Total
CONC. (UG/M3)
0.0260
0.0250
0.0240
0.0230
0.0220
0.0210
0.0200
0.0190
0.0180
0.0170
0.0160
0.0150
0.0140
0.0130
0.0120
0.0110
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360
WIND DIRECTION

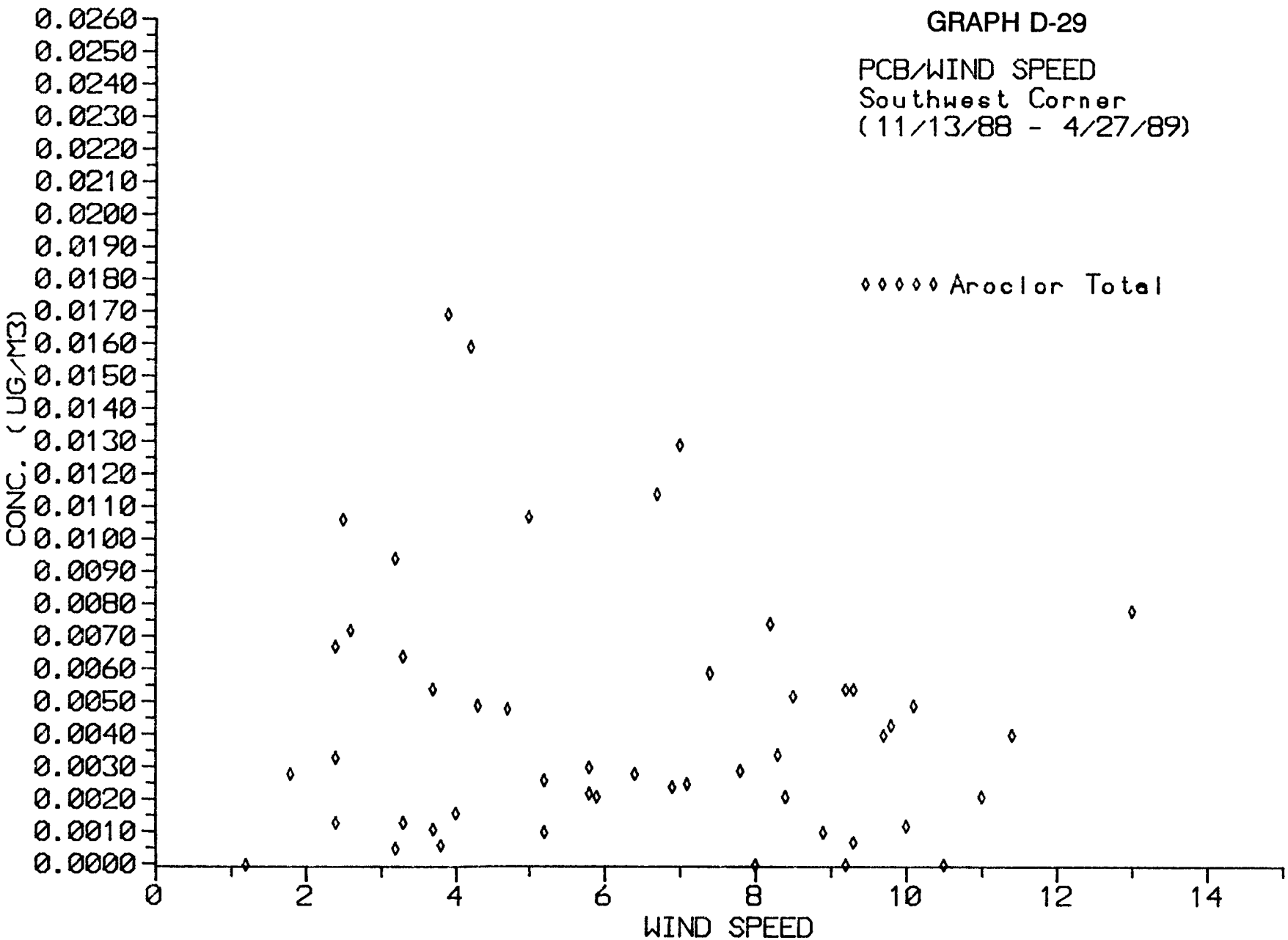

GRAPH D-24
PCB/WIND DIRECTION
Southeast Corner
(11/13/88 - 4/27/89)
◊◊◊◊◊ Aroclor Total
CONC. (UG/M3)
0.0260
0.0250
0.0240
0.0230
0.0220
0.0210
0.0200
0.0190
0.0180
0.0170
0.0160
0.0150
0.0140
0.0130
0.0120
0.0110
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360
WIND DIRECTION

