Albion Wastewater Treatment Plant Study of PCBs and Dieldrin in Discharge to the South Fork Palouse River

May 2017

Publication No. 17-03-007

DEPARTMENT OF
ECOLOGY
State of Washington

Publication information

This report is available on the Department of Ecology's website at
https://fortress.wa.gov/ecy/publications/SummaryPages/1703007.html

Data for this project are available at Ecology's Environmental Information Management (EIM) website www.ecy.wa.gov/eim/index.htm. Search Study ID RCOO0015.

The Activity Tracker Code for this study is 16-034.

Contact information

For more information contact:

Publications Coordinator
Environmental Assessment Program
P.O. Box 47600, Olympia, WA 98504-7600
Phone: (360) 407-6764

Washington State Department of Ecology - www.ecy.wa.gov

- Headquarters, Olympia (360) 407-6000
- Northwest Regional Office, Bellevue (425) 649-7000
- Southwest Regional Office, Olympia (360) 407-6300
- Central Regional Office, Yakima (509) 575-2490
- Eastern Regional Office, Spokane (509) 329-3400

Cover photo: Treatment ponds at the Albion Wastewater Treatment Plant.
(photo by Randy Coots)

Albion Wastewater Treatment Plant Study of PCBs and Dieldrin In Discharge to the South Fork Palouse River

by

Randy Coots

Toxics Studies Unit
Environmental Assessment Program
Washington State Department of Ecology
Olympia, Washington 98504-7710

Water Resource Inventory Area (WRIA) and 8-digit Hydrologic Unit Code (HUC) numbers for the study area:

WRIA
- 34

HUC number
- 17060108

This page is purposely left blank

Table of Contents

List of Figures and Tables

Page

Figures

Tables

Abstract

Albion is a small town in an area of eastern Washington State known as “The Palouse”. In 2007, the U.S. Environmental Protection Agency (EPA) approved a Total Maximum Daily Load (TMDL) analysis for toxics in the Palouse River. As an outcome, the Albion Wastewater Treatment Plant (WWTP) discharge received a wasteload allocation (WLA) for total PCBs (tPCBs) and dieldrin. The Albion WWTP discharges treated wastewater seasonally (February through May) from two facultative lagoons to the South Fork Palouse River.

Currently tPCBs and dieldrin are not required monitoring parameters on discharge monitoring reports (DMRs) for the Albion WWTP. Sampling protocols and data analysis procedures for tPCBs and dieldrin were established to meet requirements of WLAs and future National Pollutant Discharge Elimination System (NPDES) permits.

During the 2016 discharge season, composite influent and effluent samples were collected over a 24-hour period on three occasions. The effluent volumes discharged during the sample periods were totaled and combined with the laboratory results for tPCBs and dieldrin to calculate daily loads released to the South Fork Palouse River.

The daily loads of tPCBs and dieldrin discharged from the Albion WWTP were compared to the Interim WLAs established in the *Palouse River TMDL Implementation Plan* at 0.0001 g/day each. The mean daily load of tPCBs in effluent for the three sample events was 0.000175 g/day, slightly exceeding the Interim WLA, while the mean daily load of dieldrin was 0.000033 g/day, well within the Interim WLA. A 43% load reduction is needed to bring tPCB loads within Interim WLAs of 0.0001 g/day.

Recommendations include:

- The need for a 43% reduction in current tPCB effluent loads to meet the Interim WLA of 0.0001 g/day.
- Continued periodic monitoring for tPCBs and dieldrin until these parameters are included in Albion’s NPDES permit reporting requirements.
- Albion develop a Pollutant Elimination Plan to limit inputs and educate the public about Albion’s sewage collection system, then reassess the outcome.

Acknowledgements

The author of this report thanks the following people for their contributions to this study:

- Kenneth Smith, City of Albion Director of Public Works
- Washington State Department of Ecology staff:
    - Ellie Key
    - Casey Deligeannis
    - Dave Serdar
    - Debby Sargeant
    - Will Hobbs
    - Dale Norton
    - Diana Washington

Introduction

Albion is a small town in an area of eastern Washington State known as *The Palouse*. In 2007, the U.S. Environmental Protection Agency (EPA) approved a Total Maximum Daily Load (TMDL) analysis for toxic chemicals in the Palouse River. One of the outcomes of the TMDL was to establish wasteload allocations (WLAs) for total polychlorinated biphenyls (tPCBs) and dieldrin in discharge from the Albion Wastewater Treatment Plant (WWTP). The WWTP discharges treated waste seasonally (February through May) from two facultative lagoons operated in series to the South Fork Palouse River.

Small communities such as Albion have limited resources for the operation and maintenance of publicly owned infrastructure such as WWTPs, water treatment systems, and collection or distribution systems. Limited resources preclude many small towns from hiring personnel to specialize and dedicate to each municipal system. City managers or Public Works officials are often called upon to be lead WWTP operators.

PCBs and dieldrin are not currently required reporting parameters on discharge monitoring reports (DMRs) but are expected to be in the future. This study establishes sampling protocols and data analysis procedures for tPCBs and dieldrin to meet WLAs requirements for the TMDL study and also future NPDES permits.

Compliance Criteria

Interim WLAs for the Albion WWTP discharge effluent were established for tPCBs and dieldrin in the *Palouse River TMDL Implementation Plan* (Johnson et al., 2007). Compliance with the WLAs is determined by comparing measured daily loads (concentration multiplied by discharge) of tPCBs and dieldrin from the Albion WWTP effluent to the Interim WLAs.

Interim WLAs for tPCBs and dieldrin were developed based on criteria limits from the National Toxics Rule (NTR) for human health and the Albion WWTP maximum design flow of 0.12 million gallons per day (mgd). For informational purposes, concentrations of tPCBs and dieldrin in effluent are also compared to the NTR, the new human health criteria (HHC, see below), and the Aquatic Life Standards for water. Table 1 lists the tPCBs and dieldrin Interim WLAs, along with the NTR for human health, the HHC, and the Aquatic Life Standards for water.

Table 1. Compliance Criteria for tPCBs and Dieldrin.

Analyte	National Toxics Rule	NTR Interim Wasteload Allocations[1]	Revised HHC[2]	Revised Wasteload Allocations[3]	Aquatic Life Standards
tPCBs	170 pg/L[4]	0.0001 g/day	7 pg/L	0.000003 g/day	14,000 pg/L
Dieldrin	140 pg/L	0.0001 g/day	0.07 pg/L	0.00000003 g/day	56,000 pg/L

1 = Based on the NTR human health water quality criteria for tPCBs and dieldrin and the WWTP design flow of 0.12 mgd.
2 = Federally promulgated human health criteria (HHC) for Washington State.
3 = Based on the 2016 surface water quality HHC standards for tPCBs and dieldrin and the Albion WWTP design flow of 0.12 mgd.
4 = Picograms per liter, parts per quadrillion.

New Toxics Human Health Criteria (HHC)

The Washington State Department of Ecology (Ecology) recently completed the public process for revising the human health criteria (HHC) for toxics in the Water Quality Standards (WQS) for Surface Waters of the State (Chapter 173-201A WAC). These criteria underwent review by the EPA for consistency with the federal Clean Water Act. Under their authority for implementing the Clean Water Act, EPA partially approved and disapproved Ecology's proposed HHC. For the proposed HHC that did not meet federal regulations, the EPA promulgated their own numeric criteria in State's rule revision. A total of 192 new HHC for 97 priority pollutants were addressed in the recent WQS update including this study's target parameters, tPCBs and dieldrin. Implementation of the new toxic criteria updates started in late December 2016.

The Interim tPCBs and dieldrin WLAs established in the *Palouse River TMDL Implementation Plan* (Johnson et al., 2007) will be used as the TMDL loading criteria for the Albion WWTP discharge. Ecology will not be revisiting active TMDL projects where there were established WLAs in effect before updates of the toxics criteria. Table 1 presents the original Interim WLAs based on the NTR and, for informational purposes, the WLAs calculated from the recent HHC revision. The NTR criteria and the new Clean Water Act HHC for tPCBs and dieldrin are also shown.

The WLAs based on the new HHC are lower (more restrictive) than those calculated for the NTR. The new HHC for tPCBs is about 24 times, and dieldrin about 2000 times, lower (more restrictive) than the NTR-based criteria.

Study Area

City of Albion

Albion is roughly 10 miles from the Idaho border and is situated along the South Fork of the Palouse River. Based on the 2010 census, Albion has a population of 579 within its 0.36 square mile of land. See Figure 1.

Settled in the late 1800s Albion was incorporated in 1910. At an elevation of 2,398 feet, Albion has warm and dry summers, or what is referred to as a Mediterranean-like climate. The mean July high is 82°F, while the mean January low is 24°F. Albion receives about 21 inches of rainfall and 35 inches of snowfall per year (Intellicast, 2015).

Surrounding Area

The Palouse region is located in southeastern Washington and northern Idaho. The region is a major agricultural area primarily known for dry land farming of wheat and legumes. The Palouse is often characterized by its rolling hills and deep productive soils.

The nearest cities to Albion are Pullman about three miles to the southeast, Colfax about seven miles to the northwest, and Palouse about ten miles to the northeast. Distances from Albion to major eastern Washington cities are Spokane at about 55 miles to the north and Walla Walla about 67 miles to the southwest.

Figure 1. Study Area for the Albion Wastewater Treatment Plant PCB and Dieldrin Study.

Historical Data

Only one set of PCB or dieldrin data exist for conducting a toxics loading assessment for the Albion WWTP. In 2007-2008 in support of the *Palouse River TMDL Implementation Plan* (Johnson et al., 2007), Ecology conducted a toxics study in the South Fork Palouse River sub-basin that included three WWTPs and two abandoned landfills (Lubliner, 2009). The study included PCB and dieldrin monitoring of influent and effluent at Albion's WWTP.

Based on one set of PCB and dieldrin samples collected in April 2008, Albion's WWTP process reduced PCB-influent-to-effluent concentrations by an order of magnitude. Freezing spring temperatures delayed the onset of effluent discharge, reducing three planned sample events to one. While dieldrin concentrations met criteria at discharge measuring <30 pg/L (NTR= 140 pg/L), tPCBs exceeded the NTR. The tPCBs were measured at 1800 pg/L, roughly an order of magnitude greater than the NTR of 170 pg/L. An 85% reduction of tPCBs in the effluent discharge was recommended to meet Interim WLAs. The study also recommended additional effluent sampling for PCBs and dieldrin be conducted at the Albion WWTP to determine if the 2008 study's single set of results is representative of current 24-hour composite conditions throughout the discharge season.

Methods

Study Overview

At the request of Ecology's Water Quality Program, Eastern Regional Office, Ecology's Environmental Assessment Program conducted a PCB and dieldrin influent/effluent study at the Albion WWTP during 2016. The South Fork Palouse River is the receiving water for the discharge.

The *Palouse River Toxics TMDL Implementation Plan* (Johnson et al., 2007) established Interim WLAs for permitted discharges in the drainage. The Albion WWTP received Interim WLAs for tPCBs and dieldrin of 0.0001 g/day each.

The follow-up survey to the TMDL Implementation Plan conducted in 2007-2008 (Lubliner, 2009) reported results for one set of samples analyzed for PCBs and dieldrin. The dieldrin levels were within both the Interim WLA and the NTR criterion, while tPCBs were an order of magnitude greater (exceeded). An 85% reduction of tPCBs was recommended to bring the daily loads within the Interim WLA. The WLAs were based on the NTR criteria for PCBs (170 pg/L) and dieldrin (140 pg/L) in water and the Albion WWTP design flow of 0.12 mgd.

During the 2016 discharge season, tPCBs and dieldrin were sampled on three occasions. Daily loads of tPCBs and dieldrin were compared to the Interim WLA to determine compliance with the Palouse River TMDL. Sample concentrations were also compared to the NTR human health criteria and Aquatic Life Standards for informational purposes.

Measurement Procedures

The analytical parameters, sample numbers, reporting limits, and analytical methods used for the 2016 study are presented in Table 2. Method selection was based on study objectives and the analytical reporting limits possible.

Table 2. Parameters, Number of Samples, Reporting Limits, and Analytical Methods.

Parameter	Sample Number	Reporting Limits	Sample Clean-up and Extraction Methods	Analytical Method
PCB Congeners	9	10 pg/L[1,2]	EPA 3535	EPA 1668C
Dieldrin	9	30 pg/L	^{13}C labeled dieldrin	EPA 1699
TSS	9	1 mg/L[3]	SM 2540D[4]	

1 = PCBs reporting limits are congener specific.
2 = pg/L is parts per quadrillion.
3 = mg/L is parts per million.
4 = Standard Methods.
TSS = total suspended solids.

Field Measurement

The pH was measured in the field using a hand-held HACH HQ40D pH meter. Calibration of the meter using standard pH buffers 4, 7, and 10 was conducted just prior to use. The pH measurements were only taken from effluent at the same discharge location as the toxic samples. The pH measurements were made during the first and last subsamples of the composite collection period for each of the three sample events.

