DEPARTMENT OF ECOLOGY State of Washington

Submittals WQWebSubmittal

Annual Report

Question Number	Permit Section	Questions
1	S5.A.3	Attach updated annual Stormwater Management Program Plan (SWMP Plan). (S5.A.3) **Saved Document Name: SWMPReport_2015_1_02032016122912**
2	S9.D.5	Attach a map and copy of any annexations, incorporations or boundary changes resulting in an increase or decrease in the Permittee's geographic area of permit coverage during the reporting period per S9.D.5. **Not Applicable**
3	S5.A.4.a.ii	Tracked the estimated costs of implementation of each component of the SWMP. (S5.A.4.a.ii) **Yes**
4	S5.A.5.b	Coordinated among departments within the jurisdiction to eliminate barriers to permit compliance. (S5.A.5.b) **Yes**
4b	S5.A.5.b	Attach a written description of internal coordination mechanisms. (Required to be submitted no later than March 31, 2016, S5.A.5.b) **Saved Document Name: SWMPReport_2015_4b_02032016122912**
5	S5.B.1.a and b	Attach description of public education and outreach programs and stewardship activities conducted per S5.B.1.a and b. **Saved Document Name: SWMPReport_2015_5_02032016122949**
6	S5.B.2.a	Describe the opportunities created for the public to participate in the decision making processes involving the development, implementation and updates of the Permittee's SWMP. (S5.B.2.a) **Saved Document Name: SWMPReport_2015_6_02032016122950**
7	S5.B.2.b	Posted the updated SWMP Plan and latest annual report on your website no later than May 31. (S5.B.2.b) **Yes**
7b	S5.B.2.b	List the website address. **https://my.spokanecity.org/publicworks/stormwater/**
8	S5.B.3.a	Maintained a map of the MS4 that includes the requirements listed in S5.B.3.a. **Yes**
9	S5.B.3.b.vi	Implemented a compliance strategy, including informal compliance actions as well as enforcement provisions of the regulatory mechanism described in S5.B.3.b. (S5.B.3.b.vi) **Yes**

10	S5.B.3.b.vii	Updated, if necessary, the regulatory mechanism to effectively prohibit illicit discharges into the MS4 per S5.B.3.b.vii. (Required, if applicable, no later than February 2, 2019) **Not Applicable**
11	S5.B.3.c	Implemented procedures for conducting illicit discharge investigations in accordance with S5.B.3.c. **Yes**
12	S5.B.3.c.iii	Percentage of MS4 coverage area screened in reporting year per S5.C.3.c.i. (Required to screen 40% of MS4 no later than December 31, 2018 and 12% on average each year thereafter, S5.B.3.c.iii) **62**
13	S5.B.3.c.iv	Publicized a hotline telephone number for public reporting of spills and other illicit discharges. (S5.B.3.c.iv) **Yes**
13b	S5.B.3.c.iv	List the hotline number. **509-625-7999**
14	S5.B.3.c.v	Implemented an ongoing illicit discharge training program for all municipal field staff per S5.B.3.c.v. **Yes**
15	S5.B.3.c.vi	Informed public employees, businesses, and the general public of hazards associated with illicit discharges and improper disposal of waste. (S5.B.3.c.vi) **Yes**
15b	S5.B.3.c.vi	Describe actions. **See attachment SWMP section 2.3**
16	S5.B.3.d	Number of illicit discharges, including illicit connections, eliminated during the reporting period. (S5.B.3.d) **7**
17	S5.B.3.d.iv	Attach a summary of actions taken to characterize, trace and eliminate each illicit discharge found by or reported to the permittee. For each illicit discharge, include a description of actions according to required timelines per S5.B.3.d.iv. **Saved Document Name: SWMPReport_2015_17_02032016123024**
18	S5.B.3.e	Implemented an ongoing illicit discharge training program for all staff responsible for implementing the procedures and program, as described in S5.B.3.e. **Yes**
19	S5.B.4.a	Implemented an ordinance or other regulatory mechanism and enforcement procedures for construction site stormwater runoff control as described in S5.B.4.a. **Yes**
20	S5.B.4.b	Reviewed Stormwater Site Plans, including construction SWPPPs for all new development and redevelopment projects. S5.B.4.b.

			Yes
20b	S5.B.4.b	Number of site plans reviewed during the reporting period.	**132**
21	S5.B.4.c	Implemented procedures for site inspection and enforcement of construction stormwater pollution control measures. (S5.B.4.c)	**Yes**
21b	S5.B.4.c.iii	Number of permitted construction sites inspected during the reporting period, (S5.B.4.c.iii)	**387**
22	S5.B.4.c	Number of enforcement actions taken during the reporting period based on construction phase inspections at new development and redevelopment projects. (S5.B.4.c)	**0**
23	S5.B.4.b.ii and S5.B	Trained the staff involved in permitting, plan review, field inspections and enforcement for construction site runoff control. (S5.B.4.b.ii and S5.B.4.c.ii)	**Yes**
24	S5.B.4.d	Provided information to construction site operators and design professionals about training available on how to comply with the requirements in Appendix 1 and the BMPs in the SWMMEW, or an equivalent document. (S5.B.4.d)	**Yes**
24b	S5.B.4.d	Cite website address, if located on your website.	**www.spokanecity.org**
25	S5.B.4.e	The number of construction sites that provided their intent to apply for the “Erosivity Waiver” as described in (S5.B.4.e).	**Not Applicable**
26	S5.B.4.e	The number of complaints investigated about sites that have received an “Erosivity Waiver” and describe any enforcement actions taken as a result. (S5.B.4.e)	**Not Applicable**
27	S5.B.5.a.	Implemented ordinance or other regulatory mechanism and enforcement procedures as described in S5.B.5.a.	**Yes**
31	S5.B.5.b	Implemented procedures for post-construction site plan review. (S5.B.5.b)	**Yes**
32	S5.B.5.c.ii	Inspected post-construction stormwater controls, including structural BMPs, during installation at new development and redevelopment projects. (S5.B.5.c.ii)	**Yes**
32b	S5.B.5.c.ii	Number of sites inspected during the reporting period. (S5.B.5.c.ii)	**836**