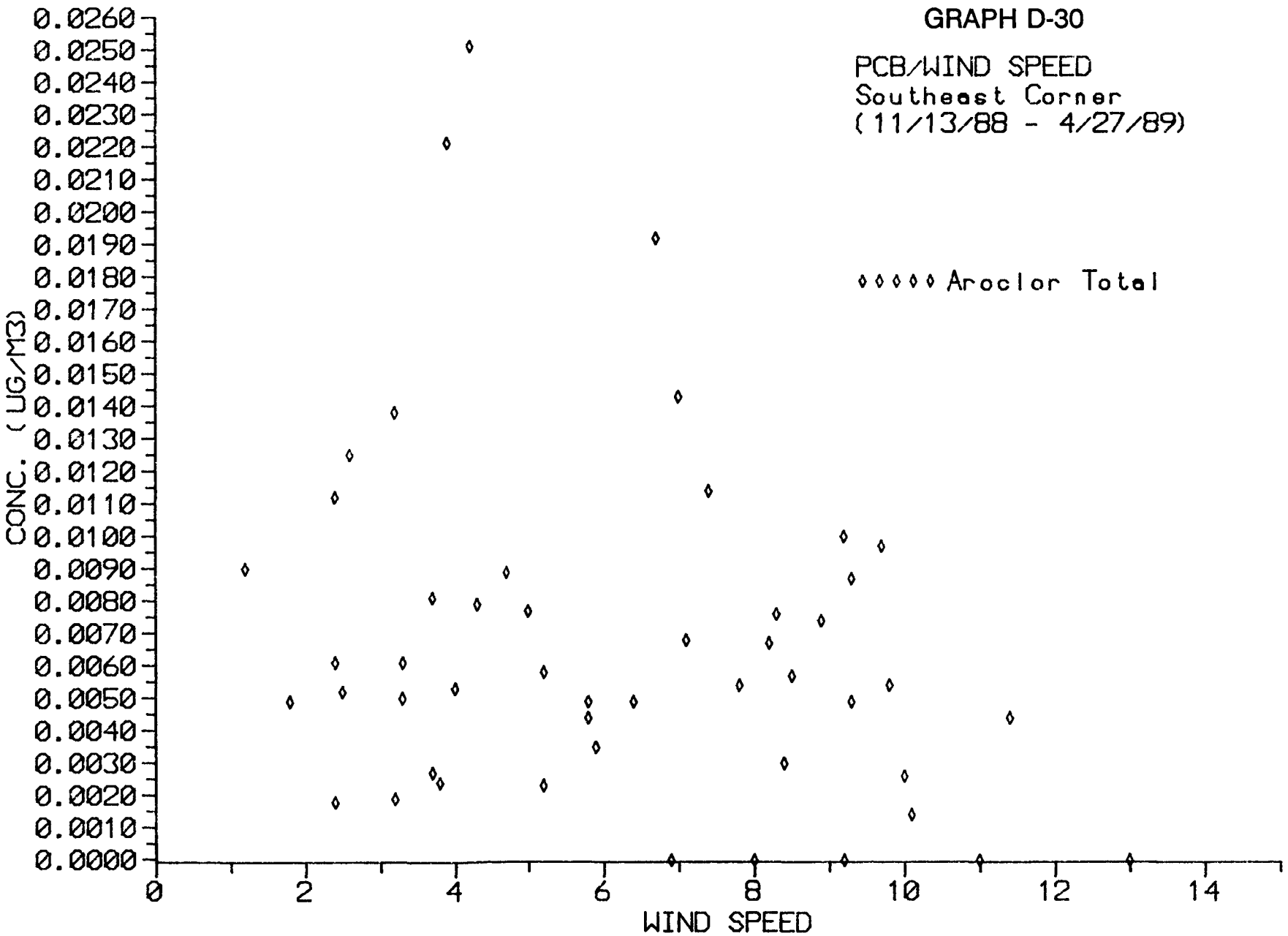

GRAPH D-25
PCB/WIND DIRECTION
Northeast Corner ◊
(11/13/88 - 4/27/89)
◊◊◊◊◊ Aroclor Total
CONC. (UG/M3)
0.0260
0.0250
0.0240
0.0230
0.0220
0.0210
0.0200
0.0190
0.0180
0.0170
0.0160
0.0150
0.0140
0.0130
0.0120
0.0110
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360
WIND DIRECTION