Goals and Objectives

The goal of the study was to determine whether Interim WLAs set forth in the Palouse River TMDL are being met for the Albion WWTP discharge.

Study objectives are listed below:

- Collected 24-hour composite influent and effluent samples from the Albion WWTP on three occasions during the discharge season and analyze for PCB congeners and dieldrin.
- Determined total daily loads for PCBs and dieldrin discharged to the South Fork Palouse River from the Albion WWTP and compare to Interim WLAs established in the *Palouse River TMDL Implementation Plan*.
- Compared effluent results for tPCBs and dieldrin to human health and Aquatic Life Standards for informational purposes.

Quality Assessment Overview

In addition to the quality assessment of study data, summary results are presented below in the Results Section. The studies laboratory data quality results are in Appendix A, Tables A-1 through A-12.

Data sets like PCB congeners can have large numbers of non-detected or qualified results. PCB data sets require decisions about how sample totals are determined. For this study, tPCBs included all detected congeners per sample and any “J” (estimated concentration, positively identified) qualified results at full value. Results qualified as “NJ” (approximate concentration, tentatively identified) were not included in concentration totals or means. If no other detected results other than “NJ” are available for a sample or study mean then one-half the “NJ” result was used. “Non-detected” PCB values (“U” and “UJ”) were excluded. All detected and “J” qualified PCB congeners within each homolog group were totaled. The 10 possible homolog groups per sample with at least one detected congener are then summed for a tPCB sample concentration.

All laboratory results for the study are included in Ecology’s Environmental Information Management (EIM) database. Public access to electronic data and the final report for the study is available through Ecology’s Internet homepage (www.ecy.wa.gov).

Quality Assurance/Quality Control

Results were reviewed for qualitative and quantitative accuracy following the National Functional Guidelines for Organic Data Review under the Contract Laboratory Program (CLP). Written case narratives assessing the quality of the data reports are provided by Ecology's Manchester Environmental Laboratory (MEL). These narratives included descriptions of the analytical methods, a review of sample holding times, instrument calibration checks, blank results, surrogate recoveries, matrix spike recoveries, and laboratory control samples. The case narratives and complete data reports can be obtained by request from the report author.

The quality assurance (QA) review verified laboratory performance met most quality control (QC) specifications outlined in the analytical methods. The quality of the data reported here is appropriate for the intended uses. To verify results generated for the study were of the quality needed, control sample results were compared to data quality objectives established in the QA Project Plan (Ecology, 2016).

QC results are included in Appendix A. QC results for PCB analyses included labeled PCB spikes, laboratory blanks, labeled PCB spiked blanks, ongoing precision and recovery (OPR) spikes, and OPR labeled spikes. QC results for dieldrin analyses included laboratory blanks, spiked blanks, OPR blanks, and OPR labeled blanks.

For the May sample event, one of the two tPCB duplicate samples (Effl-QA-03, 1605010-03) was rejected as an outlier. The outlier result (2962 pg/L) was over four times the duplicate sample value (698 pg/L) and over seven times the next highest effluent tPCB sample result. The May tPCB sample pair had a relative percent difference (RPD) of 124%. It was likely impacted by discharge of solids with higher PCB concentrations at the end of the discharge season. The February and March tPCB duplicate pairs had RPDs of 68% and 1.5%, respectively.

Sample Holding

PCBs and dieldrin samples were shipped by FedEx, directly to AXYS Analytical Services the contract laboratory in Sydney, British Columbia. The samples were collected in laboratory-provided sample bottles and coolers containing blue-ice. All study samples were maintained under chain-of-custody from the time of collection throughout the analytical process. Preparation and analysis of all samples was completed within method holding-time limits.

TSS samples were maintained on wet ice throughout the sample period and driven to Ecology Headquarters in Lacey. The Ecology currier transported the cooler containing the TSS samples the following morning to MEL for analysis. Preparation and analysis of all samples was completed within method holding-time limits.

Results

On February 9, March 22, and May 3, during the 2016 discharge season, the influent and effluent were sampled at the Albion WWTP for PCBs, dieldrin, and TSS. The samples were 24-hour composites made-up of eight subsamples collected about every three hours over each of the three sample days. Sample logs with information on sample times, volumes, and collection locations for the composite samples are in Appendix B, Table B-1.

Influent, Effluent, and pH

The Chief Operator of the Albion WWTP provided the 24-hour totals of influent and effluent volumes over the sample collection periods. The volume of influent to the plant was determined by totaling run times for the influent wet well pump over the composite sample periods. The influent pumps have a known pumping volume per unit of time. The effluent discharge in gallons per day was taken from the WWTP's flow totalizer. The pH was measured at the effluent v-notched weir only.

Table 3. Summary of the Albion WWTP Influent, Effluent, and pH.

Sample Source	Sample Dates	Influent (gal/day)	**Effluent** (gal/day)	pH Sample (Time)	pH (Units)
Influent	2/9/2016	65,938	-	**0025**	**8.20**
Effluent		-	**120,000**	**2125**	**9.02**
Influent	3/22/2016	85,924	-	**0011**	**9.09**
Effluent		-	**107,600**	**2120**	**9.09**
Influent	5/3/2016	74,182	-	**0020**	**9.35**
Effluent		-	**78,723**	**2115**	**9.41**

Bold = Visual aid for effluent results.

PCB Congeners

PCBs were analyzed by the congener method EPA 1668C HRGC/HRMS. Table 4 shows summary results for influent and effluent tPCB samples analyzed for the Albion WWTP study.

Table 4. Summary Results for PCB Congeners (pg/L).

Sample Source	Sample Number	Sample Date	Infl/**Effl** PCBs	Infl/**Effl** PCBs Study Mean
Influent	1602009-01	2/9/2016	4527	5021
Effluent	**1602009-02**		**267 J**	**454 J**
	1602009-03			
Influent	1603015-01	3/22/2016	1434	
Effluent	**1603015-02**		**396 J**	
	1603015-03			
Influent	1605010-01	5/3/2016	9102	
Effluent	**1605010-02**		**698 J**	

Dieldrin

Dieldrin samples were analyzed by EPA method 1699 HRGC/HRMS. Table 5 shows summary results for influent and effluent dieldrin samples analyzed for the Albion WWTP study.

Table 5. Summary Results for Dieldrin (pg/L).

Sample Source	Sample Number	Sample Date	Infl/**Effl** Dieldrin	Infl/**Effl** Dieldrin Study Mean
Influent	1602009-01	2/9/2016	768 J	
Effluent	**1602009-02**		**82.1 J**	
	1602009-03			
Influent	1603015-01	3/22/2016	207 J	429 J
Effluent	**1603015-02**		**116 NJ***	**85.4 J**
	1603015-03			
Influent	1605010-01	5/3/2016	311 J	
Effluent	**1605010-02**		**116 J**	
	1605010-03			

***** One half the reported "NJ" value for the March Effluent was used.

TSS

TSS samples were analyzed by Standards Methods 2540D. Table 6 shows summary results for influent and effluent TSS samples analyzed for the Albion WWTP study.

Table 6. Summary Results for Total Suspended Solids (mg/L).

Sample Source	Sample Number	Sample Date	Infl/**Effl** TSS	Infl/**Effl** TSS Study Mean
Influent	1602009-01	2/9/2016	74	
Effluent	**1602009-02**		**46**	
	1602009-03			
Influent	1603015-01	3/22/2016	37	101
Effluent	**1603015-02**		**74**	**66**
	1603015-03			
Influent	1605010-01	5/3/2016	192	
Effluent	**1605010-02**		**78**	
	1605010-03			

Discussion

Influent and Effluent Volume and pH

Influent and Effluent

During the three 24-hour sample events, the influent volume was determined by totaling the wet well pump run times over the composite sample periods. The influent pumps have a known pumping volume per unit of time. The effluent discharge volume over the 24-hour sample collection periods was determined by the WWTP flow totalizer measured at the effluent v-notched weir. Influent and effluent sample period volumes in gallons per day were provided by the Chief Operator of the Albion WWTP. The influent and effluent volumes are shown in Table 7.

Discharge volumes for the study were within permitted design flows for the WWTP, ranging from 120,000 down to 78,723 gal/day. As a result of effluent flows and tPCB concentrations, the WWTP must reduce effluent tPCB concentrations to meet interim wasteload allocations (WLAs) of 0.0001 g/day.

pH

Over the study period, the pH slightly increased from the first sample event to the last (Table 3). During the first sample event, the pH was within NPDES discharge limits of equal to or greater than pH 6.0 and less than or equal to 9.0 pH standard units (Ecology, 2010). For the last two events, March was slightly greater than the NPDES discharge limits and May was up to 0.41 pH units over discharge limits. The first and last sample events were during bright sunny days, while the second event was overcast. The warmer sunny sample day in May likely increased algal use of carbon dioxide which can raise the pH (SRAC, 2008).

Interim WLAs and Removal Efficiency

PCBs and Dieldrin Interim WLAs

Interim WLAs were established in the *Palouse River TMDL Implementation Plan* (Johnson et al., 2007) at 0.0001 g/day for tPCBs. The WLAs were based on the WWTP's design effluent maximum discharge (0.12 mgd) and the NTR human health tPCB criterion (170 pg/L). Table 7 shows the sample day tPCB concentrations and loads along with study means.

PCB concentrations and loads showed an inverse relationship with discharge volume. Through the discharge season, PCB concentrations and loads increased from just above the interim WLA while effluent volume decreased. The tPCB Interim WLA target of 0.0001 g/day discharged was slightly exceeded through the study. The tPCB loads ranged from 0.000121 to 0.000208 g/day, with a study mean of 0.000175. The measured study loads ranged from about 20% greater to about two times the target Interim WLA. Figure 2 shows the effluent tPCB loads in g/day discharged for each of the three sample events and the Interim WLA.

Table 7. Summary of tPCB Loads and Removal Efficiency.

Sample Source	Sample Date	Infl/**Effl** (gal/day)	tPCBs (pg/L)	tPCB Load (g/day)	tPCB % Removal
Influent	2/9/2016	65,938	4527	0.00113	
Effluent		**120,000**	**267 J**	**0.000121**	89
Influent	3/22/2016	85,924	1434	0.000466	
Effluent		**107,600**	**396 J**	**0.000161**	65
Influent	5/3/2016	74,182	9102	0.00256	
Effluent		**78,723**	**698 J**	**0.000208**	92
Influent Study Mean		75,348	5021	0.00143	
Effluent Study Mean		**102,108**	**454 J**	**0.000175**	88

Bold = Visual aid to effluent information.

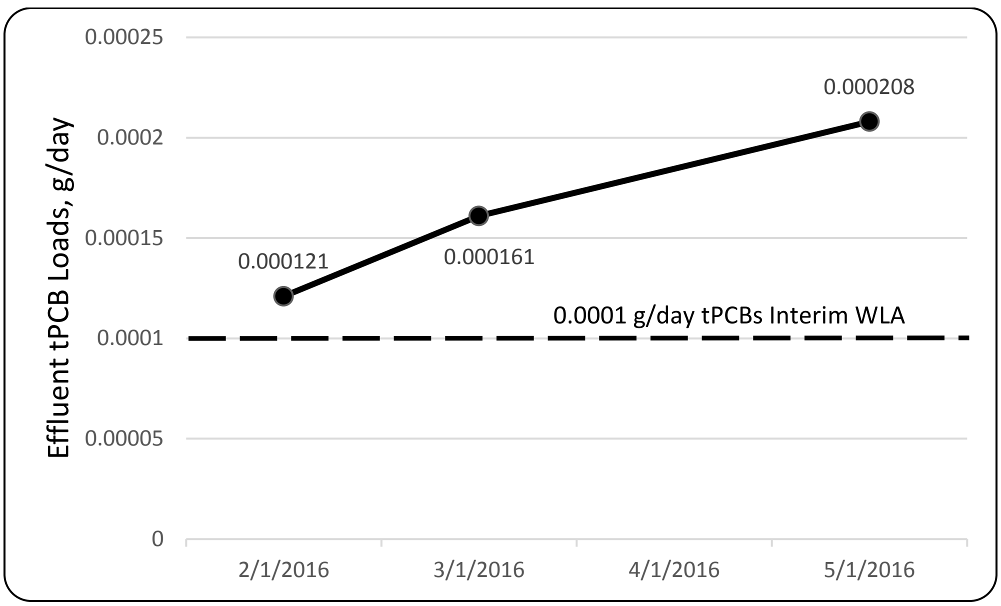

Figure 2. tPCB Loads in Albion WWTP Effluent (g/day).

To compare the allowable loads to current loads, and quantify the percent reduction needed to meet the tPCB Interim WLA, current study loads were calculated as the mean study tPCB concentration combined with the mean effluent quantity discharged for the three sample events. Table 8 presents current tPCB loads, the allowable loads to meet the Interim WLA, the needed load reduction, and the percent of current load reduction needed to meet the Interim WLA.

Table 8. Albion WWTP tPCB Effluent Study Load and Reduction Needed (g/day).