33	S5.B.5.c	Number of enforcement actions taken during the reporting period? (S5.B.5.c) **0**
34	S5.B.5.c.iii	Inspected structural BMPs at least once every five years after final installation. (S5.B.5.c.iii) **Yes**
34b	S5.B.5.c.iii	Number of BMPs inspected during the reporting period. (S5.B.5.c.iii) **836**
35	S5.B.5.d	Trained the staff involved in permitting, plan review, inspection and enforcement for post-construction stormwater control. (S5.B.5.d) **Yes**
37	S5.B.6.a	Implemented the schedule of Operation and Maintenance activities for municipal operations. (S5.B.6.a) **Yes**
38	S5.B.6.a.i (f) and (	Have NPDES permit coverage for all applicable Permittee construction projects and industrial facilities. (S5.B.6.a.i (f) and (g)) **Yes**
39	S5.B.6.a.ii (a)	Inspected stormwater treatment and flow control facilities (except catch basins) owned or operated by the Permittee at least once every two years. (S5.B.6.a.ii (a)) **Yes**
39b	S5.B.6.a.ii (a)	Number of facilities inspected during the reporting period. (S5.B.6.a.ii (a)) **11**
41	S5.B.6.a.ii (b)	If used an alternative to standard schedule for catch basin inspections for all or a portion of the MS4, attach description of the method used. (S5.B.6.a.ii(b)) **Not Applicable**
42	S5.B.6.a.ii(c)	Conducted spot checks of stormwater facilities after major storms. (S5.B.6.a.ii (c)) **Yes**
43	S5.B.6.b	Trained the staff with primary construction, operations, or maintenance job functions that are likely to impact stormwater quality. (S5.B.6.b) **Yes**
44	S7.A	Complied with the Total Maximum Daily Load (TMDL)-specific requirements identified in Appendix 2. (S7.A) **Yes**
45	S7.A	For TMDLs listed in Appendix 2: Attach a summary of relevant SWMP and Appendix 2 activities to address the applicable TMDL parameter(s). (S7.A) **Saved Document Name: SWMPReport_2015_45_02032016123236**
46	S8.A	Attach a description of any stormwater monitoring or stormwater-related studies as described in S8.A. **Saved Document Name: SWMPReport_2015_46_02032016123236**

47	S8.B	Participated in the regional group to select, develop and conduct effectiveness studies as described in S8.B. **Yes**
48	G3	Notified Ecology in accordance with G3 of any discharge into or from the Permittees MS4 which could constitute a threat to human health, welfare or the environment. (G3) **No**
49	G3.A	Took appropriate action to correct or minimize the threat to human health, welfare, and/or the environment per G3.A. **No**
50	G20	Notified Ecology of the failure to comply with the permit terms and conditions within 30 days of becoming aware of the non-compliance. (G20) **Not Applicable**
51	G20	Number of non-compliance notifications (G20) provided in reporting year.
51b	G20	If applicable, list permit conditions described in non-compliance notification(s).
52	S4.F.3.d	Attach a summary of the status of implementation of any actions taken pursuant to S4.F.3 and the status of any monitoring, assessment, or evaluation efforts conducted during the reporting period. (S4.F.3.d) **Saved Document Name: PCB_2014-annual-report_52_02032016010624**

Attachments:

View Files Attached to Submission

	DocDescr	DocName	DocExt	DocID	SubID	AppName
View	Submitted Copy of Record for City of Spokane	Copy of Record CityofSpokane Wednesday February 17 2016	.pdf	431883	1528340	wqwebportal
View	Submitted Cover Letter for City of Spokane	Cover Letter CityofSpokane Wednesday February 17 2016	.pdf	431884	1528340	wqwebportal
View	WAR046505_52_02032016010624	PCB_2014-annual-report_52_02032016010624	.pdf	427083	1528340	wqwebportal
View	WAR046505_1_02032016122912	SWMPReport_2015_1_02032016122912	.pdf	427041	1528340	wqwebportal
View	WAR046505_17_02032016123024	SWMPReport_2015_17_02032016123024	.pdf	427045	1528340	wqwebportal
View	WAR046505_45_02032016123236	SWMPReport_2015_45_02032016123236	.pdf	427046	1528340	wqwebportal
View	WAR046505_46_02032016123236	SWMPReport_2015_46_02032016123236	.pdf	427047	1528340	wqwebportal
View	WAR046505_4b_02032016122912	SWMPReport_2015_4b_02032016122912	.pdf	427042	1528340	wqwebportal
View	WAR046505_5_02032016122949	SWMPReport_2015_5_02032016122949	.pdf	427043	1528340	wqwebportal
View	WAR046505_6_02032016122950	SWMPReport_2015_6_02032016122950	.pdf	427044	1528340	wqwebportal

Close

CITY OF SPOKANE STORMWATER MANAGEMENT PROGRAM (SWMP)

2015

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) EASTERN WASHINGTON PHASE II MUNICIPAL STROMWATER PERMIT

Permit No. WAR04-6505

January 1, 2016

Prepared by:
Wastewater Management Department
909 E. Sprague Avenue
Spokane, WA 99202-2127

Permit Cycle(s):
February 16, 2007 - July 31, 2014
August 1, 2014 – July 31, 2019

TABLE OF CONTENTS

TABLES

FIGURES

1.0 INTRODUCTION

The National Pollutant Discharge Elimination System (NPDES) is a federal requirement that regulates stormwater and wastewater dischargers to waters of the State. While it is a federal requirement, the regulatory authority in Washington State has been passed to the Washington State Department of Ecology (Ecology). The NPDES Eastern Washington Phase II Municipal Stormwater Permit (Permit) was first issued to the City of Spokane by Ecology in January of 2007, and went into effect February 16, 2007. The permit covered a five-year cycle that expired on February 15, 2012. A 2012 legislative change directed Ecology to reissue the permit unchanged for the period of September 1, 2012 to July 31, 2014. A second permit cycle was then implemented, and an updated and revised version of the permit became effective for the period of August 1st, 2014 through July 31st, 2019.

The Permit requires that all affected municipalities create and implement a Stormwater Management Program (SWMP) which addresses six required program elements: (1) Public Education and Outreach, (2) Public Involvement and Participation, (3) Illicit Discharge Detection and Elimination, (4) Construction Site Stormwater Runoff Control, (5) Post-Construction Stormwater Management for New and Redevelopment, and (6) Municipal Operations and Maintenance.