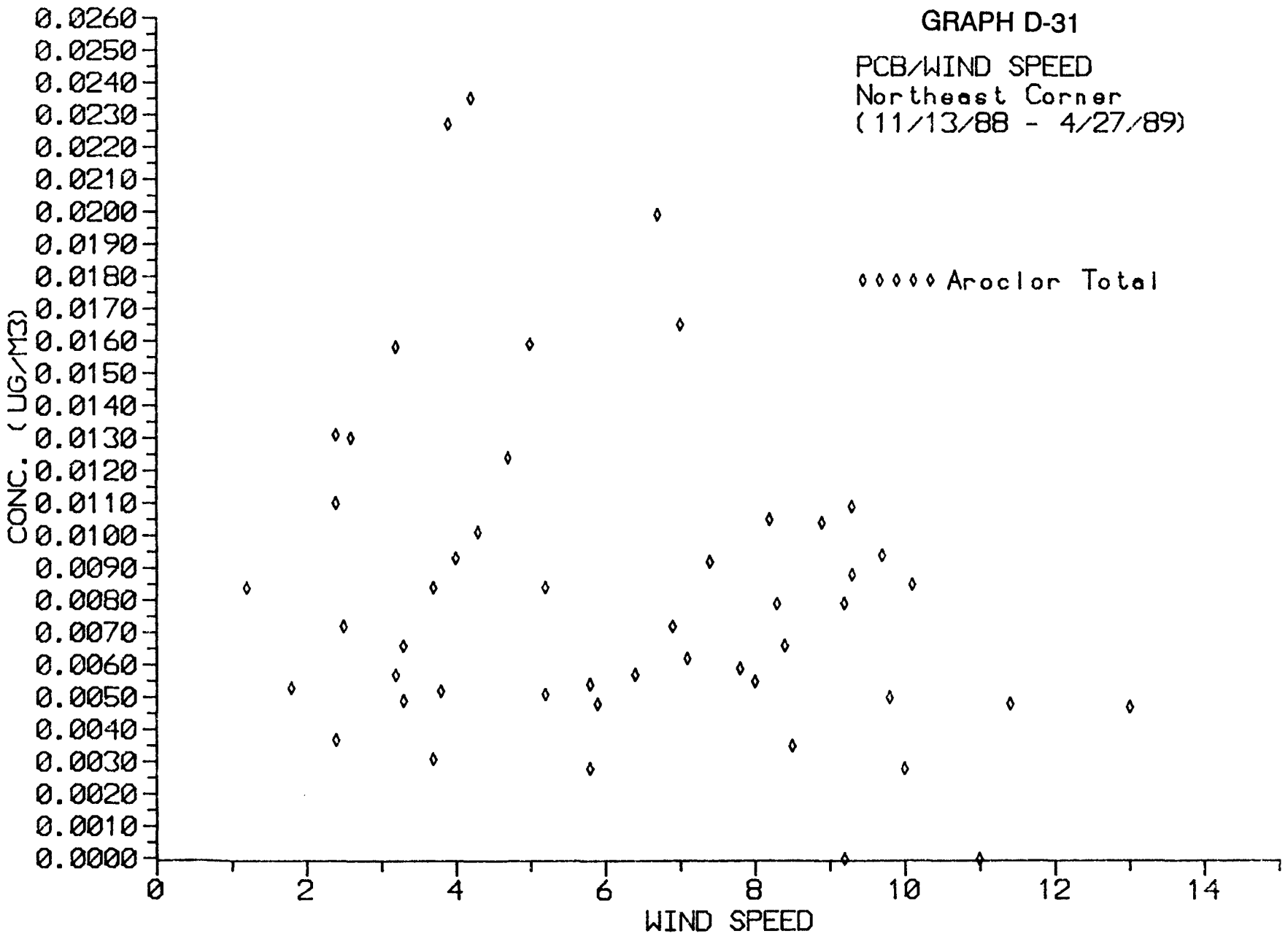

GRAPH D-26
PCB/WIND DIRECTION
Northwest Corner
(11/13/88 - 4/27/89)
◊◊◊◊◊ Aroclor Total
CONC. (UG/M3)
0.0260
0.0250
0.0240
0.0230
0.0220
0.0210
0.0200
0.0190
0.0180
0.0170
0.0160
0.0150
0.0140
0.0130
0.0120
0.0110
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360
WIND DIRECTION