Sample Source	Current tPCB Load	Interim tPCB WLA	Needed Load Reduction	Needed Percent Reduction
Effluent	0.000175	0.0001	0.000075	43

Based on mean study flow for the 2016 discharge season sample events and the tPCBs Interim WLA at 0.0001 g/day, a 43% reduction is needed in tPCB loads through the discharge season to meet the Interim WLA. The percent reduction calculation is shown below:

tPCB Reduction = [(0.000175 g/day – 0.0001 g/day) / (0.000175 g/day)] x 100 = **43%**

The dieldrin Interim WLA target was established in the *Palouse River TMDL Implementation Plan* (Johnson et al., 2007) at 0.0001 g/day. The WLA was based on the WWTP's design maximum discharge (0.12 mgd) and the dieldrin NTR human health criterion (140 pg/L). Table 9 shows the sample day dieldrin concentrations and loads, along with the study mean.

Table 9. Summary of Dieldrin Loads and Removal Efficiency.

Sample Source	Sample Date	Infl/**Effl** (gal/day)	Dieldrin (pg/L)	Dieldrin Load (g/day)	Dieldrin % Removal
Influent	2/9/2016	65,938	768 J	0.000192	
Effluent		**120,000**	**82.1 J**	**0.000037**	81
Influent	3/22/2016	85,924	207 J	0.000067	
Effluent		**107,600**	**116 NJ**[1]	**0.000024**	64
Influent	5/3/2016	74,182	311 J	0.000087	
Effluent		**78,723**	**116 J**	**0.000035**	60
Influent Study Mean		75,348	429 J	0.000122	
Effluent Study Mean		**102,108**	**85.4 J**	**0.000033**	73

1 = Used one-half the NJ value (58 NJ) in Loading and % Removal Dieldrin Calculations.

Generally, dieldrin concentrations and loads were lower than those reported for tPCBs. Dieldrin did not show the same discharge-season increasing trend like the tPCB concentrations and loads did. With the effluent volume decreasing through the discharge season, dieldrin concentrations increased but loads did not. Figure 3 shows the effluent dieldrin loads in g/day discharged for each of the three sample events and the Interim WLA.

Dieldrin results show Albion WWTP was consistently meeting the Interim WLA target of 0.0001 g/day through the 2016 discharge season. Based on the dieldrin Interim WLA target from the *Palouse River TMDL Implementation Plan* (Johnson et al., 2007), no load reductions are currently needed.

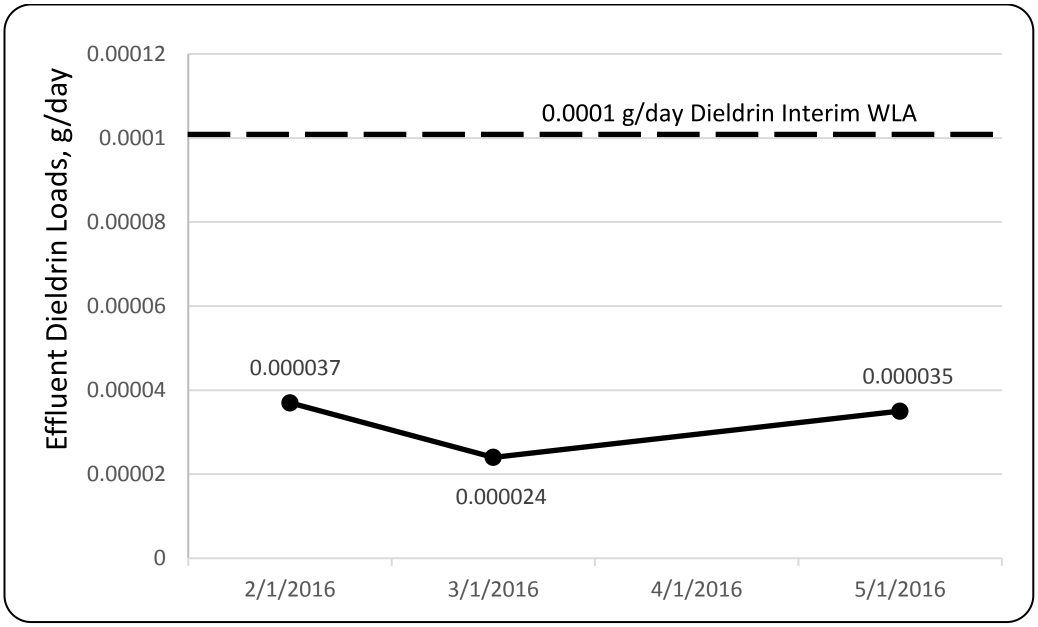

Figure 3. Dieldrin Loads in Albion WWTP Effluent (g/day)

WWTP Removal Efficiency for PCBs, Dieldrin, and TSS

The Albion WWTP removal efficiencies were determined as the percentage of the influent's contaminant load removed from the discharged effluent load. Based on measured tPCB loads, the data show generally good treatment efficiencies through the 2016 study. For tPCBs, only the March sample event was below an 80% removal threshold. Removal efficiencies ranged from 65% to 92%, with an 88% mean for the study. Table 7 shows the Albion WWTP loads and removal efficiency for tPCBs. Figure 2 graphically presents the tPCB load results along with the Interim WLA.

Treatment removal efficiencies for dieldrin were generally good, decreasing through the study from 81% down to 60%. While the WWTP is meeting the dieldrin Interim WLA target of less than 0.0001 g/day discharged, the removal efficiency is slightly low with a study mean of 73%. Table 9 shows the WWTP percent removal efficiencies for dieldrin through the study. Figure 3 graphically presents the study load results and the dieldrin Interim WLA.

TSS is a required reporting parameter for the Albion NPDES permit. Currently the permit is under Interim Effluent Limitations with TSS limits based on a weekly mean not to exceed 65 mg/L and 63 lbs/day. The Albion WWTP Interim Effluent Limitations require TSS treatment efficiencies meet an 80% removal based on a monthly mean. The Albion WWTP treatment removal efficiency for TSS during the three sample events and the study mean are shown in Table 10, along with sample day influent and effluent TSS loads in lbs/day.

Table 10. Summary of TSS Loads and Removal Efficiency.

Sample Source	Sample Date	Infl/**Effl** (gal/day)	TSS (mg/L)	TSS Load (lbs/day)	TSS % Removal
Influent	2/9/2016	65,938	74	40.7	
Effluent		**120,000**	**46**	**46.0**	0%
Influent	3/22/2016	85,924	37	26.5	
Effluent		**107,600**	**74**	**66.4**	0%
Influent	5/3/2016	74,182	192	119	
Effluent		**78,723**	**78**	**51.2**	57%
Influent Study Mean		75,348	101	63.5	
Effluent Study Mean		**102,108**	**66**	**56.2**	12%

TSS levels can be a problem in facultative lagoon systems. Algal concentrations and design of the discharge structure can impact levels of TSS discharged. The EPA reports commonly achieved effluent levels of TSS from facultative lagoons may range from 30 – 150 mg/L (EPA, 2011). The study data show TSS removal efficiency for the facultative system did not meet an 80% removal rate for any of the three 24-hour composite samples. Only the March TSS loading results (66.4 lbs/day) exceeded the 63 lbs/day weekly TSS Interim Effluent Limitation by about 5%, while the study mean was about 7 lbs/day under the TSS Interim Effluent Limitation.

Effluent PCBs and Dieldrin Results Compared to Criteria

Effluent tPCBs and dieldrin results were compared to available ambient water quality criteria for informational purposes. While tPCBs and dieldrin are not currently required monitoring parameters for the Albion WWTP's NPDES permit (No. WA-002260-8), they may be in the future. Influent flow to the WWTP has some design criteria based on flow, BOD, and TSS, but no toxic design criteria.

The Albion WWTP effluent concentrations of tPCBs and dieldrin were determined by analysis of three 24-hour composite samples collected on February 9, March 22, and May 3 of 2016. The tPCBs and dieldrin discharged during the three sample periods are compared in Table 11 to the NTR criteria, the HHC, and the Aquatic Life Standard for each sample event and the study mean.

Table 11. Effluent PCBs and Dieldrin Results Compared to Water Quality Criteria (pg/L).

Sample Source	Sample Date	tPCBs	tPCBs Study Mean	Dieldrin	Dieldrin Study Mean
Effluent	2/9/2016	267 J	454 J	82.1 J	85.4 J
Effluent	3/22/2016	396 J		116 NJ[1]	
Effluent	5/3/2016	698 J		116 J	
National Toxics Rule (NTR)			170		140
New PCBs Toxics Criterion (HHC)			7		0.07
Aquatic Life Standard			14,000		56,000

1 = Used one-half the NJ value (58 NJ) in the study mean calculation.

Over the discharge season, tPCB concentrations increased (Table 11) as the discharge decreased (Table 10). Compared to the NTR criterion for tPCBs, the effluent concentration increased from about 1.5 times the NTR to about 4 times over the study period, with a study mean effluent concentration of about 2.7 times the NTR criterion. The new HHC is much lower (more restrictive) than the NTR criteria. The effluent tPCBs never approached the Aquatic Life Standard.

Dieldrin concentrations for the three individual sample events and the study mean were all below the NTR criterion of 140 pg/L. Dieldrin results for the study ranged from 82 to 116 pg/L and had a study mean of 85.4 pg/L. While dieldrin results were within the NTR criterion, they would exceed the new and lower HHC criterion. The effluent dieldrin concentrations never approached the Aquatic Life Standard.

Facility Design Load for TSS

Albion's NPDES permit includes design criteria for influent TSS loads that should not be exceeded. These criteria ensure the WWTP is built to accommodate the wastewater treatment needs and expected future growth. The Albion WWTP's maximum design quantity for influent TSS loads is 212 lbs/day. The formula below shows the most current loads of influent TSS measured through the 2016 discharge season at the Albion WWTP during the three 24-hour composite sample events for the study. The formula used for determining TSS loads in units of lbs/day is:

(Flow in MGD) X (Concentration in mg/L) X (lbs/Gallon) = lbs/day

February:

$$\frac{0.065938 \text{ MG}}{\text{Day}} \times \frac{74 \text{ mg}}{\text{L}} \times \frac{8.34 \text{ lbs}}{\text{Gal}} = \frac{40.7 \text{ lbs}}{\text{day}}$$ (19% of Design Load)

March:

$$\frac{0.085924 \text{ MG}}{\text{Day}} \times \frac{37 \text{ mg}}{\text{L}} \times \frac{8.34 \text{ lbs}}{\text{Gal}} = \frac{26.5 \text{ lbs}}{\text{day}}$$ (13% of Design Load)

May:

$$\frac{0.074182\ \text{MG}}{\text{Day}} \times \frac{192\ \text{mg}}{\text{L}} \times \frac{8.34\ \text{lbs}}{\text{Gal}} = \frac{119\ \text{lbs}}{\text{day}} \quad \text{(56\% of Design Load)}$$

Study Mean:

$$\frac{0.075348\ \text{MG}}{\text{Day}} \times \frac{101\ \text{mg}}{\text{L}} \times \frac{8.34\ \text{lbs}}{\text{Gal}} = \frac{63.5\ \text{lbs}}{\text{day}} \quad \text{(30\% of Design Load)}$$

The Albion NPDES permit identifies a trigger for TSS influent loads reaching 85% of design capacity requiring a plan be submitted to Ecology with a schedule to continue to maintain capacity. Study loads of TSS ranged from 26.5 to 119 lbs/day, with a mean of 63.5 lbs/day. The influent TSS facility maximum design load (212 lbs/day) was never approached during the study. The 119 lbs/day maximum measured study load was from the May sample at roughly one-half the maximum design load. The percent of the influent maximum design load measured during the study is shown above with the associated month and the study mean. Comparing TSS design loads to study loads show that, based on the 2016 discharge season, the Albion WWTP would not be expected to reach the maximum design loads in the near term.

Conclusions

Results of this 2016 study support the following conclusions:

- Effluent tPCB concentrations increased through the 2016 discharge season from 267 to 698 pg/L, with a study mean of 454 pg/L. The Interim tPCB wasteload allocation (WLA) target of 0.0001 g/day was slightly exceeded through the study. Study loads ranged from 0.000121 to 0.000208 g/day, with a mean of 0.000175 g/day. An effluent load reduction of 43% in current tPCB loads is needed to meet the Interim WLA of 0.0001 g/day.
- The tPCB trend over the discharge period showed concentrations and loads had an inverse relationship with effluent volume. While the effluent decreased through the discharge season, tPCBs increased in concentration and loads.
- tPCBs removal efficiency for the Albion WWTP was generally good at 88%. One of the three sample events showed removal efficiency below an 80% threshold.
- Effluent dieldrin concentrations increased from the first 2016 sample event to the last, ranging from 82.1 to 116 pg/L, with a mean of 85.4 pg/L. Dieldrin is consistently below the National Toxics Rule (NTR) human health criterion and considered to be meeting the Interim WLA target of 0.0001 g/day through the 2016 discharge season. Based on the Interim WLA target from the *Palouse River TMDL Implementation Plan* (Johnson et al., 2007), no dieldrin load reduction would currently be required.
- While dieldrin removal efficiencies at Albion's WWTP were slightly low with a study mean of 73%, Interim WLAs of 0.0001 g/day were consistently met at discharge.
- Dieldrin did not show an increasing trend over the discharge period like the PCBs did. While the effluent decreased through the discharge season, dieldrin increased in concentration but not load.
- Total suspended solids (TSS) did not meet the 80% removal rate at discharge through the study. One of three study samples exceeded the weekly TSS Interim Effluent Limitations (63 lbs/day) by roughly 5%, while the study mean was about 7 lbs/day less than the TSS Average Weekly Interim Effluent Limitations.
- pH increased from within NPDES limits ($\geq$6.0 - $\leq$9.0) during the first sample event to greater than pH 9.0 during the last. Facultative ponds are known to have issues in warmer environments that can affect pH. Use of carbon dioxide by algal communities can raise the pH.
- The Albion WWTP design load maximums for TSS in influent were never approached. The May sample had the largest TSS load at roughly one-half the maximum design load, while the study mean was about 30% of maximum design load.