The Phase II Permit authorizes municipalities to discharge stormwater runoff from municipal separate storm sewers (MS4s) to surface waters and ground waters of the state. This SWMP is a set of actions and activities adopted by the City of Spokane comprising the six required program elements and any additional actions necessary to meet the requirements of applicable Total Maximum Daily Loads (TMDLs) pursuant to S7, Compliance with Total Maximum Daily Load Requirements, and Appendix 2.

1.1 Purpose

The purpose of this SWMP is to describe the programs, practices and responsibilities adopted by the City of Spokane to manage the MS4. Also, to formalize and highlight the work that the City of Spokane's Wastewater Management (WWM) Department and other departments have accomplished in stormwater management. This SWMP serves as a guide for coordination efforts among WWM and other departments. Coordination efforts are executed by multiple communication methods, including but not limited to meetings, phone calls, and email.

1.2 Relationship to the Stormwater Management Plan (SMP)

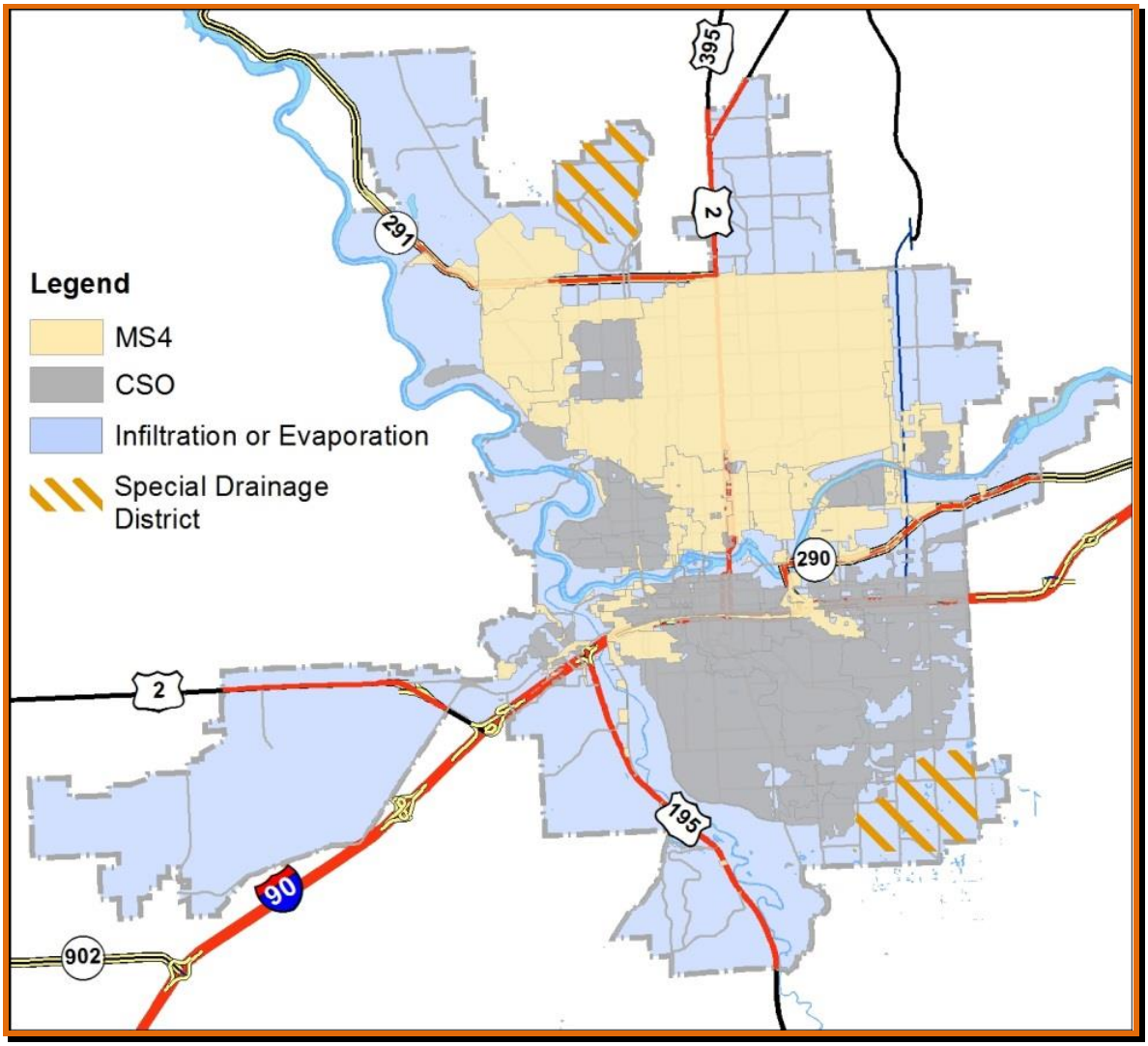
In 2004, the City wrote and adopted its first Stormwater Management Plan (SMP). This plan was written in anticipation of the Permit, which requires this Stormwater Management Program (SWMP). Following the issuance of the first year Permit in 2007, the City of Spokane developed the required SWMP (2008). Further, over the years the City of Spokane developed and implemented many water quality best management practices (BMPs), but there was still a recognized need to establish a *task* driven program in order to guide and coordinate its stormwater management activities, especially between departments. Therefore, we have both an SMP for tasks required by the Permit, as well as the SWMP which outlines the permit requirements and activities achieved to meet compliance. Both documents are written to complement each other.

1.3 Stormwater Infrastructure

The City of Spokane's stormwater infrastructure consists of an MS4, combined sewer overflow (CSO), infiltration including underground injection controls (UIC), and evaporation. Stormwater flows to the CSO system predominantly on the south side of the City, where geology does not readily allow infiltration, and is regulated under

the a separate NPDES Waste Discharge Permit managed by the Riverside Park Water Reclamation Facility (RPWRF). Infiltration is the primary means of stormwater management on the margins of the City and is regulated under UIC rules. Evaporation is used in the Moran Prairie and Five Mile Prairie Special Drainage Districts. The MS4 system, covered by the NPDES Phase II Municipal Stormwater Permit, is located predominantly on the north side of the City. Much of the MS4 serves residential areas, and receives limited runoff from commercial and industrial sites. Less than half of the City is served by the MS4. Figure 1 displays a generalized map of the City of Spokane's stormwater infrastructure.

Figure 1. Map of stormwater infrastructure throughout the City of Spokane.