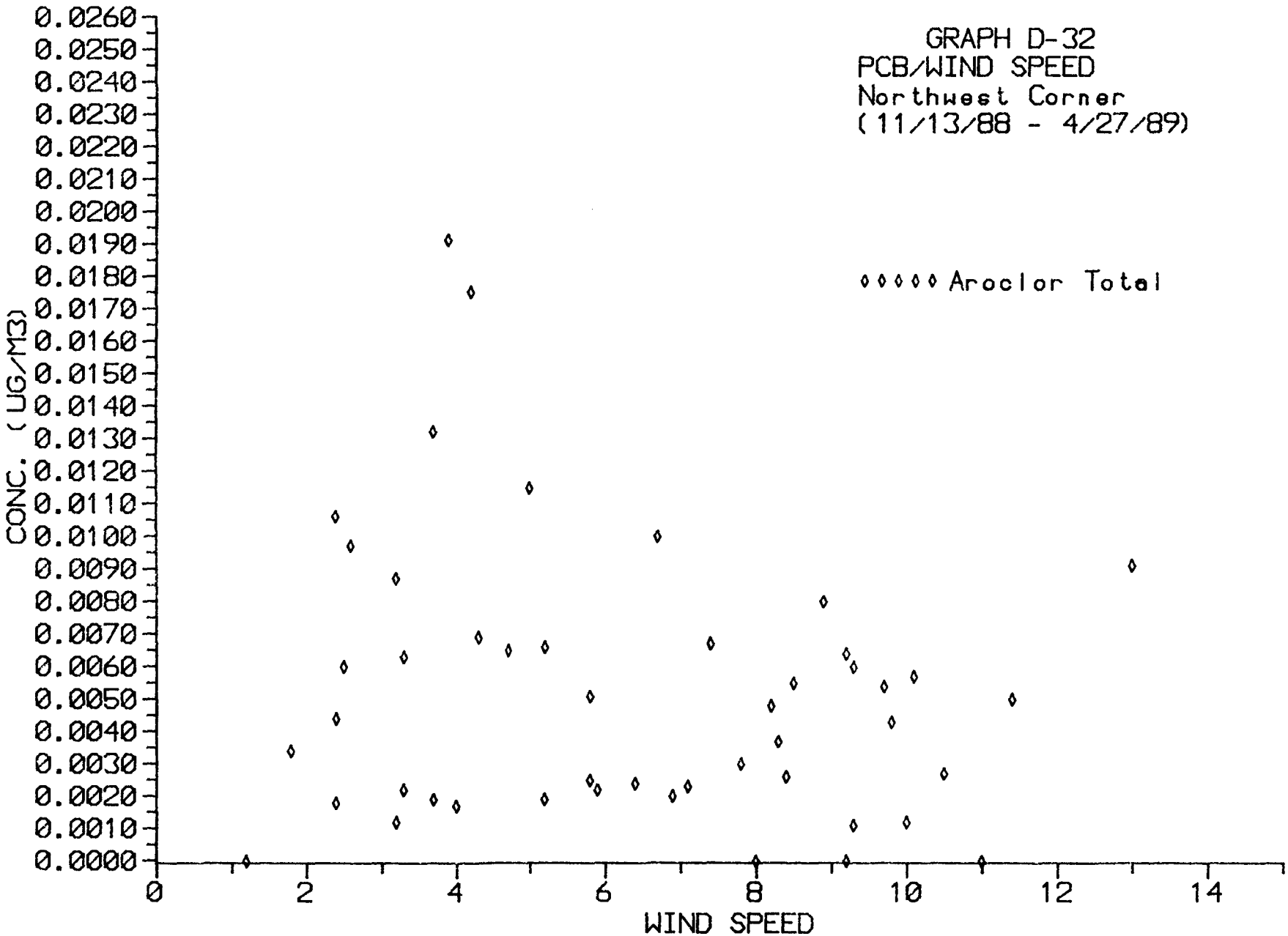

GRAPH D-27
PCB/WIND DIRECTION
Background
(12/27/88 - 4/27/89)
◊◊◊◊◊ Aroclor Total
CONC. (UG/M3)
0.0260
0.0250
0.0240
0.0230
0.0220
0.0210
0.0200
0.0190
0.0180
0.0170
0.0160
0.0150
0.0140
0.0130
0.0120
0.0110
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360
WIND DIRECTION