Recommendations

Results of this 2016 study support the following recommendations:

- The Albion WWTP will need a 43% reduction in tPCB effluent loads to meet the Interim WLA of 0.0001 g/day.
- tPCB and dieldrin influent and effluent loads from the Albion WWTP should be monitored periodically. Frequency of sampling should be at least every five years or following any WWTP upgrades or changes in the system, such as sludge removal, until these toxic chemicals are incorporated into the Albion NPDES permit. Samples to determine tPCBs and dieldrin effluent loads should be collected to represent the discharge period.
- Albion should develop a Pollutant Elimination Plan to limit inputs and educate the public about Albion's sewage collection system, then reassess the outcome.
- Periodic cleaning of the sewage collection system should be considered. If the Albion WWTP has a sludge removal program for the treatment ponds, cleaning the sewage collection system should be timed for the best coordination between the two.

References

Ecology, 2016. Quality Assurance Project Plan: Albion Wastewater Treatment Plant Discharge of PCBs and Dieldrin to the South Fork Palouse River. Washington State Department of Ecology, Olympia, WA, Publication No. 16-03-102. 45 pages. https://fortress.wa.gov/ecy/publications/SummaryPages/1603102.html

Ecology, 2010. National Pollutant Discharge Elimination System Waste Discharge Permit No. WA-002260-8 for Albion Washington. Washington State Department of Ecology, Spokane, WA. 23 pages.

EPA, 2011. Principles of Design and Operations of Wastewater Treatment Pond Systems for Plant Operators, Engineers, and Managers. United States Environmental Protection Agency Office of Research and Development. EPA/600/R-11/088, August 2011. 457 pages. https://www.epa.gov/sites/production/files/2014-09/documents/lagoon-pond-treatment-2011.pdf

Intellicast, 2015. Web access to Albion, Washington's monthly averages for temperature and precipitation. Accessed the site on 9/3/2015. http://www.intellicast.com/Local/History.aspx?location=USWA0006

Johnson, A., E. Snouwaert, K. Kinney, and B. Era-Miller, 2007. Palouse River Chlorinated Pesticide and PCB Total Maximum Daily Load: Water Quality Improvement Report and Implementation Plan. Washington State Department of Ecology, Olympia, WA. Publication No. 07-03-018. https://fortress.wa.gov/ecy/publications/SummaryPages/0703018.html

Lubliner, B., 2009. Palouse River Watershed PCB and Dieldrin Monitoring, 2007-2008, Wastewater Treatment Plants and Abandoned Landfills. Washington State Department of Ecology, Olympia, WA. Publication No. 09-03-004. https://fortress.wa.gov/ecy/publications/SummaryPages/0903004.html

SRAC, 2008. Managing High pH in Freshwater Ponds. Southern Regional Aquaculture Center, SRAC Fact Sheet Publication No. 4604, USDA, Cooperative State Research, Education, and Extension Service. http://www2.ca.uky.edu/wkrec/high-ph-ponds.pdf

Appendices

Appendix A. Quality Control Results for PCBs and Dieldrin

Table A-1. Labeled PCB Spike Samples Collected February 9, 2016 (% Recovery).

Sample Type	Analyte	Alb-Infl 01 1602009-01	Alb-Effl 02 1602009-02	Effl-QA 03 1602009-03
Labeled Spike	PCB-001L	52.4	44.9	38.9
Labeled Spike	PCB-003L	57.1	51.8	46.2
Labeled Spike	PCB-004L	59	50.1	46
Labeled Spike	PCB-015L	64.6	61.4	56.2
Labeled Spike	PCB-019L	55.3	46.1	42.6
Labeled Spike	PCB-028L	84.4	86.1	80.3
Labeled Spike	PCB-037L	77.2	65.6	61.9
Labeled Spike	PCB-054L	69	50.9	48.7
Labeled Spike	PCB-077L	78.3	59.6	59.1
Labeled Spike	PCB-081L	78.2	57.9	57.1
Labeled Spike	PCB-104L	52.4	39.7	39.4
Labeled Spike	PCB-105L	76.4	59.7	62.3
Labeled Spike	PCB-111L	75.3	75.8	74.9
Labeled Spike	PCB-114L	67.6	52	54.4
Labeled Spike	PCB-118L	68.6	52.8	55.5
Labeled Spike	PCB-123L	67.2	53.4	56.6
Labeled Spike	PCB-126L	66.7	49.1	54.4
Labeled Spike	PCB-155L	46.2	50	47.3
Labeled Spike	PCB-156L/157L	49.6	47.5	47.9
Labeled Spike	PCB-167L	45.8	46.3	45.9
Labeled Spike	PCB-169L	48.9	43	44.6
Labeled Spike	PCB-170L	54.9	50.3	55.3
Labeled Spike	PCB-178L	55.2	68.8	57.7
Labeled Spike	PCB-180L	53.2	48.1	53.2
Labeled Spike	PCB-188L	50.6	44	54.9
Labeled Spike	PCB-189L	63.8	50.1	63.5
Labeled Spike	PCB-202L	32.9	36.9	47.9
Labeled Spike	PCB-205L	59.3	54.2	58.2
Labeled Spike	PCB-206L	48.4	43.7	47.2
Labeled Spike	PCB-208L	47.3	43.1	50.8
Labeled Spike	PCB-209L	39.8	41.5	44.6

Table A-2. Labeled PCB Spike Samples Collected March 22, 2016 (% Recovery).

Sample Type	Analyte	Alb-Infl 01 1603015-01	Alb-Effl 02 1603015-02	Effl-QA 03 1603015-03
Labeled Spike	PCB-001L	42.6	36.4	35.9
Labeled Spike	PCB-003L	47.6	42.3	38.1
Labeled Spike	PCB-004L	51.2	42.1	40.7
Labeled Spike	PCB-015L	64.6	52.4	50.8
Labeled Spike	PCB-019L	61.9	46.2	46.9
Labeled Spike	PCB-028L	75.3	68.7	67.7
Labeled Spike	PCB-037L	70.2	49.1	50
Labeled Spike	PCB-054L	58.5	38.6	39.5
Labeled Spike	PCB-077L	87.5	51.2	55.6
Labeled Spike	PCB-081L	85.4	49.3	54.3
Labeled Spike	PCB-104L	63.3	32	37
Labeled Spike	PCB-105L	82.9	42.7	51.6
Labeled Spike	PCB-111L	80.2	77.5	76.4
Labeled Spike	PCB-114L	80.1	40.8	49.9
Labeled Spike	PCB-118L	80.3	40.3	48.4
Labeled Spike	PCB-123L	78.7	39.6	47.2
Labeled Spike	PCB-126L	80.5	43.3	52.9
Labeled Spike	PCB-155L	63	29.3	39.4
Labeled Spike	PCB-156L/157L	71.4	34.1	45.5
Labeled Spike	PCB-167L	72	34	45
Labeled Spike	PCB-169L	72.8	36.4	49.7
Labeled Spike	PCB-170L	68.6	33.5	46.5
Labeled Spike	PCB-178L	84.1	81	82.7
Labeled Spike	PCB-180L	71.9	33.7	47.2
Labeled Spike	PCB-188L	52.8	24.8	35.3
Labeled Spike	PCB-189L	67.4	31.8	44.3
Labeled Spike	PCB-202L	52.6	24.4	35.6
Labeled Spike	PCB-205L	65	29.9	43.2
Labeled Spike	PCB-206L	60.1	27.1	41.2
Labeled Spike	PCB-208L	56.3	26.7	39.3
Labeled Spike	PCB-209L	60.2	27.8	43.3

Table A-3. Labeled PCB Spike Samples Collected May 3, 2016 (% Recovery).

Sample Type	Analyte	Alb-Infl 01 1605010-01	Alb-Effl 02 1605010-02	Effl-QA 03 1605010-03
Labeled Spike	PCB-001L	34.5	25.8	27
Labeled Spike	PCB-003L	38.1	30.3	30.4
Labeled Spike	PCB-004L	40.3	29.9	30.4
Labeled Spike	PCB-015L	49.5	34.7	35.6
Labeled Spike	PCB-019L	43.5	29.8	31
Labeled Spike	PCB-028L	64.6	62	51.3
Labeled Spike	PCB-037L	50.4	34.6	37.1
Labeled Spike	PCB-054L	41.1	27.5	28.5
Labeled Spike	PCB-077L	46.6	38	38.8
Labeled Spike	PCB-081L	47.5	37	38.1
Labeled Spike	PCB-104L	39.7	29.8	29.7
Labeled Spike	PCB-105L	37.8	32.9	33.9
Labeled Spike	PCB-111L	70.5	78.5	68.5
Labeled Spike	PCB-114L	35.9	30.7	31.9
Labeled Spike	PCB-118L	36.6	31	32.4
Labeled Spike	PCB-123L	36.6	31.6	32.5
Labeled Spike	PCB-126L	41.5	38.5	36.5
Labeled Spike	PCB-155L	48.9	33.5	32.9
Labeled Spike	PCB-156L/157L	39.6	32.2	32.5
Labeled Spike	PCB-167L	37	30.6	30.4
Labeled Spike	PCB-169L	45.3	38.8	35.7
Labeled Spike	PCB-170L	39.2	32.8	33.1
Labeled Spike	PCB-178L	82.7	84.9	77.2
Labeled Spike	PCB-180L	41.8	33.1	33.3
Labeled Spike	PCB-188L	44.4	33.6	34.3
Labeled Spike	PCB-189L	39.7	31.1	31.4
Labeled Spike	PCB-202L	42.4	33.9	33.2
Labeled Spike	PCB-205L	37.6	29.7	28.4
Labeled Spike	PCB-206L	37.7	29.8	28.8
Labeled Spike	PCB-208L	37.3	29.3	29
Labeled Spike	PCB-209L	36.7	32	32.6

Table A-4. Laboratory PCB Blank Samples Analyzed February 2016 (pg/L). Bold = positive results.

Sample Type	Analyte	#1 WG54352-101	#2 WG54352-104	#3 WG54352-105
Lab Blank	PCB-001	**5.89**	4.83 U	4.71 U
Lab Blank	PCB-002	**2.83 J**	4 U	4 U
Lab Blank	PCB-003	**5.22**	5.3 U	5.09 U
Lab Blank	PCB-004	**5.8**	4.69 U	4.11 U
Lab Blank	PCB-005	0.649 UJ	0.559 UJ	0.785 UJ
Lab Blank	PCB-006	**3.41 J**	4 U	4 U
Lab Blank	PCB-007	**1.36 J**	4 U	4 U
Lab Blank	PCB-008	**16.8**	13.8 U	12.7 U
Lab Blank	PCB-009	**1.3 J**	4 U	4 U
Lab Blank	PCB-010	0.583 UJ	0.502 UJ	0.705 UJ
Lab Blank	PCB-011	**81.4**	31.2 U	26.8 U
Lab Blank	PCB-012/013	**1.87 J**	4 U	4 U
Lab Blank	PCB-014	0.589 UJ	0.507 UJ	0.712 UJ
Lab Blank	PCB-015	**8.4**	6.93 U	6.5 U
Lab Blank	PCB-016	**7.15**	4.91 U	4.85 U
Lab Blank	PCB-017	**7.46**	5.38 U	5.09 U
Lab Blank	PCB-018/030	**16.4**	10.4 U	9.89 U
Lab Blank	PCB-019	**2.1 J**	4 U	4 U
Lab Blank	PCB-020/028	**23.5**	16.9 U	15.2 U
Lab Blank	PCB-021/033	**13.9**	9.91 U	9.18 U
Lab Blank	PCB-022	**8.71**	6.17 U	5.77 U
Lab Blank	PCB-023	0.511 UJ	0.5 UJ	0.555 UJ
Lab Blank	PCB-024	0.535 UJ	0.5 UJ	0.534 UJ
Lab Blank	PCB-025	**1.57 J**	4 U	4 U
Lab Blank	PCB-026/029	**3.88 J**	4 U	4 U
Lab Blank	PCB-027	**0.975 J**	4 U	4 U
Lab Blank	PCB-031	**20**	13.9 U	13 U
Lab Blank	PCB-032	**5.03**	4 U	4 U
Lab Blank	PCB-034	0.5 UJ	0.5 UJ	0.525 UJ
Lab Blank	PCB-035	**0.548 J**	4 U	0.504 UJ
Lab Blank	PCB-036	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-037	**2.83 J**	4 U	4 U
Lab Blank	PCB-038	0.5 UJ	0.5 UJ	0.518 UJ
Lab Blank	PCB-039	0.5 UJ	0.5 UJ	0.517 UJ
Lab Blank	PCB-040/041/071	**6.42**	4.61 U	4.66 U
Lab Blank	PCB-042	**2.81 J**	4 U	4 U
Lab Blank	PCB-043	1.04 UJ	0.789 UJ	0.921 UJ
Lab Blank	PCB-044/047/065	**22.4**	11.4 U	9.9 U
Lab Blank	PCB-045/051	**5.38**	4 U	4 U