1.3.1 UIC Program

Underground injection controls (UICs) are structures that discharge stormwater underground rather than to a surface water body. Most UICs in Spokane are drywells. Some drywells are found in streets, and many others are used as overflow structures in grassed swales. The UIC Program is administered separately from the Phase II Municipal Stormwater Permit. However, many of the best management practices found in the Phase II permit

elements may be applied to stormwater discharges to UICs. Therefore, pertinent elements of this SWMP are also applied to UIC areas.

The Phase II permit does not fulfill all of the requirements of the UIC Program. The following elements are required for UICs in addition to the best management practices in this SWMP:

- UIC wells must be registered with the Department of Ecology.
- New UIC wells must be constructed according to the specifications in the UIC Guidance Manual (Ecology, 2006).
- A well assessment must be completed for all existing UICs.
- Existing UICs that are determined to be a high threat to groundwater must be retrofitted.

2.0 PROGRAM COMPONENTS

2.1 Public Education & Outreach

Permit Requirements (S5.B.1)

Implement an education and outreach program for businesses and the general public, including school-age children, regarding:

- The importance of improving water quality and protecting beneficial uses of waters of the state; potential impacts from stormwater discharges; methods for avoiding and minimizing, reducing, and/or eliminating the adverse impacts of stormwater discharges; and actions individuals can take to improve water quality, including encouraging participation in local environmental stewardship activities.
- Preventing illicit discharges, including what constitutes illicit discharges and their impact as well as promoting the proper management and disposal of toxic materials, and including all education and outreach activities pursuant to S5.B.3.d

Develop information for engineers, construction contractors, developers, development review staff, and land use planners about:

- Technical standards, the development of stormwater site plans and erosion control plans, low impact development (LID) and stormwater Best Management Practices (BMPs) for reducing adverse impacts from stormwater runoff from development sites, including all education and outreach activities pursuant to S5.B.4.d and S5.B.5.e.

Track and maintain records of public education and outreach activities.

2.1.1 Stormwater Marketing Campaign Plan

The City of Spokane has been working on a Public Education and Outreach (PEO) program since before the establishment of Permit requirements. To formalize those efforts, however, WWM developed a *Stormwater Marketing Campaign Plan* for public education and involvement activities. The plan helped centralize our objectives, identify target audiences, and assess past and future promotion activities. The central mission of the plan is to inform the identified target audiences about the value in improving water quality by reducing stormwater pollution. To verify comprehension, Stormwater Marketing Campaign Plan activities encourage positive behavioral changes. When able, program achievement is measured and appropriate improvements are made. Our PEO program often

works in concert with permit component Public Involvement and Participation (PIP), and therefore many overlapping themes occur.

To achieve Permit expectations, the Stormwater Marketing Campaign Plan has listed the following objectives:

- *Measure* the community's baseline stormwater knowledge before the second permit cycle (2014-2019), and measure an improvement during the second permit cycle with the implementation of the SMC Plan.
- *Inform* the general public about the importance of improving water quality by avoiding and minimizing adverse storm water discharges.

After extensive survey research and analysis of U.S. Census results, select target audiences were identified that would be receptive of stormwater education and productive with the knowledge. Each target audience has its own set of activities and programs designed to meet their communication channels and there varying levels of involvement. The target audiences are highlighted below:

- *Homeowners:* Owner occupied homes account for 65% of roughly 198,000 homes in Spokane County. Owner occupied homes tend to be better cared for than renter occupied homes because of the personal and financial investment involved. Our focus will be on homeowners with at least a high school diploma, where English is spoken in the home, and where 1-3 vehicles are used. 88.1% of Spokane County residents graduated from high school. 93% have English spoken in the home. 30% own one vehicle but we will especially target the 24% of households with three or more vehicles (Increased likelihood of vehicle pollution).
- *Local Business:*
    - Food and Restaurant: Food waste, grease, cleaning fluids, mop water and trash from restaurant operations often make their way into Spokane water bodies. WWM educates businesses and prevent illicit discharges by encouraging best management practices for recycling oil and grease, cleaning dumpster areas, improving maintenance operations, managing spills, and handling toxic chemicals.
    - Construction: Each year, hundreds of building permits may be granted in Spokane. This presents several opportunities for cement wash, sediment, vehicle fluids, dust and hazardous debris found from construction sites to worsen stormwater discharges. Local water bodies can improve, however, when construction businesses are better educated on how to best store materials, recycle waste, prevent erosion during construction, and clean up the work site. WWM encourages construction BMPs such as preventing soil erosion, sweeping sidewalks, having places for vehicle mud removal, and developing vegetative cover on sites.
    - Automotive: Automotive facilities can greatly reduce unwanted stormwater discharges with covered fuel stations, immediate cleaning of spills, the installation of oil/water separators, and proper containment of stored supplies and wastes.
- *Youth:* In grades 1-8 there are nearly 48,000 children in Spokane County. Comprehension level varies considerably from kindergarten to the 8th grade. To account for this, we have varying levels of complexity in our stormwater education programs. Young students want a hands-on approach that is heavily based in visual learning. With shorter attention spans and increased possibility of distraction, short lessons are useful that are inclusive and easy to understand. Stastics taken from U.S. Census Bureau, 2005-2009 American Community Survey.

2.1.1.1 CURRENT ACTIVITIES

Hazel's Creek Regional Stormwater Facility and LID Demonstration Site: Construction was completed in Fall 2012 to begin receiving stormwater from properties within a specified up-gradient boundary. The site also contains publicly used walking trails. This system was utilized as an LID educational opportunity, hosting various LID demonstrations throughout the trail system. Visitors can download a brochure from the WWM website and take a self-guided tour. http://www.spokanewastewater.org/HazelsCreek.aspx

Integrated Clean Water Plan: The City of Spokane developed the Integrated Clean Water Plan throughout 2013 and 2014 to prioritize stormwater and wastewater projects based on their positive environmental impact to the Spokane River. During development of the plan, the City endeavored to open and maintain communication channels with the public, stakeholders, and regulatory agencies. A communications action plan was developed and implemented, employing various approaches such as in-person presentations, meetings, local media, utility bill inserts, use of internet resources and social media to reach a wide audience. Details of the public outreach effort can be found in the public involvement chapter of the Integrated Clean Water Plan.