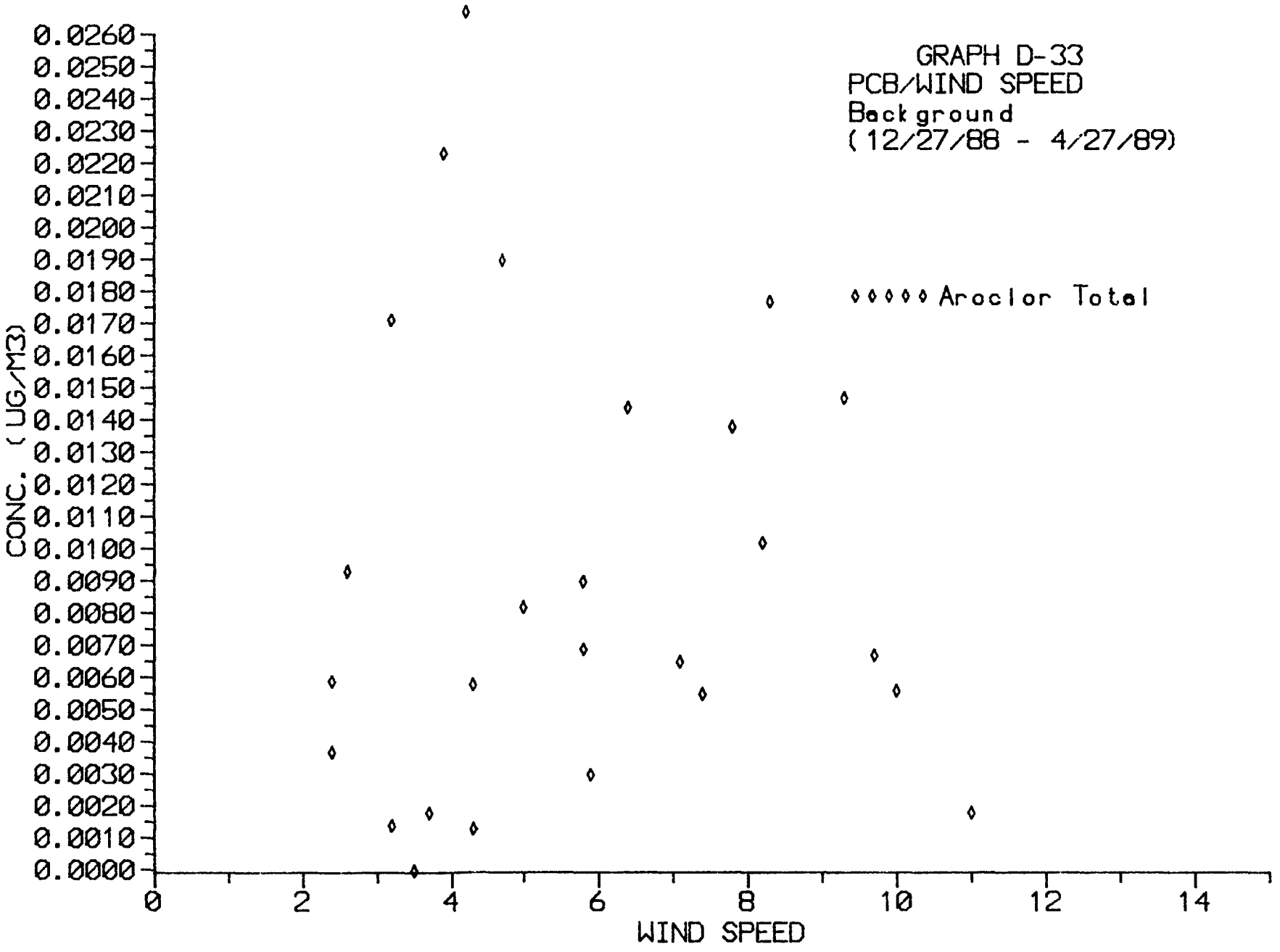

GRAPH D-28
PCB/WIND DIRECTION
All Sites
(11/13/88 - 4/27/89)
Southwest Corner
Southeast Corner
Northwest Corner
Background
Northeast Corner
CONC. (UG/M3)
0.0260
0.0250
0.0240
0.0230
0.0220
0.0210
0.0200
0.0190
0.0180
0.0170
0.0160
0.0150
0.0140
0.0130
0.0120
0.0110
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360
WIND DIRECTION