Sample Type	Analyte	#1 WG54352-101	#2 WG54352-104	#3 WG54352-105
Lab Blank	PCB-046	1.03 UJ	0.78 UJ	0.91 UJ
Lab Blank	PCB-048	**2.96 J**	4 U	4 U
Lab Blank	PCB-049/069	**7.5**	6.06 U	5.07 U
Lab Blank	PCB-050/053	**1.97 J**	4 U	4 U
Lab Blank	PCB-052	**18.2**	12.3 U	10.1 U
Lab Blank	PCB-054	0.612 UJ	0.5 UJ	0.558 UJ
Lab Blank	PCB-055	0.695 UJ	0.558 UJ	0.716 UJ
Lab Blank	PCB-056	2.05 NJ	**1.38 J**	1.21 NJ
Lab Blank	PCB-057	0.643 UJ	0.517 UJ	0.662 UJ
Lab Blank	PCB-058	0.656 UJ	0.527 UJ	0.675 UJ
Lab Blank	PCB-059/062/075	**1.18 J**	4 U	4 U
Lab Blank	PCB-060	**1.69 J**	4 U	4 U
Lab Blank	PCB-061/070/074/076	**10.9**	8.32 U	4 U
Lab Blank	PCB-063	0.633 UJ	0.508 UJ	0.652 UJ
Lab Blank	PCB-064	**4.61**	4.15 U	4 U
Lab Blank	PCB-066	**5.93**	4 U	4 U
Lab Blank	PCB-067	0.592 UJ	0.5 UJ	0.609 UJ
Lab Blank	PCB-068	**1.78 J**	0.504 UJ	0.646 UJ
Lab Blank	PCB-072	0.624 UJ	0.501 UJ	0.643 UJ
Lab Blank	PCB-073	0.664 UJ	0.504 UJ	0.588 UJ
Lab Blank	PCB-077	0.703 UJ	0.58 UJ	0.727 UJ
Lab Blank	PCB-078	0.658 UJ	0.528 UJ	0.677 UJ
Lab Blank	PCB-079	0.552 UJ	0.5 UJ	0.568 UJ
Lab Blank	PCB-080	0.619 UJ	0.5 UJ	0.637 UJ
Lab Blank	PCB-081	0.695 UJ	0.545 UJ	0.695 UJ
Lab Blank	PCB-082	1.43 UJ	0.973 UJ	1.39 UJ
Lab Blank	PCB-083/099	**4.24**	4 U	4 U
Lab Blank	PCB-084	1.38 NJ	**1.95 J**	1.29 UJ
Lab Blank	PCB-085/116/117	1.29 NJ	**1.06 J**	0.98 UJ
Lab Blank	PCB-086/087/097/109/119/125	**4.89**	4 U	4 U
Lab Blank	PCB-088/091	1.33 NJ	1.02 NJ	1.13 UJ
Lab Blank	PCB-089	1.24 UJ	0.845 UJ	1.21 UJ
Lab Blank	PCB-090/101/113	**5.74**	5.57 U	4.28 U
Lab Blank	PCB-092	1.18 UJ	0.996 NJ	1.15 UJ
Lab Blank	PCB-093/095/098/100/102	**6.05**	5.85 U	5.14 U
Lab Blank	PCB-094	1.26 UJ	0.859 UJ	1.23 UJ
Lab Blank	PCB-096	0.7 UJ	0.629 UJ	0.766 UJ
Lab Blank	PCB-103	1.02 UJ	0.693 UJ	0.99 UJ
Lab Blank	PCB-104	0.683 UJ	0.61 UJ	0.754 UJ
Lab Blank	PCB-105	**1.89 J**	4 U	4 U

Sample Type	Analyte	#1 WG54352-101	#2 WG54352-104	#3 WG54352-105
Lab Blank	PCB-106	0.902 UJ	0.778 UJ	0.894 UJ
Lab Blank	PCB-107	0.872 UJ	0.751 UJ	0.863 UJ
Lab Blank	PCB-108/124	0.949 UJ	0.818 UJ	0.94 UJ
Lab Blank	PCB-110/115	**5.56**	5.16 U	5.02 U
Lab Blank	PCB-111	0.925 UJ	0.629 UJ	0.899 UJ
Lab Blank	PCB-112	0.86 UJ	0.585 UJ	0.836 UJ
Lab Blank	PCB-114	1 UJ	0.847 UJ	0.986 UJ
Lab Blank	PCB-118	**4.38**	4.3 U	4 U
Lab Blank	PCB-120	1 UJ	0.683 UJ	0.976 UJ
Lab Blank	PCB-121	0.878 UJ	0.597 UJ	0.853 UJ
Lab Blank	PCB-122	1.04 UJ	0.894 UJ	1.03 UJ
Lab Blank	PCB-123	0.97 UJ	0.886 UJ	1.01 UJ
Lab Blank	PCB-126	1.18 UJ	1.01 UJ	1.38 UJ
Lab Blank	PCB-127	1.1 UJ	0.951 UJ	1.09 UJ
Lab Blank	PCB-128/166	1.52 UJ	**0.983 J**	1.27 UJ
Lab Blank	PCB-129/138/160/163	4.63 NJ	4.91 NJ	**4.31**
Lab Blank	PCB-130	1.92 UJ	1.19 UJ	1.61 UJ
Lab Blank	PCB-131	1.68 UJ	1.03 UJ	1.41 UJ
Lab Blank	PCB-132	1.82 UJ	**1.36 J**	1.52 UJ
Lab Blank	PCB-133	1.71 UJ	1.05 UJ	1.43 UJ
Lab Blank	PCB-134/143	1.71 UJ	1.06 UJ	1.44 UJ
Lab Blank	PCB-135/151/154	**1.88 J**	4 U	0.906 UJ
Lab Blank	PCB-136	0.738 UJ	0.682 UJ	0.651 UJ
Lab Blank	PCB-137	1.82 UJ	1.12 UJ	1.53 UJ
Lab Blank	PCB-139/140	1.56 UJ	0.959 UJ	1.3 UJ
Lab Blank	PCB-141	1.65 UJ	1.02 UJ	1.38 UJ
Lab Blank	PCB-142	1.75 UJ	1.08 UJ	1.46 UJ
Lab Blank	PCB-144	1.05 UJ	0.974 UJ	0.929 UJ
Lab Blank	PCB-145	0.789 UJ	0.729 UJ	0.695 UJ
Lab Blank	PCB-146	1.52 UJ	**1.01 J**	1.28 UJ
Lab Blank	PCB-147/149	3.01 NJ	**2.93 J**	**2.67 J**
Lab Blank	PCB-148	1.04 UJ	0.964 UJ	0.92 UJ
Lab Blank	PCB-150	0.754 UJ	0.697 UJ	0.665 UJ
Lab Blank	PCB-152	0.674 UJ	0.623 UJ	0.594 UJ
Lab Blank	PCB-153/168	**4.81**	4.84 U	4 U
Lab Blank	PCB-155	0.609 UJ	0.534 UJ	0.508 UJ
Lab Blank	PCB-156/157	1.57 UJ	0.996 UJ	1.35 UJ
Lab Blank	PCB-158	1.17 UJ	0.719 UJ	0.978 UJ
Lab Blank	PCB-159	1.39 UJ	0.859 UJ	1.17 UJ
Lab Blank	PCB-161	1.19 UJ	0.734 UJ	0.998 UJ

Sample Type	Analyte	#1 WG54352-101	#2 WG54352-104	#3 WG54352-105
Lab Blank	PCB-162	1.4 UJ	0.862 UJ	1.17 UJ
Lab Blank	PCB-164	1.3 UJ	0.801 UJ	1.09 UJ
Lab Blank	PCB-165	1.39 UJ	0.854 UJ	1.16 UJ
Lab Blank	PCB-167	1.29 UJ	0.818 UJ	1.09 UJ
Lab Blank	PCB-169	1.53 UJ	0.935 UJ	1.32 UJ
Lab Blank	PCB-170	1.1 UJ	0.893 UJ	0.917 UJ
Lab Blank	PCB-171/173	1.23 UJ	0.898 UJ	1.07 UJ
Lab Blank	PCB-172	1.23 UJ	0.896 UJ	1.07 UJ
Lab Blank	PCB-174	1.14 UJ	0.832 UJ	0.995 UJ
Lab Blank	PCB-175	1.03 UJ	0.757 UJ	0.905 UJ
Lab Blank	PCB-176	0.727 UJ	0.532 UJ	0.637 UJ
Lab Blank	PCB-177	1.1 UJ	0.804 UJ	0.962 UJ
Lab Blank	PCB-178	1.04 UJ	0.759 UJ	0.908 UJ
Lab Blank	PCB-179	0.687 UJ	0.503 UJ	0.601 UJ
Lab Blank	PCB-180/193	0.872 NJ	1.54 NJ	1.45 NJ
Lab Blank	PCB-181	1.12 UJ	0.818 UJ	0.978 UJ
Lab Blank	PCB-182	1.02 UJ	0.745 UJ	0.891 UJ
Lab Blank	PCB-183/185	1.07 UJ	0.785 UJ	0.939 UJ
Lab Blank	PCB-184	0.703 UJ	0.514 UJ	0.615 UJ
Lab Blank	PCB-186	0.776 UJ	0.567 UJ	0.679 UJ
Lab Blank	PCB-187	1.66 NJ	1.7 NJ	1.74 NJ
Lab Blank	PCB-188	0.668 UJ	0.5 UJ	0.585 UJ
Lab Blank	PCB-189	0.897 UJ	0.948 UJ	1.22 UJ
Lab Blank	PCB-190	0.804 UJ	0.588 UJ	0.704 UJ
Lab Blank	PCB-191	0.871 UJ	0.637 UJ	0.762 UJ
Lab Blank	PCB-192	0.96 UJ	0.702 UJ	0.84 UJ
Lab Blank	PCB-194	0.928 UJ	0.708 UJ	0.816 UJ
Lab Blank	PCB-195	1.05 UJ	0.802 UJ	0.924 UJ
Lab Blank	PCB-196	0.887 UJ	0.869 UJ	0.804 UJ
Lab Blank	PCB-197/200	0.669 UJ	0.656 UJ	0.606 UJ
Lab Blank	PCB-198/199	0.91 UJ	0.892 UJ	0.825 UJ
Lab Blank	PCB-201	0.688 UJ	0.674 UJ	0.623 UJ
Lab Blank	PCB-202	0.798 UJ	0.756 UJ	0.684 UJ
Lab Blank	PCB-203	0.856 UJ	0.839 UJ	0.776 UJ
Lab Blank	PCB-204	0.684 UJ	0.67 UJ	0.62 UJ
Lab Blank	PCB-205	0.733 UJ	0.578 UJ	0.682 UJ
Lab Blank	PCB-206	0.96 UJ	0.986 UJ	0.989 UJ
Lab Blank	PCB-207	0.729 UJ	0.705 UJ	0.747 UJ
Lab Blank	PCB-208	0.78 UJ	0.72 UJ	0.799 UJ
Lab Blank	PCB-209	**1.75 J**	4 U	4 U
	Total PCBs	**383 J**	**10.7 J**	**6.98 J**

Table A-5. Laboratory PCB Blank Samples Analyzed March 2016 (pg/L).