Storm Garden Outreach: Storm garden locations were planned in the Shadle Park area to reduce stormwater flows to the Spokane River. The City partnered with the Lands Council, who performed public outreach and education throughout the basin. The Lands Council went door-to-door, visiting nearly 1600 houses in 2013 to find homeowners who would be interested in having a storm garden on or in front of their property. Nearly 95% of respondents liked the idea, indicating that storm gardens would be generally well-accepted in the community. While this outreach was performed in a combined sewer basin, the subject matter is applicable city-wide. Construction of three adjacent storm gardens on Garland Avenue began in Fall 2014 and will be completed with plantings in Spring 2015. The storm gardens will be monitored for water quality and also serve as a public education tool. It is anticipated that additional storm gardens will be constructed in this area in the future as funding allows.

Riverton Basin Stormwater: The City of Spokane partnered with The Lands Council, who performed public outreach and education throughout the Riverton Basin, located within an MS4 system. The goal was to educate residents about stormwater and its effects, raise awareness about LID, and provide residents the opportunity to plant trees at no cost to them. The Lands Council appeared as a guest on the KYRS's environmental "Down to Earth" radio show. They also went door-to-door, visiting nearly 375 residents to find homeowners who would be interested in having a storm garden and free tree.

Student Projects: Several student groups are interested in learning about stormwater and how to reduce its impacts to the environment. The City assisted the following student groups:

WSU Saving the Spokane: The WSU Undergraduate Multidisciplinary Research Competition for the College of Arts and Sciences in 2013/2014 was themed Saving the Spokane. Students were taken on a tour of some of the City's wastewater and stormwater infrastructure and given an opportunity to ask questions during and after the tour. Later in the school year, the students used this information to synthesize a solution to reduce stormwater and competed with other student groups for a scholarship.

Community School: A group of students from the Spokane Community School came to Wastewater Management for a water quality interview for a school project. Students learned about the physical system, various pollutants, and career skills needed for a water quality-related job.

Gonzaga Stormwater Engineering Class: The City has formed a partnership with stormwater engineering professors at Gonzaga University. The City's stormwater permit coordinator was the guest speaker for a

classroom session in 2014, teaching students about the storm sewer system, regulations, and the complexities of stormwater monitoring. Gonzaga professors and students are also partnering with the City on the Sharp Avenue pervious pavement project. Senior level student projects include the design of monitoring systems and monitoring procedures to test the effectiveness of pervious pavement in the Spokane climate and geology. Engineers from the City's Integrated Capital Management Department and Wastewater Management are advisors on the project.

Water on Wheels: Asotin County received a grant from Ecology to develop elementary school environmental education curriculum known as Water on Wheels with the Franklin Conservation District. The City of Spokane and other eastern Washington permittees assisted in development and review of the material in early 2014. The material was delivered to students throughout eastern Washington by conservation district staff, including over 500 students in Spokane.

Cable 5: Cable 5 rotated stormwater pollution prevention tips on the reader board. A different seasonally relevant tip was used each week. An EPA video entitled "After the Storm" was shown throughout the year, highlighting the importance of stormwater management and individual citizen responsibility to help prevent stormwater pollution.

Website: The City overhauled its multiple departmental websites into a singular, user-friendly, mobile-friendly site. Stormwater information was elevated one level on the new website to its own page in the Public Works and Utilities section rather than a sub-section of wastewater. Web users seeking stormwater information are now able to find it more quickly. The beta version of the website was available for public viewing through 2014 at https://beta.spokanecity.org.

On August 1st 2014, the day the new stormwater permit went into effect, the City posted an article on its website, 'Managing stormwater, protecting the Spokane River.' The article described the Phase II permit and the City's efforts to improve water quality in the river.

Public Events: The City of Spokane Wastewater Management staffed stormwater-related booths at the following events. Occasionally booths are shared with Spokane County Water Resources for coordinated educational outreach. Attendees receive various informational materials and promotional products regarding stormwater pollution prevention and low impact development. Games and mason jars filled with "pollution" are used as educational aids.

- Holmes Elementary School Science Night, February 2014
- Earth Day at Riverfront Park, April 2014

Presentations: Various professional and educational groups are interested in learning about the City's stormwater management system and its efforts to prevent and reduce stormwater pollution. Presentations are open to the public to attend. Presentations were given to the following groups or conferences:

- Spokane River Forum
- Air and Waste Management Association, PNWIS Section
- StormCon
- Washington Municipal Stormwater Conference
- Coeur d'Alene Municipal stormwater group
- Spokane River Regional Toxics Task Force

Low Impact Development/Green Infrastructure Educational Materials: A brochure was developed that describes the benefits of LID, recent projects completed by the City of Spokane, and how to find more information. The brochures are placed in each building permit application package obtained at the City Hall Development Services Center. The brochure also includes more detail about different LID practices and shows an example LID design. A page was added to the City's website with a PDF copy of the brochure and additional information such as a video from the Green Solutions Seminar and description of the storm garden partnership with the Lands Council: https://my.spokanecity.org/publicworks/stormwater/green-infrastructure/

Stormwater Permitting Educational Materials: The City of Spokane worked in cooperation with the Spokane River Forum and Spokane Riverkeeper to develop "Understanding Stormwater Permitting in the City of Spokane." This guide addresses stormwater-related building permit requirements, erosion and sediment control, and also references Ecology's stormwater permit requirements. The guide can be found at: http://www.spokaneriver.net/?page_id=7688

2.2 Public Involvement & Participation

Permit Requirements (S5.B.2)

- Provide ongoing opportunities for public involvement through advisory councils, watershed committees, participation in developing rate-structures, stewardship programs, environmental activities or other similar activities. Develop and implement a process for consideration of public comments on the SWMP, including required ordinances and regulatory mechanisms.

- Make the SWMP document and the Annual Report available to the public by posting it on our website.

2.2.1 Stormwater Marketing Campaign Plan

Similar to our Public Outreach program, the City of Spokane has long been active within the community. The Stormwater Marketing Campaign Plan, as outlined in Chapter 2.1, has outlined many activities that reflect our ongoing commitment to involve the public in stormwater-related activities. Again, there exist many overlapping themes between public education & outreach and public involvement & participation.

To achieve Permit expectations, the stormwater marketing campaign has listed the following objectives for Public Involvement and Participation:

- *Encourage and support behavioral changes* in reducing individual's stormwater pollution contributions.
- Measure *objective achievement* in promotion activities and make appropriate improvements.
- Actively seek new ways to *get the public involved* and participating in improving Spokane waterways.