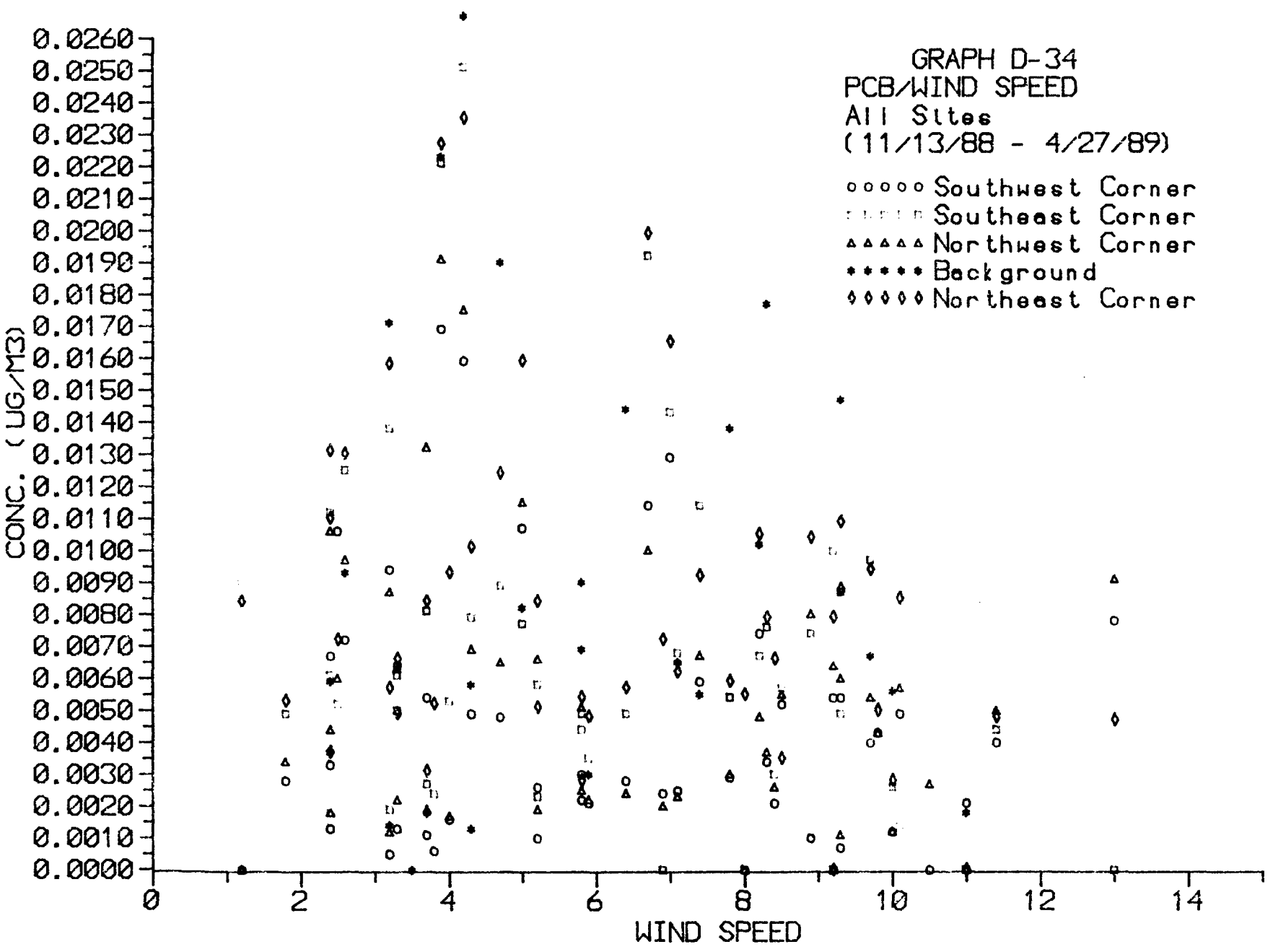

GRAPH D-29
PCB/WIND SPEED
Southwest Corner
(11/13/88 - 4/27/89)
◊◊◊◊◊ Aroclor Total
CONC. (UG/M3)
0.0260
0.0250
0.0240
0.0230
0.0220
0.0210
0.0200
0.0190
0.0180
0.0170
0.0160
0.0150
0.0140
0.0130
0.0120
0.0110
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
0
2
4
6
8
10
12
14
WIND SPEED