Sample Type	Analyte	#1 WG54716-101	#2 WG54716-104	#3 WG54716-105
Lab Blank	PCB-001	3.59 NJ	**3.39 J**	**4.22**
Lab Blank	PCB-002	1.24 NJ	**1.41 J**	**3.98 J**
Lab Blank	PCB-003	3.26 NJ	3.36 NJ	15.4 NJ
Lab Blank	PCB-004	2.4 NJ	1.71 NJ	1.48 UJ
Lab Blank	PCB-005	1.69 UJ	1.1 UJ	1.15 UJ
Lab Blank	PCB-006	1.5 UJ	0.974 UJ	**1.03 J**
Lab Blank	PCB-007	1.94 NJ	0.997 UJ	**2.04 J**
Lab Blank	PCB-008	**6.11**	**5.14**	4 U
Lab Blank	PCB-009	1.48 UJ	0.959 UJ	1.01 UJ
Lab Blank	PCB-010	1.56 UJ	1.01 UJ	1.07 UJ
Lab Blank	PCB-011	**19.3**	**15**	4 U
Lab Blank	PCB-012/013	1.52 UJ	0.986 UJ	**1.54 J**
Lab Blank	PCB-014	1.48 UJ	0.958 UJ	1.01 UJ
Lab Blank	PCB-015	**4.69**	**3.45 J**	**3.96 J**
Lab Blank	PCB-016	**2.86 J**	4 U	4 U
Lab Blank	PCB-017	**2.11 J**	**1.69 J**	4 U
Lab Blank	PCB-018/030	**4.37**	4.28 U	4.07 U
Lab Blank	PCB-019	0.62 UJ	0.519 UJ	**0.609 J**
Lab Blank	PCB-020/028	**8.21**	5.97 U	6.44 U
Lab Blank	PCB-021/033	**4.68**	**3.33 J**	**3.68 J**
Lab Blank	PCB-022	**3.07 J**	4 U	4 U
Lab Blank	PCB-023	0.524 UJ	0.534 UJ	0.5 UJ
Lab Blank	PCB-024	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-025	0.598 NJ	**0.555 J**	**0.638 J**
Lab Blank	PCB-026/029	1.24 NJ	**0.934 J**	**0.993 J**
Lab Blank	PCB-027	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-031	5.73 NJ	**4.79**	**4.74**
Lab Blank	PCB-032	**1.49 J**	**1.07 J**	**1.19 J**
Lab Blank	PCB-034	0.52 UJ	0.53 UJ	0.5 UJ
Lab Blank	PCB-035	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-036	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-037	1.05 NJ	**0.878 J**	**1.23 J**
Lab Blank	PCB-038	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-039	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-040/041/071	**2.61 J**	**1.89 J**	4 U
Lab Blank	PCB-042	0.731 NJ	**0.991 J**	**0.875 J**
Lab Blank	PCB-043	0.732 UJ	0.644 UJ	0.53 UJ
Lab Blank	PCB-044/047/065	**6.38**	4.56 U	5.54 U
Lab Blank	PCB-045/051	1.52 NJ	**1.05 J**	**1.2 J**

Sample Type	Analyte	#1 WG54716-101	#2 WG54716-104	#3 WG54716-105
Lab Blank	PCB-046	0.653 UJ	0.575 UJ	0.5 UJ
Lab Blank	PCB-048	**0.951 J**	4 U	4 U
Lab Blank	PCB-049/069	**2.45 J**	**1.89 J**	4 U
Lab Blank	PCB-050/053	0.549 UJ	**0.588 J**	**0.687 J**
Lab Blank	PCB-052	**5.78**	**4.81**	**6.24**
Lab Blank	PCB-054	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-055	0.646 UJ	0.633 UJ	0.692 UJ
Lab Blank	PCB-056	**0.9 J**	4 U	0.712 UJ
Lab Blank	PCB-057	0.602 UJ	0.591 UJ	0.645 UJ
Lab Blank	PCB-058	0.657 UJ	0.644 UJ	0.703 UJ
Lab Blank	PCB-059/062/075	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-060	0.636 UJ	0.624 UJ	0.681 UJ
Lab Blank	PCB-061/070/074/076	**4.06**	4 U	**3.52 J**
Lab Blank	PCB-063	0.583 UJ	0.572 UJ	0.625 UJ
Lab Blank	PCB-064	1.85 NJ	**1.2 J**	**1.65 J**
Lab Blank	PCB-066	**1.91 J**	**1.33 J**	4 U
Lab Blank	PCB-067	0.527 UJ	0.517 UJ	0.564 UJ
Lab Blank	PCB-068	0.582 UJ	0.571 UJ	0.624 UJ
Lab Blank	PCB-072	0.594 UJ	0.583 UJ	0.637 UJ
Lab Blank	PCB-073	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-077	0.666 UJ	0.678 UJ	0.704 UJ
Lab Blank	PCB-078	0.603 UJ	0.591 UJ	0.646 UJ
Lab Blank	PCB-079	0.505 UJ	0.5 UJ	0.541 UJ
Lab Blank	PCB-080	0.568 UJ	0.557 UJ	0.608 UJ
Lab Blank	PCB-081	0.673 UJ	0.671 UJ	0.721 UJ
Lab Blank	PCB-082	0.622 UJ	0.5 UJ	0.635 UJ
Lab Blank	PCB-083/099	1.69 NJ	**1.03 J**	**1.56 J**
Lab Blank	PCB-084	**1.07 J**	4 U	0.671 UJ
Lab Blank	PCB-085/116/117	0.652 NJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-086/087/097/109/119/125	2.25 NJ	**1.75 J**	**2.04 J**
Lab Blank	PCB-088/091	0.82 NJ	0.5 UJ	0.604 UJ
Lab Blank	PCB-089	0.613 UJ	0.5 UJ	0.626 UJ
Lab Blank	PCB-090/101/113	3.28 NJ	**2.44 J**	**3.08 J**
Lab Blank	PCB-092	0.583 UJ	0.5 UJ	0.595 UJ
Lab Blank	PCB-093/095/098/100/102	**3.82 J**	**3.01 J**	**2.71 J**
Lab Blank	PCB-094	0.643 UJ	0.5 UJ	0.656 UJ
Lab Blank	PCB-096	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-103	0.539 UJ	0.5 UJ	0.55 UJ
Lab Blank	PCB-104	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-105	**1.21 J**	0.733 UJ	4 U
Lab Blank	PCB-106	0.701 UJ	0.596 UJ	0.577 UJ

Sample Type	Analyte	#1 WG54716-101	#2 WG54716-104	#3 WG54716-105
Lab Blank	PCB-107	0.792 UJ	0.673 UJ	0.652 UJ
Lab Blank	PCB-108/124	0.825 UJ	0.701 UJ	0.678 UJ
Lab Blank	PCB-110/115	3.13 NJ	**2.37 J**	**2.83 J**
Lab Blank	PCB-111	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-112	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-114	0.858 UJ	0.742 UJ	0.685 UJ
Lab Blank	PCB-118	**2.45 J**	4 U	**2.02 J**
Lab Blank	PCB-120	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-121	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-122	0.84 UJ	0.713 UJ	0.691 UJ
Lab Blank	PCB-123	0.906 UJ	0.759 UJ	0.759 UJ
Lab Blank	PCB-126	0.959 UJ	0.811 UJ	0.79 UJ
Lab Blank	PCB-127	0.77 UJ	0.654 UJ	0.633 UJ
Lab Blank	PCB-128/166	0.541 UJ	0.582 UJ	0.593 UJ
Lab Blank	PCB-129/138/160/163	**2.02 J**	4 U	**1.94 J**
Lab Blank	PCB-130	0.688 UJ	0.74 UJ	0.754 UJ
Lab Blank	PCB-131	0.679 UJ	0.73 UJ	0.744 UJ
Lab Blank	PCB-132	0.699 UJ	0.752 UJ	0.766 UJ
Lab Blank	PCB-133	0.66 UJ	0.71 UJ	0.723 UJ
Lab Blank	PCB-134/143	0.689 UJ	0.741 UJ	0.755 UJ
Lab Blank	PCB-135/151/154	**1.65 J**	4 U	**1.15 J**
Lab Blank	PCB-136	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-137	0.695 UJ	0.748 UJ	0.762 UJ
Lab Blank	PCB-139/140	0.629 UJ	0.677 UJ	0.689 UJ
Lab Blank	PCB-141	0.588 UJ	0.633 UJ	0.645 UJ
Lab Blank	PCB-142	0.677 UJ	0.728 UJ	0.742 UJ
Lab Blank	PCB-144	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-145	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-146	0.581 UJ	0.625 UJ	0.636 UJ
Lab Blank	PCB-147/149	1.57 NJ	**1.54 J**	**1.35 J**
Lab Blank	PCB-148	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-150	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-152	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-153/168	1.61 NJ	**0.802 J**	**1.47 J**
Lab Blank	PCB-155	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-156/157	0.526 UJ	0.574 UJ	0.556 UJ
Lab Blank	PCB-158	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-159	0.5 UJ	0.5 UJ	0.509 UJ
Lab Blank	PCB-161	0.5 UJ	0.5 UJ	0.503 UJ
Lab Blank	PCB-162	0.5 UJ	0.508 UJ	0.518 UJ

Sample Type	Analyte	#1 WG54716-101	#2 WG54716-104	#3 WG54716-105
Lab Blank	PCB-164	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-165	0.527 UJ	0.567 UJ	0.578 UJ
Lab Blank	PCB-167	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-169	0.5 UJ	0.529 UJ	0.536 UJ
Lab Blank	PCB-170	0.58 UJ	0.517 UJ	0.5 UJ
Lab Blank	PCB-171/173	0.602 UJ	0.535 UJ	0.526 UJ
Lab Blank	PCB-172	0.595 UJ	0.529 UJ	0.519 UJ
Lab Blank	PCB-174	0.539 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-175	0.548 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-176	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-177	0.605 UJ	0.538 UJ	0.528 UJ
Lab Blank	PCB-178	0.578 UJ	0.514 UJ	0.505 UJ
Lab Blank	PCB-179	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-180/193	0.5 UJ	**0.647 J**	**0.657 J**
Lab Blank	PCB-181	0.594 UJ	0.528 UJ	0.519 UJ
Lab Blank	PCB-182	0.538 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-183/185	0.561 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-184	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-186	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-187	0.632 NJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-188	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-189	0.915 UJ	0.806 UJ	0.797 UJ
Lab Blank	PCB-190	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-191	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-192	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-194	0.504 UJ	0.5 UJ	0.505 UJ
Lab Blank	PCB-195	0.531 UJ	0.5 UJ	0.532 UJ
Lab Blank	PCB-196	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-197/200	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-198/199	0.5 UJ	0.5 UJ	**0.517 J**
Lab Blank	PCB-201	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-202	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-203	0.5 UJ	0.5 UJ	**0.544 J**
Lab Blank	PCB-204	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-205	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-206	1.3 UJ	1.16 UJ	1.05 UJ
Lab Blank	PCB-207	0.965 UJ	0.869 UJ	0.795 UJ
Lab Blank	PCB-208	1.04 UJ	0.941 UJ	0.867 UJ
Lab Blank	PCB-209	1.17 NJ	**0.877 J**	**0.797 J**
	Total PCBs	**94.2 J**	**69.9 J**	**66.7 J**

Table A-6. Laboratory PCB Blank Samples Analyzed May 2016 (pg/L).

Sample Type	Analyte	#1 WG54716-101	#2 WG54716-104	#3 WG54716-105
Lab Blank	PCB-001	**2.84 J**	**2.63 J**	**2.66 J**
Lab Blank	PCB-002	**1.91 J**	**1.34 J**	**1.58 J**
Lab Blank	PCB-003	**3.54 J**	**5.15**	**3.51 J**
Lab Blank	PCB-004	2.27 UJ	1.58 UJ	1.77 UJ
Lab Blank	PCB-005	1.59 UJ	1.19 UJ	1.31 UJ
Lab Blank	PCB-006	**1.47 J**	1.09 UJ	**1.48 J**
Lab Blank	PCB-007	**2.16 J**	**24.1**	**3.32 J**
Lab Blank	PCB-008	**5.96**	**5.53**	**5.6**
Lab Blank	PCB-009	1.41 UJ	1.06 UJ	1.17 UJ
Lab Blank	PCB-010	1.38 UJ	1.04 UJ	1.14 UJ
Lab Blank	PCB-011	**16**	**13.6**	**14.4**
Lab Blank	PCB-012/013	1.63 UJ	1.22 UJ	1.35 UJ
Lab Blank	PCB-014	1.52 UJ	1.14 UJ	1.26 UJ
Lab Blank	PCB-015	**2.65 J**	**2.64 J**	**3.01 J**
Lab Blank	PCB-016	**1.92 J**	**1.67 J**	**1.78 J**
Lab Blank	PCB-017	**1.72 J**	**2.09 J**	**2.03 J**
Lab Blank	PCB-018/030	**3.47 J**	**4.19**	**4.04**
Lab Blank	PCB-019	**0.608 J**	**0.716 J**	**0.574 J**
Lab Blank	PCB-020/028	0.5 UJ	**5.56**	**6.13**
Lab Blank	PCB-021/033	**3.15 J**	**3.29 J**	**3.37 J**
Lab Blank	PCB-022	**2.03 J**	**2.03 J**	**2.13 J**
Lab Blank	PCB-023	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-024	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-025	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-026/029	**1.03 J**	**1.56 J**	**1.02 J**
Lab Blank	PCB-027	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-031	**4.44**	**4.48**	**4.73**
Lab Blank	PCB-032	**1.08 J**	**1.26 J**	**1.08 J**
Lab Blank	PCB-034	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-035	**1.58 J**	**0.779 J**	**0.821 J**
Lab Blank	PCB-036	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-037	**0.808 J**	**0.801 J**	**0.962 J**
Lab Blank	PCB-038	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-039	0.5 UJ	0.5 UJ	**0.675 J**
Lab Blank	PCB-040/041/071	**1.55 J**	**1.58 J**	**1.8 J**
Lab Blank	PCB-042	**0.83 J**	**0.594 J**	**0.744 J**
Lab Blank	PCB-043	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-044/047/065	4.22 UJ	**17.1**	**3.6 J**
Lab Blank	PCB-045/051	**1.01 J**	**2.59 J**	**0.916 J**