2.2.2 Activities

Manhole Cover Art Contest: The Spokane Arts Commission teamed up again with the City of Spokane Wastewater Management Department to congratulate the 2015 winner of the student-designed manhole cover contest. Seth Tibbs, a student at Chase Middle School, was selected from over 600 entries by members of the staff of Wastewater Management, Spokane Arts Commission, and community representatives. Fifty newly designed manhole covers will be strategically installed throughout Spokane starting in the Spring/Summer of 2016.

The Spokane Arts Commission and the City of Spokane Wastewater Management Department congratulated Clair Mattes, a seventh grader at Shaw Middle School in 2011. Claire was the winner of the student-designed manhole cover contest that has supplied covers used in scheduled maintenance repairs throughout the City of Spokane since summer 2012. Claire's manhole cover design was selected from over 600 entries by members of the staff of Wastewater Management, Spokane Arts Commission, and community representatives.

Pledge Campaign: The pledge campaign was designed to encourage and support behavioral changes after an individual learns about stormwater issues. The pledge campaign has been used at three Summer Parkways events, CCASL Science Fair, Leaf Fall Festival, neighborhood movie night, at various Public Library Displays, and other public events. The quality and wide variation of pledges show that Spokane residents understand stormwater issues and are willing to be a part of the solution.

Ordinances: Public involvement is a required component of the ordinance process. Involvement of any interested member of the public is encouraged through workshops, open houses and a formal public comment period. Ordinances passed as a requirement of the Permit include Spokane Municipal Code (SMC) Sections 17D.060 Stormwater Facilities and 17D.090 Erosion and Sediment Control.

PCB-free Purchasing Ordinance: Polychlorinated biphenyls (PCBs) are a man-made, cardinogenic chemical that has been detected in low concentrations across the globe, including in City stormwater and wastewater. PCBs are entering the sewer systems through a multitude of products as well as legacy contamination. In an effort to reduce the sources of PCBs, the City passed on ordinance requiring City departments to purchase products and packaging that do not contain PCBs unless it is not cost-effective or technically feasible to do so. Cost-effective means that the product does not increase the price by more than 25%.

2.3 Illicit Discharge Detection & Elimination

Permit Requirements (S5.B.3)

- Maintain a storm sewer system map of the MS4, showing the location of all known and new connections to the MS4 authorized or approved by the Permittee; all known outfalls; the names and locations of all waters of the state that receive discharges from those outfalls; and areas served by discharges to ground. Update the map information periodically as needed.
- Implement an ordinance or similar regulatory mechanism that effectively prohibits non-stormwater discharges into the MS4.
- Publicize a hotline for reporting of spills or other illicit discharges. Track illicit discharge reports and actions taken in response to calls.

- Implement an ongoing program to detect and remove illicit connections, discharges, and improper disposal, including any spills not under the purview of another responding authority, into municipal separate storm sewers (MS4s) owned or operated by the Permittee.
- Implement procedures for IDDE program evaluation and assessment, including tracking the number and type of spills or illicit discharges identified, inspections made and any feedback received from public education efforts.
- Provide appropriate training to staff on identification and reporting of illicit discharges.

2.3.1 Introduction

The City of Spokane's *Illicit Discharge Detection and Elimination (IDDE)* program is administered by the Wastewater Management Department. In addition to meeting the requirements established by Ecology, this document describes how the City of Spokane uses local knowledge and available resources in systematically identifying, responding, and removing illicit discharges. We also work to inform both the public and our own municipal employees to take proactive measures in reducing if not avoiding illicit discharges. It is our aim to develop and continually improve our IDDE program in order to benefit and contribute to other community-wide water resources-based programs, such as public education, storm water management, stream restoration, and pollution prevention.

2.3.2 The Basics of Illicit Discharge

Federal regulations (40 CFR 122.26(b) (2)) define *Illicit discharge as "…* any discharge to an MS4 that is not composed entirely of stormwater…" with some exceptions. These exceptions include discharges from NPDES-permitted industrial sources and discharges from fire-fighting activities. Illicit discharges are considered "illicit" because MS4s are not designed to accept, process, or discharge such non-stormwater wastes. Municipalities can deal successfully with illicit non-stormwater discharge through adequate knowledge of the public drainage system in the form of maps, legal prohibition of such discharges, and informing key individuals about their responsibilities to properly dispose of wastes.

In most communities, the municipal separate storm drain systems discharges to receiving waters without treatment. Therefore, it is particularly important that only stormwater is discharged and to ensure that illicit discharges are eliminated from the system. The General Permit requires that an IDDE program be developed by the regulated municipalities. Several excellent IDDE guidance manuals were reviewed and used in developing our own program for the City of Spokane. See reference list.

Table 1. Common Stormwater Pollutants, Sources, and Impacts

Pollutant	Sources	Impacts
Sediment	Construction Sites Winter sand and salt applications Vehicle/boat washing	Destruction of plant and fish habitat Transportation of attached oils, nutrients and other pollutants Increased maintenance costs
Nutrients (phosphorus, nitrogen)	Fertilizers Livestock, bird and pet waste Vehicle/boat washing Decaying grass and leaves Leaking trash containers	Nuisance or toxic algal blooms Hypoxia/anoxia (low levels of dissolved oxygen which can kill aquatic organisms)
Hydrocarbons	Vehicle and equipment leaks Vehicle and equipment emissions Pesticides Fuel spills Equipment cleaning Improper fuel storage and disposal	Toxic at low levels
Pathogens	Livestock, bird and pet waste	Risk to human health leading to closure of swimming areas
Toxic Chemicals (heavy metals, PAHs, pesticides, dioxins, PCBs)	Vehicle wear Spills and leaks Illegal discharges Sediments Pesticide application Deicing and dust control	Toxic at low levels
Debris/Litter	Improper waste disposal and storage Fishing gear Leaking trash containers	Potential risk to human and aquatic life

Source: modified from (CBEP)

2.3.3 Mapping the System (S5.B.3.a)

The first major component of the City's illicit discharge program is mapping the municipal stormwater drainage system. Maintaining an accurate and up-to-date map of the stormwater drainage system enables the City to track and locate the source(s) of suspected illicit discharges. The Permit outlines minimum information that should be included in the City's municipal storm sewer system map:

- Location of all known municipal storm sewer outfalls, receiving waters, and structural BMPs owned, operated, or maintained by the City;
- Tributary conveyances (type, material, size) leading to outfalls that are 24-inches or larger (or have an equivalent cross-sectional area);
- Drainage areas and land use for the drainage basins contributing to outfalls that are 24-inches or larger (or have an equivalent cross-sectional area);
- Locations of new connections to the City's stormwater drainage system; and
- Drainage areas within the City that do not discharge to surface water (aka closed depressions).