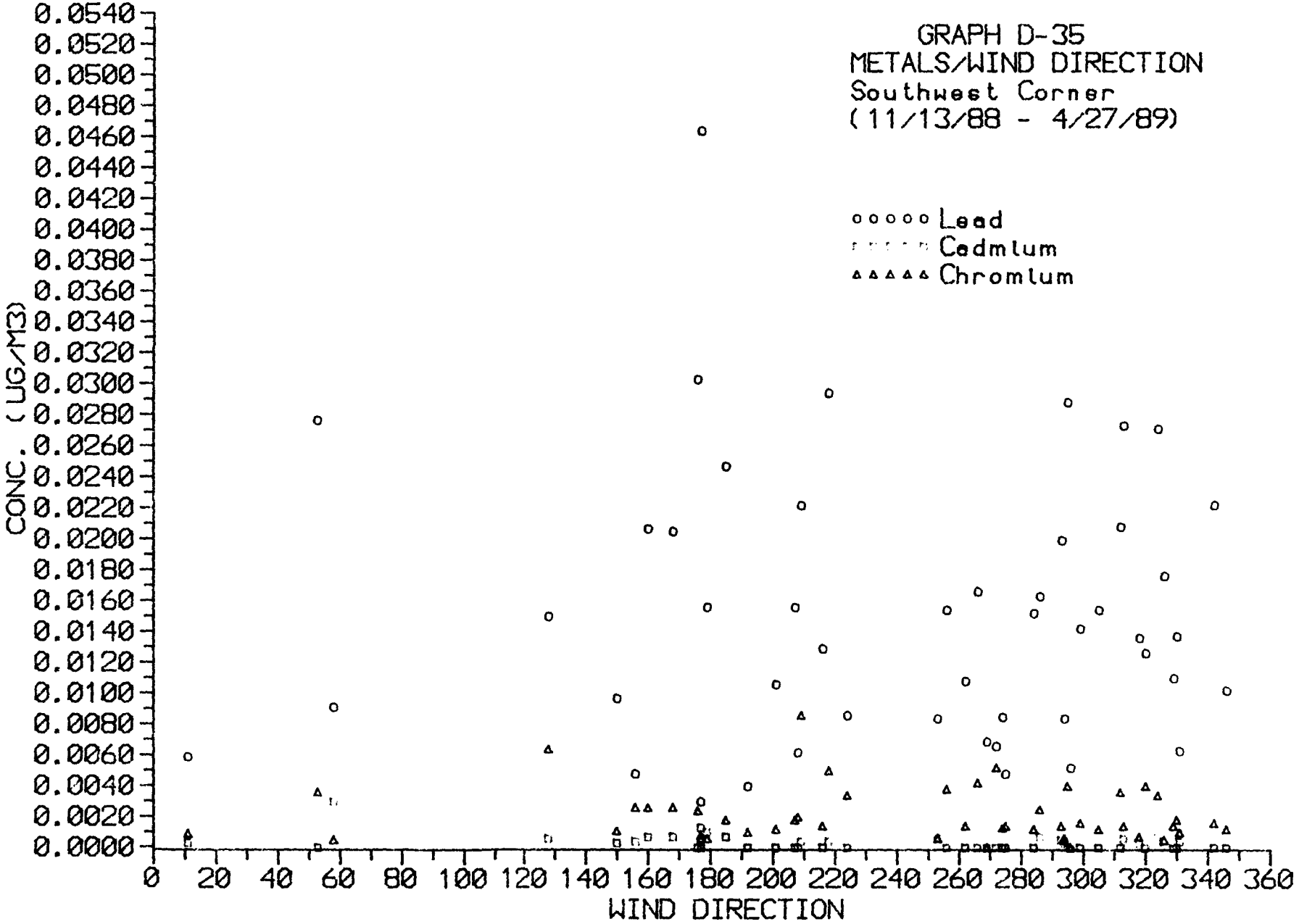

GRAPH D-30
PCB/WIND SPEED
Southeast Corner
(11/13/88 - 4/27/89)
◊◊◊◊◊ Aroclor Total
CONC. (UG/M3)
0.0260
0.0250
0.0240
0.0230
0.0220
0.0210
0.0200
0.0190
0.0180
0.0170
0.0160
0.0150
0.0140
0.0130
0.0120
0.0110
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
0
2
4
6
8
10
12
14
WIND SPEED


GRAPH D-31
PCB/WIND SPEED
Northeast Corner
(11/13/88 - 4/27/89)
◊◊◊◊◊ Aroclor Total
CONC. (UG/M3)
0.0260
0.0250
0.0240
0.0230
0.0220
0.0210
0.0200
0.0190
0.0180
0.0170
0.0160
0.0150
0.0140
0.0130
0.0120
0.0110
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
0
2
4
6
8
10
12
14
WIND SPEED


GRAPH D-32
PCB/WIND SPEED
Northwest Corner
(11/13/88 - 4/27/89)
◊◊◊◊◊ Aroclor Total
CONC. (UG/M3)
0.0260
0.0250
0.0240
0.0230
0.0220
0.0210
0.0200
0.0190
0.0180
0.0170
0.0160
0.0150
0.0140
0.0130
0.0120
0.0110
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
0
2
4
6
8
10
12
14
WIND SPEED


GRAPH D-33
PCB/WIND SPEED
Background