Sample Type	Analyte	#1 WG54716-101	#2 WG54716-104	#3 WG54716-105
Lab Blank	PCB-046	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-048	**0.961 J**	**0.792 J**	**0.737 J**
Lab Blank	PCB-049/069	**1.5 J**	**1.88 J**	**1.59 J**
Lab Blank	PCB-050/053	**0.653 J**	**0.568 J**	**0.619 J**
Lab Blank	PCB-052	**3.44 J**	4.13 NJ	**3.84 J**
Lab Blank	PCB-054	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-055	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-056	**0.579 J**	0.5 UJ	0.5 UJ
Lab Blank	PCB-057	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-058	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-059/062/075	0.5 UJ	**0.512 J**	0.5 UJ
Lab Blank	PCB-060	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-061/070/074/076	**2.41 J**	**2.52 J**	**3.18 J**
Lab Blank	PCB-063	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-064	**1.08 J**	**1.04 J**	**1.05 J**
Lab Blank	PCB-066	0.5 UJ	**1.14 J**	**1.5 J**
Lab Blank	PCB-067	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-068	0.5 UJ	4.18 NJ	**0.633 J**
Lab Blank	PCB-072	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-073	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-077	0.5 UJ	0.5 UJ	**0.607 J**
Lab Blank	PCB-078	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-079	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-080	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-081	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-082	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-083/099	**1.07 J**	**1.59 J**	**1.36 J**
Lab Blank	PCB-084	**0.742 J**	**0.501 J**	**0.797 J**
Lab Blank	PCB-085/116/117	0.5 UJ	**0.52 J**	**0.568 J**
Lab Blank	PCB-086/087/097/109/119/125	**1.83 J**	**1.82 J**	**2.02 J**
Lab Blank	PCB-088/091	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-089	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-090/101/113	**2.3 J**	**2.03 J**	**2.47 J**
Lab Blank	PCB-092	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-093/095/098/100/102	**1.97 J**	**2.45 J**	**2.13 J**
Lab Blank	PCB-094	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-096	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-103	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-104	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-105	**0.756 J**	**0.572 J**	**0.87 J**

Sample Type	Analyte	#1 WG54716-101	#2 WG54716-104	#3 WG54716-105
Lab Blank	PCB-106	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-107	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-108/124	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-110/115	**1.96 J**	**1.86 J**	**2.19 J**
Lab Blank	PCB-111	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-112	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-114	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-118	**1.41 J**	**1.83 J**	**2.14 J**
Lab Blank	PCB-120	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-121	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-122	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-123	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-126	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-127	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-128/166	0.5 UJ	0.5 UJ	**0.526 J**
Lab Blank	PCB-129/138/160/163	**1.63 J**	**1.93 J**	**2.4 J**
Lab Blank	PCB-130	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-131	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-132	**0.906 J**	**0.687 J**	0.5 UJ
Lab Blank	PCB-133	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-134/143	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-135/151/154	**0.731 J**	**0.71 J**	**0.643 J**
Lab Blank	PCB-136	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-137	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-139/140	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-141	0.5 UJ	**0.572 J**	**0.636 J**
Lab Blank	PCB-142	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-144	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-145	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-146	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-147/149	**1.32 J**	**1.67 J**	**1.95 J**
Lab Blank	PCB-148	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-150	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-152	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-153/168	**1.68 J**	**1.94 J**	**2.13 J**
Lab Blank	PCB-155	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-156/157	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-158	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-159	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-161	0.5 UJ	0.5 UJ	0.5 UJ

Sample Type	Analyte	#1 WG54716-101	#2 WG54716-104	#3 WG54716-105
Lab Blank	PCB-162	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-164	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-165	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-167	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-169	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-170	0.5 UJ	0.5UJ	**0.803 J**
Lab Blank	PCB-171/173	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-172	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-174	0.5 UJ	0.5 UJ	**0.589 J**
Lab Blank	PCB-175	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-176	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-177	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-178	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-179	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-180/193	**1.24 J**	**1.05 J**	**2.64 J**
Lab Blank	PCB-181	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-182	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-183/185	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-184	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-186	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-187	0.5 UJ	**0.547 J**	**1.1 J**
Lab Blank	PCB-188	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-189	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-190	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-191	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-192	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-194	0.5 UJ	0.5 UJ	**0.736 J**
Lab Blank	PCB-195	0.5 UJ	0.5 UJ	**0.522 J**
Lab Blank	PCB-196	0.5 UJ	0.5 UJ	**0.562 J**
Lab Blank	PCB-197/200	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-198/199	**0.646 J**	0.5 UJ	**1.84 J**
Lab Blank	PCB-201	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-202	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-203	0.5 UJ	0.5 UJ	**1.41 J**
Lab Blank	PCB-204	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-205	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-206	**0.58 J**	0.5 UJ	**1.27 J**
Lab Blank	PCB-207	0.5 UJ	0.5 UJ	0.5 UJ
Lab Blank	PCB-208	0.5 UJ	**2.07 J**	**0.586 J**
Lab Blank	PCB-209	**0.966 J**	**1.07 J**	**1.12 J**
	Total PCBs	**94.1 J**	**139 J**	**122 J**

Table A-7. Laboratory PCB Spiked Blank Samples Analyzed February 2016 (% Recovery).

Sample Type	QC Type	Analyte	#1 WG54352-101	#2 WG54352-104	#3 WG54352-105
Lab Blank	Labeled Spike	PCB-001L	44.4	40.3	40
Lab Blank	Labeled Spike	PCB-003L	49.6	48.9	46.1
Lab Blank	Labeled Spike	PCB-004L	51.2	48.8	47.2
Lab Blank	Labeled Spike	PCB-015L	60.3	64.3	60.4
Lab Blank	Labeled Spike	PCB-019L	49.5	49.8	47.8
Lab Blank	Labeled Spike	PCB-028L	80.5	89.8	84.4
Lab Blank	Labeled Spike	PCB-037L	75.3	82.2	78
Lab Blank	Labeled Spike	PCB-054L	62.3	65.6	61.7
Lab Blank	Labeled Spike	PCB-077L	78.2	82.2	80.6
Lab Blank	Labeled Spike	PCB-081L	76.7	81.3	78.3
Lab Blank	Labeled Spike	PCB-104L	57.9	60.2	56.7
Lab Blank	Labeled Spike	PCB-105L	80	85.9	83.7
Lab Blank	Labeled Spike	PCB-111L	74.2	79.3	75.3
Lab Blank	Labeled Spike	PCB-114L	73.9	77.3	72.5
Lab Blank	Labeled Spike	PCB-118L	76.3	78.1	74
Lab Blank	Labeled Spike	PCB-123L	76.8	77.8	72.6
Lab Blank	Labeled Spike	PCB-126L	71.3	75.4	58.8
Lab Blank	Labeled Spike	PCB-155L	58.9	63.7	76.9
Lab Blank	Labeled Spike	PCB-156L/157L	58.7	59.2	70.3
Lab Blank	Labeled Spike	PCB-167L	57.9	57.6	70.7
Lab Blank	Labeled Spike	PCB-169L	52.8	54.6	62.9
Lab Blank	Labeled Spike	PCB-170L	74.8	79.8	71.4
Lab Blank	Labeled Spike	PCB-178L	57.7	60.9	73
Lab Blank	Labeled Spike	PCB-180L	79.2	79.1	71.5
Lab Blank	Labeled Spike	PCB-188L	68.8	82.2	62
Lab Blank	Labeled Spike	PCB-189L	77	84.6	68.9
Lab Blank	Labeled Spike	PCB-202L	57	58.7	60.7
Lab Blank	Labeled Spike	PCB-205L	78.9	80.1	76.6
Lab Blank	Labeled Spike	PCB-206L	63.5	62.8	61.7
Lab Blank	Labeled Spike	PCB-208L	64	69.4	64.8
Lab Blank	Labeled Spike	PCB-209L	55.6	61.4	59.4

Table A-8. Laboratory PCB Spiked Blank Samples Analyzed March 2016 (% Recovery).

Sample Type	QC Type	Analyte	#1 WG54716-101	#2 WG54716-104	#3 WG54716-105
Lab Blank	Labeled Spike	PCB-001L	31.5	48.2	50
Lab Blank	Labeled Spike	PCB-003L	37.6	52.5	51.8
Lab Blank	Labeled Spike	PCB-004L	44.1	58.1	55.4
Lab Blank	Labeled Spike	PCB-015L	59.1	71.1	66.7
Lab Blank	Labeled Spike	PCB-019L	59	70	63.2
Lab Blank	Labeled Spike	PCB-028L	67.9	77.8	75.4
Lab Blank	Labeled Spike	PCB-037L	72.6	77.8	75.7
Lab Blank	Labeled Spike	PCB-054L	61.2	69.6	61.6
Lab Blank	Labeled Spike	PCB-077L	91.3	92.4	93.5
Lab Blank	Labeled Spike	PCB-081L	89.5	92.1	90.7
Lab Blank	Labeled Spike	PCB-104L	65.5	70.7	61.8
Lab Blank	Labeled Spike	PCB-105L	86.3	87.3	89.9
Lab Blank	Labeled Spike	PCB-111L	78	81.3	81.8
Lab Blank	Labeled Spike	PCB-114L	82	83.5	84.9
Lab Blank	Labeled Spike	PCB-118L	83.1	85.4	84.1
Lab Blank	Labeled Spike	PCB-123L	83.7	85	82.3
Lab Blank	Labeled Spike	PCB-126L	86.8	88.6	86.1
Lab Blank	Labeled Spike	PCB-155L	68.4	71.3	62.3
Lab Blank	Labeled Spike	PCB-156L/157L	80.2	81	80.6
Lab Blank	Labeled Spike	PCB-167L	80	82	80.4
Lab Blank	Labeled Spike	PCB-169L	80.4	82.9	81.5
Lab Blank	Labeled Spike	PCB-170L	81.8	82.5	83.9
Lab Blank	Labeled Spike	PCB-178L	83.3	85.3	87
Lab Blank	Labeled Spike	PCB-180L	82.3	83.2	85
Lab Blank	Labeled Spike	PCB-188L	59.8	61.5	58.5
Lab Blank	Labeled Spike	PCB-189L	80.5	81.8	81.9
Lab Blank	Labeled Spike	PCB-202L	62.7	64.3	64
Lab Blank	Labeled Spike	PCB-205L	77.7	78.4	79.2
Lab Blank	Labeled Spike	PCB-206L	71	72.2	74.2
Lab Blank	Labeled Spike	PCB-208L	68.6	68.4	70.3
Lab Blank	Labeled Spike	PCB-209L	68.2	69.6	73

Table A-9. Laboratory PCB Spiked Blank Samples Analyzed May 2016 (% Recovery).

Sample Type	QC Type	Analyte	#1 WG54716-101	#2 WG54716-104	#3 WG54716-105
Lab Blank	Labeled Spike	PCB-001L	27.2	44.9	35.3
Lab Blank	Labeled Spike	PCB-003L	31.6	45.9	37.2
Lab Blank	Labeled Spike	PCB-004L	36.2	50	41
Lab Blank	Labeled Spike	PCB-015L	46.7	55	47
Lab Blank	Labeled Spike	PCB-019L	44.9	53.9	44.6
Lab Blank	Labeled Spike	PCB-028L	56.5	63	56.5
Lab Blank	Labeled Spike	PCB-037L	60.2	62	56.7
Lab Blank	Labeled Spike	PCB-054L	52.7	57.8	49.7
Lab Blank	Labeled Spike	PCB-077L	68.5	69.6	63.1
Lab Blank	Labeled Spike	PCB-081L	66.7	68.5	62.2
Lab Blank	Labeled Spike	PCB-104L	67	67.2	58.9
Lab Blank	Labeled Spike	PCB-105L	65.5	65.1	60.9
Lab Blank	Labeled Spike	PCB-111L	74.5	74.1	74.1
Lab Blank	Labeled Spike	PCB-114L	61.1	63	56.5
Lab Blank	Labeled Spike	PCB-118L	62.2	63.3	58
Lab Blank	Labeled Spike	PCB-123L	63.1	63.2	59.2
Lab Blank	Labeled Spike	PCB-126L	75.8	73.7	71.8
Lab Blank	Labeled Spike	PCB-155L	71.8	69.7	62.6
Lab Blank	Labeled Spike	PCB-156L/157L	71.5	65.8	65.1
Lab Blank	Labeled Spike	PCB-167L	66.5	64.1	61.5
Lab Blank	Labeled Spike	PCB-169L	86.9	80	82.7
Lab Blank	Labeled Spike	PCB-170L	74.2	70.4	68.7
Lab Blank	Labeled Spike	PCB-178L	77.7	77.5	75.5
Lab Blank	Labeled Spike	PCB-180L	73.7	68.1	67.5
Lab Blank	Labeled Spike	PCB-188L	73	68.8	63.9
Lab Blank	Labeled Spike	PCB-189L	69.6	70.7	62.8
Lab Blank	Labeled Spike	PCB-202L	73.9	71.4	69.3
Lab Blank	Labeled Spike	PCB-205L	71.5	70.9	64.8
Lab Blank	Labeled Spike	PCB-206L	63.4	65.2	60.3
Lab Blank	Labeled Spike	PCB-208L	68.7	66	61.4
Lab Blank	Labeled Spike	PCB-209L	63.4	63	59.8

Table A-10. Ongoing Precision and Recovery Results for February, March, and May 2016 (% Recovery).