The Wastewater Management Department has a completed map of the stormwater MS4. GIS layers are updated periodically to reflect changes to the system and additional information.

A stormwater utility layer is available on the City Map website, maps.spokanecity.org. A Google Earth (KMZ) file containing the stormwater system is also available for download on the WWM website, spokanewastewater.org/gis.aspx.

2.3.5 Ordinance (S5.B.3.b)

On March 8, 2010, with an effective date of April 11, 2010, the City of Spokane adopted Ordinance ORD C34564 Section 17. The full ordinance can be viewed on the City's Municipal Code website, my.spokanecity.org/smc. Section 17D.060.190 addresses illicit discharges in accordance with requirements in the Permit. The ordinance defines allowable discharges to the MS4, unlawful discharges, and enforcement actions.

2.3.6 Illicit Discharge Detection & Elimination Program (S5.B.3.c)

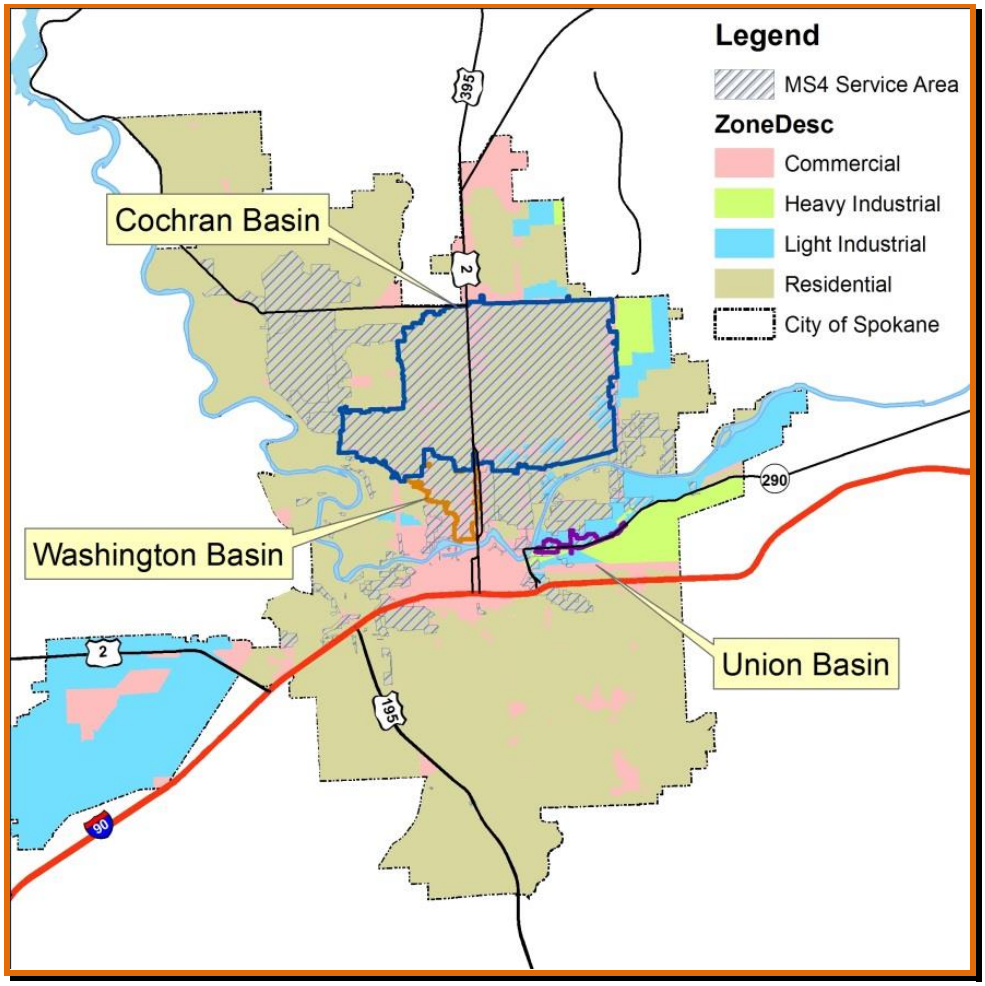
Most illicit discharges are detected when the City of Spokane receives a call on the Stormwater Hotline. Calls may also be received on WWM's primary phone number. The hotline is publicized on storm drain markers throughout the city, on the WWM website, and in brochures. A call to the hotline is routed to one of the WWM Stormwater Inspectors, who inspects and reports the complaint. WWM maintains a protocol for investigating stormwater complaints and keeping records. In addition to the stormwater hotline, Wastewater Management staff continually check for illicit discharges as a part of normal day to day operations. Staff and maintenance crews frequently en route to job sites throughout the City report any noticed illicit discharges to the Stormwater Inspectors. In many cases, the staff and maintenance crews inform the public about proper disposal and appropriate BMPs at the time of seeing the illicit discharge.

2.3.6.1 PRIORITY AREAS

IDDE priority investigation areas have been defined according to the receiving water body, past illicit discharge complaints, land use and known sources of contamination. The Spokane River courses through the City of Spokane, and is the main priority water body. Past illicit discharge complaints do not indicate that any one sub-basin within the MS4 has had substantially more complaints than another. Figure 2 shows a map of zoning and MS4 sub-basins. Industrial zoning areas are assumed to have the greatest potential for storage of large quantities of materials which may potentially produce illicit discharges. Only one stormwater basin within the City is located in a heavy industrial area. The Union Basin is located between I-90 and the Spokane River, east of the Hamilton Street Bridge as shown in Figure 2, and is located in heavy industrial and light industrial zoned areas. Stormwater from the Union Basin has been sampled by the Department of Ecology and detections of polychlorinated biphenyls (PCBs) were present. PCBs are a contaminant of concern in the Spokane River. Therefore, the priority areas of investigation are located in this vicinity.