(12/27/88 - 4/27/89)
◊◊◊◊◊ Aroclor Total
CONC. (UG/M3)
0.0260
0.0250
0.0240
0.0230
0.0220
0.0210
0.0200
0.0190
0.0180
0.0170
0.0160
0.0150
0.0140
0.0130
0.0120
0.0110
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
0
2
4
6
8
10
12
14
WIND SPEED


GRAPH D-34
PCB/WIND SPEED
All Sites
(11/13/88 - 4/27/89)
Southwest Corner
Southeast Corner
Northwest Corner
Background
Northeast Corner
CONC. (UG/M3)
0.0260
0.0250
0.0240
0.0230
0.0220
0.0210
0.0200
0.0190
0.0180
0.0170
0.0160
0.0150
0.0140
0.0130
0.0120
0.0110
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
0
2
4
6
8
10
12
14
WIND SPEED


GRAPH D-35
METALS/WIND DIRECTION
Southwest Corner
(11/13/88 - 4/27/89)
Lead
Cadmium
Chromium
CONC. (UG/M3)
0.0540
0.0520
0.0500
0.0480
0.0460
0.0440
0.0420
0.0400
0.0380
0.0360
0.0340
0.0320
0.0300
0.0280
0.0260
0.0240
0.0220
0.0200
0.0180
0.0160
0.0140
0.0120
0.0100
0.0080
0.0060
0.0040
0.0020
0.0000
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360
WIND DIRECTION