Sample Type	QC Type	Analyte	February WG54352-102	March WG54716-102	May WG54716-102
OPR	Spike	PCB-001	102	93.9	110
OPR	Spike	PCB-003	102	96.3	106
OPR	Spike	PCB-004	106	93.8	108
OPR	Spike	PCB-015	99.9	101	106
OPR	Spike	PCB-019	101	97.1	100
OPR	Spike	PCB-037	95.7	103	105
OPR	Spike	PCB-054	107	97.7	96.7
OPR	Spike	PCB-077	102	104	103
OPR	Spike	PCB-081	96.5	105	101
OPR	Spike	PCB-104	103	95.2	95.7
OPR	Spike	PCB-105	98.8	103	103
OPR	Spike	PCB-114	96.9	102	106
OPR	Spike	PCB-118	97.7	103	101
OPR	Spike	PCB-123	96.2	103	103
OPR	Spike	PCB-126	106	105	103
OPR	Spike	PCB-155	106	97.5	95.7
OPR	Spike	PCB-156/157	102	99.2	105
OPR	Spike	PCB-167	102	98.7	102
OPR	Spike	PCB-169	102	98.6	97.5
OPR	Spike	PCB-188	109	98.3	98.8
OPR	Spike	PCB-189	92.5	109	109
OPR	Spike	PCB-202	102	97.5	102
OPR	Spike	PCB-205	99.1	99.1	100
OPR	Spike	PCB-206	99.6	101	102
OPR	Spike	PCB-208	103	99.7	98.1
OPR	Spike	PCB-209	97.6	95.3	97.8

Table A-11. Ongoing Precision and Recovery Results for February, March, and May 2016 (% Recovery).

Sample Type	QC Type	Analyte	February WG54352-102	March WG54716-102	May WG54716-102
OPR	Labeled Spike	PCB-001L	49.7	41	36.6
OPR	Labeled Spike	PCB-003L	51.3	46.9	40.7
OPR	Labeled Spike	PCB-004L	54.3	50.9	44.6
OPR	Labeled Spike	PCB-015L	62.1	65.5	53.9
OPR	Labeled Spike	PCB-019L	53.7	61.3	51.1
OPR	Labeled Spike	PCB-028L	82.3	78.3	62.3
OPR	Labeled Spike	PCB-037L	75.7	80.1	64.8
OPR	Labeled Spike	PCB-054L	65.1	68.1	57.7
OPR	Labeled Spike	PCB-077L	76.5	94.6	77.4
OPR	Labeled Spike	PCB-081L	77.2	92.4	75.7
OPR	Labeled Spike	PCB-104L	59.4	69.1	68
OPR	Labeled Spike	PCB-105L	82.5	92.5	73.1
OPR	Labeled Spike	PCB-111L	71.1	79.9	81
OPR	Labeled Spike	PCB-114L	72.7	88.3	69.5
OPR	Labeled Spike	PCB-118L	72.5	89.9	70.1
OPR	Labeled Spike	PCB-123L	73	89.1	71.8
OPR	Labeled Spike	PCB-126L	57.1	90.7	84.3
OPR	Labeled Spike	PCB-155L	80.7	70.7	69.8
OPR	Labeled Spike	PCB-156L/157L	71	80.5	74.3
OPR	Labeled Spike	PCB-167L	68.2	82.1	73.1
OPR	Labeled Spike	PCB-169L	64.3	78.6	87.2
OPR	Labeled Spike	PCB-178L	67.4	82.6	81
OPR	Labeled Spike	PCB-188L	68.2	66.2	69.7
OPR	Labeled Spike	PCB-189L	74.1	88.6	78.9
OPR	Labeled Spike	PCB-202L	57.9	66.6	75
OPR	Labeled Spike	PCB-205L	78.4	82.1	76.1
OPR	Labeled Spike	PCB-206L	64.1	71.8	72
OPR	Labeled Spike	PCB-208L	66.8	73.4	73.7
OPR	Labeled Spike	PCB-209L	62.7	66.3	73.3

Table A-12. Dieldrin QC Results for Laboratory Blanks and On-going Precision and Recovery Samples.

Laboratory Sample ID	Sample Type	QC Type	Sample Date	Analyte	Result (pg/L) [1]	Percent Recovery
WG54245-101i	Blank	Lab Blank	2/9/2016	Dieldrin	22.7 NJ	-
WG54245-101i	Blank	Spiked Blank	2/9/2016	13C-Dieldrin	-	86.2
WG54245-102i	Blank	OPR[2]	2/9/2016	Dieldrin	-	97
WG54245-102i	Blank	OPR	2/9/2016	13C-Dieldrin	-	83.3
WG54733-101	Blank	Lab Blank	3/22/2016	Dieldrin	21.4 NJ	-
WG54733-101	Blank	Spiked Blank	3/22/2016	13C-Dieldrin	-	91.2
WG54733-102	Blank	OPR	3/22/2016	Dieldrin	-	95.8
WG54733-102	Blank	OPR	3/22/2016	13C-Dieldrin	-	90
WG55181-101	Blank	Lab Blank	5/3/2016	Dieldrin	5.37 UJ	-
WG55181-101	Blank	Spiked Blank	5/3/2016	13C-Dieldrin	-	80.9
WG55181-102	Blank	OPR	5/3/2016	Dieldrin	-	99.7
WG55181-102	Blank	OPR	5/3/2016	13C-Dieldrin	-	80.4

1 = Picograms per liter, parts per quadrillion.

Appendix B. Sample Logs for PCBs, Dieldrin, and TSS

Table B-1. Composite Sample Logs for PCBs, Dieldrin, and TSS.

Sample Location	Subsample Number	Sample Date	Sample Time	Subsample[1] Volume (mLs)
Influent	1	2/9/2016	0014	125
	2		0315	
	3		0610	
	4		0910	
	5		1210	
	6		1510	
	7		1800	
	8		2110	
Effluent	1	2/9/2016	0025	125
	2		0325	
	3		0620	
	4		0940	
	5		1220	
	6		1525	
	7		1810	
	8		2125	
Influent	1	3/22/2016	0011	125
	2		0305	
	3		0616	
	4		0907	
	5		1156	
	6		1507	
	7		1751	
	8		2109	
Effluent	1	3/22/2016	0030	125
	2		0315	
	3		0631	
	4		0915	
	5		1207	
	6		1520	
	7		1805	
	8		2120	
Influent	1	5/3/2016	0005	125
	2		0309	
	3		0602	
	4		0900	

Sample Location	Subsample Number	Sample Date	Sample Time	Subsample[1] Volume (mLs)
	5		1201	
	6		1503	
	7		1805	
	8		2100	
Effluent	1	5/3/2016	0015	125
	2		0319	
	3		0612	
	4		0912	
	5		1212	
	6		1515	
	7		1816	
	8		2110	

1 = PCB, dieldrin, and TSS samples were a composite of eight 125 mL subsamples collected over 24 hours.

Appendix C. Glossary, Acronyms, and Abbreviations

Glossary

Clean Water Act: A federal act passed in 1972 that contains provisions to restore and maintain the quality of the nation's waters. Section 303(d) of the Clean Water Act establishes the TMDL program.

Effluent: An outflowing of water from a natural body of water or from a man-made structure. For example, the treated outflow from a wastewater treatment plant.

National Pollutant Discharge Elimination System (NPDES): National program for issuing, modifying, revoking and reissuing, terminating, monitoring, and enforcing permits, and imposing and enforcing pretreatment requirements under the Clean Water Act. The NPDES program regulates discharges from wastewater treatment plants, large factories, and other facilities that use, process, and discharge water back into lakes, streams, rivers, bays, and oceans.

Nonpoint source: Pollution that enters any waters of the state from any dispersed land-based or water-based activities, including but not limited to atmospheric deposition, surface-water runoff from agricultural lands, urban areas, or forest lands, subsurface or underground sources, or discharges from boats or marine vessels not otherwise regulated under the NPDES program. Generally, any unconfined and diffuse source of contamination. Legally, any source of water pollution that does not meet the legal definition of "point source" in section 502(14) of the Clean Water Act.

Parameter: Water quality constituent being measured (analyte). A physical, chemical, or biological property whose values determine environmental characteristics or behavior.

pH: A measure of the acidity or alkalinity of water. A low pH value (0 to 7) indicates that an acidic condition is present, while a high pH (7 to 14) indicates a basic or alkaline condition. A pH of 7 is considered to be neutral. Since the pH scale is logarithmic, a water sample with a pH of 8 is ten times more basic than one with a pH of 7.

Point source: Sources of pollution that discharge at a specific location from pipes, outfalls, and conveyance channels to a surface water. Examples of point source discharges include municipal wastewater treatment plants, municipal stormwater systems, industrial waste treatment facilities, and construction sites where more than 5 acres of land have been cleared.

Pollution: Contamination or other alteration of the physical, chemical, or biological properties of any waters of the state. This includes change in temperature, taste, color, turbidity, or odor of the waters. It also includes discharge of any liquid, gaseous, solid, radioactive, or other substance into any waters of the state. This definition assumes that these changes will, or are likely to, create a nuisance or render such waters harmful, detrimental, or injurious to (1) public health, safety, or welfare, or (2) domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses, or (3) livestock, wild animals, birds, fish, or other aquatic life.

Stormwater: The portion of precipitation that does not naturally percolate into the ground or evaporate but instead runs off roads, pavement, and roofs during rainfall or snow melt. Stormwater can also come from hard or saturated grass surfaces such as lawns, pastures, playfields, and from gravel roads and parking lots.

Surface waters of the state: Lakes, rivers, ponds, streams, inland waters, salt waters, wetlands and all other surface waters and water courses within the jurisdiction of Washington State.

Total Maximum Daily Load (TMDL): Water cleanup plan. A distribution of a substance in a waterbody designed to protect it from not meeting (exceeding) water quality standards. A TMDL is equal to the sum of all of the following: (1) individual wasteload allocations for point sources, (2) the load allocations for nonpoint sources, (3) the contribution of natural sources, and (4) a Margin of Safety to allow for uncertainty in the wasteload determination. A reserve for future growth is also generally provided.

Watershed: A drainage area or basin in which all land and water areas drain or flow toward a central collector such as a stream, river, or lake at a lower elevation.

303(d) list: Section 303(d) of the federal Clean Water Act requires Washington State to periodically prepare a list of all surface waters in the state for which beneficial uses of the water – such as for drinking, recreation, aquatic habitat, and industrial use – are impaired by pollutants. These are water quality-limited estuaries, lakes, and streams that fall short of state surface water quality standards and are not expected to improve within the next two years.

Acronyms and Abbreviations

BMP	Best management practice
BOD	Biochemical oxygen demand
Ecology	Washington State Department of Ecology
EIM	Environmental Information Management database
EPA	U.S. Environmental Protection Agency
HHC	Human health criteria
MEL	Manchester Environmental Laboratory
NPDES	(See Glossary above)
NTR	National Toxics Rule (human health criteria)
OPR	Ongoing precision and recovery
PBT	Persistent, bioaccumulative, and toxic substance
QA	Quality Assurance
QC	Quality Control
RPD	Relative percent difference
SOP	Standard operating procedure
TMDL	(See Glossary above)
TSS	Total suspended solids
USGS	U.S. Geological Survey
WAC	Washington Administrative Code
WLA	Wasteload allocation

WRIA	Water Resource Inventory Area
WWTP	Wastewater treatment plant

Units of Measurement

°C	degrees centigrade
dw	dry weight
ft	feet
g	gram, a unit of mass
g/day	grams per day
kg	kilograms, a unit of mass equal to 1,000 grams
km	kilometer, a unit of length equal to 1,000 meters
m	meter
mg	milligram
mgd	million gallons per day
mg/L	milligrams per liter (parts per million)
mL	milliliters
mm	millimeters
ng/Kg	nanograms per kilogram (parts per trillion)
ng/L	nanograms per liter (parts per trillion)
pg/L	picograms per liter (parts per quadrillion)
s.u.	standard units
ug/Kg	micrograms per kilogram (parts per billion)
ug/L	micrograms per liter (parts per billion)