Two additional areas of investigation were added in late 2012 and 2013. The Cochran stormwater basin is the largest basin in the City, encompassing nearly 5,300 acres of primarily residential area with relatively smaller areas of commercial and light industrial land use. The Cochran basin is considered to have 'typical' stormwater pollutant concentrations for the City of Spokane. The Washington stormwater basin, whose outfall is on the north end of the Washington Street Bridge, is a much smaller stormwater basin (about 450 acres). However, land use is predominantly commercial. PCB samples were collected near the outfall of both basins to compare concentrations of PCBs in various areas and land uses.

Figure 2. Map if zoning and MS4 sub-basins.



2.3.6.2 FIELD INSPECTIONS, CHARACTERIZING AND TRACING ILLICIT DISCHARGES

Wastewater Management incorporated field inspections into routine maintenance. Multiple assets, including outfalls, are inspected during throughout the year. A software database, maintained by Wastewater Management, was recently purchased to provide assistance with documenting field inspections. Wastewater Management continues the process of transferring existing data into this new database software system; while, simultaneously, inputting current data as field inspections are completed. Current inspection percentages of completion will flux as Wastewater Management continuously transfers data into the new database software.

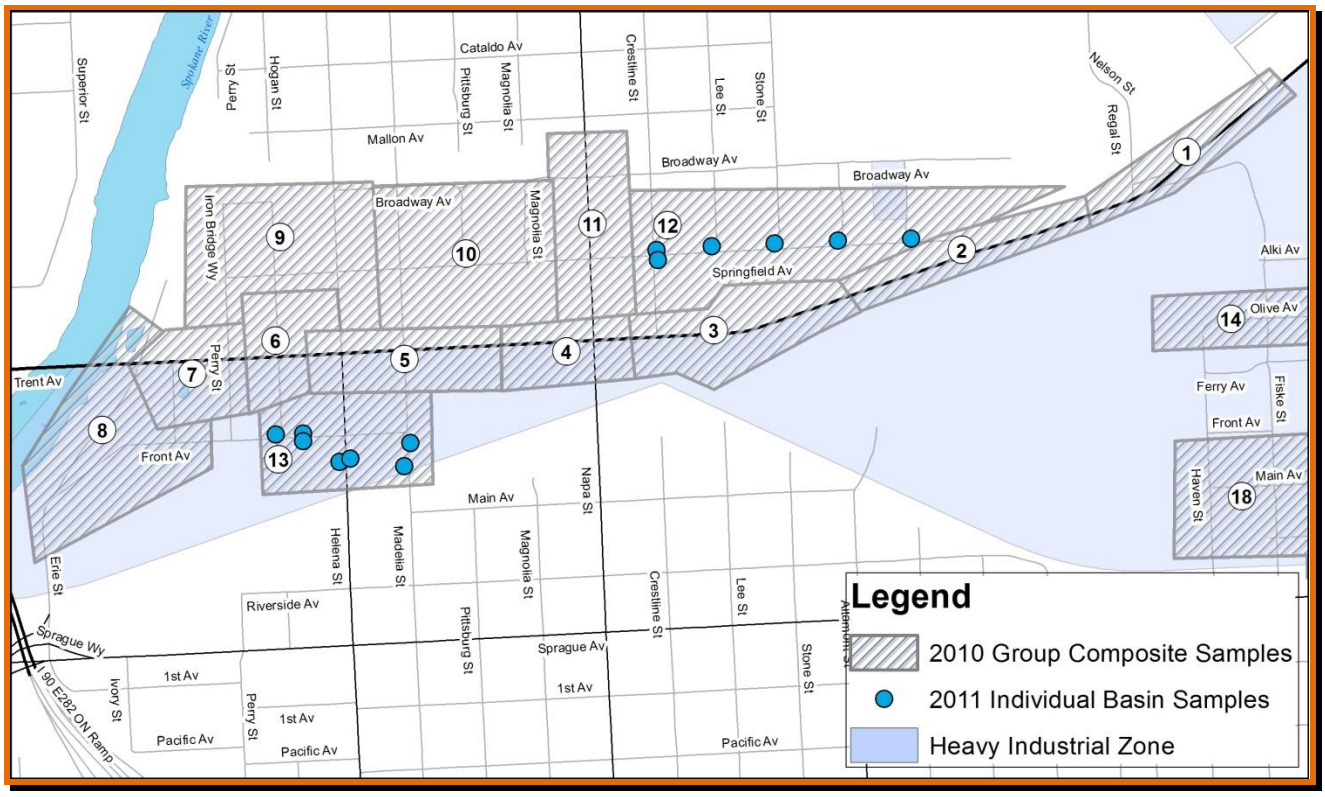
The specific illicit discharge of concern is PCBs, which can be found both in sediment and in stormwater. PCBs can be found within other classifications of illicit discharges, such as motor oil, paint, and suspended solids. Detecting and eliminating sources of PCBs may in turn eliminate other illicit discharge sources. In 2010, 2011, and 2012, catch basins in the Union Basin were sampled for PCBs in sediment. The Union Basin was divided into 13 sample areas. After sampling, remedial maintenance was performed on each catch basin. Sediment was removed using a Vactor truck and disposed at the North Side Landfill after confirmation that PCB concentrations were low enough to dispose sediments at this location. This effort is part of a larger study that also sampled catch basins in CSO and drywell locations.

Remedial maintenance and sampling were first completed in the Union Basin in 2010. The basin was split into 13 priority areas for investigation (Figure 3). Samples from each group were composited and analyzed for Aroclors. No PCBs samples exceeded the MTCA residential cleanup standard of 1 mg/kg for the Aroclor analysis. The Anatek results were sent to the City of Spokane's Solid Waste Management Department to approve disposal at the Northside Landfill facility. All samples were then sent to Pacific Rim Labs for more detailed analysis, including lower detection limits, and analyzed for 209 congeners.

In 2011, re-testing was done on 13 individual catch basins of groups 12 and 13. These basins are located in the groups with highest PCB concentrations. Re-testing individual catch basins assists in tracing sources of PCBs, which will aid in detection and elimination of the illicit discharge.

In 2012, additional catch basin sampling and analysis was performed in the Union Basin to help quantify ongoing PCB sources. Composite samples were collected in Groups 1, 2, 8, 11, and 12. Individual catch basin samples were collected in Groups 3, 4, 5, 6, 10, and 13 where sufficient sediment depth had accumulated. The concentration of PCBs had reduced slightly from the 2010 samples; however, PCBs were still detected in all catch basin samples, indicating an ongoing and diffuse source.

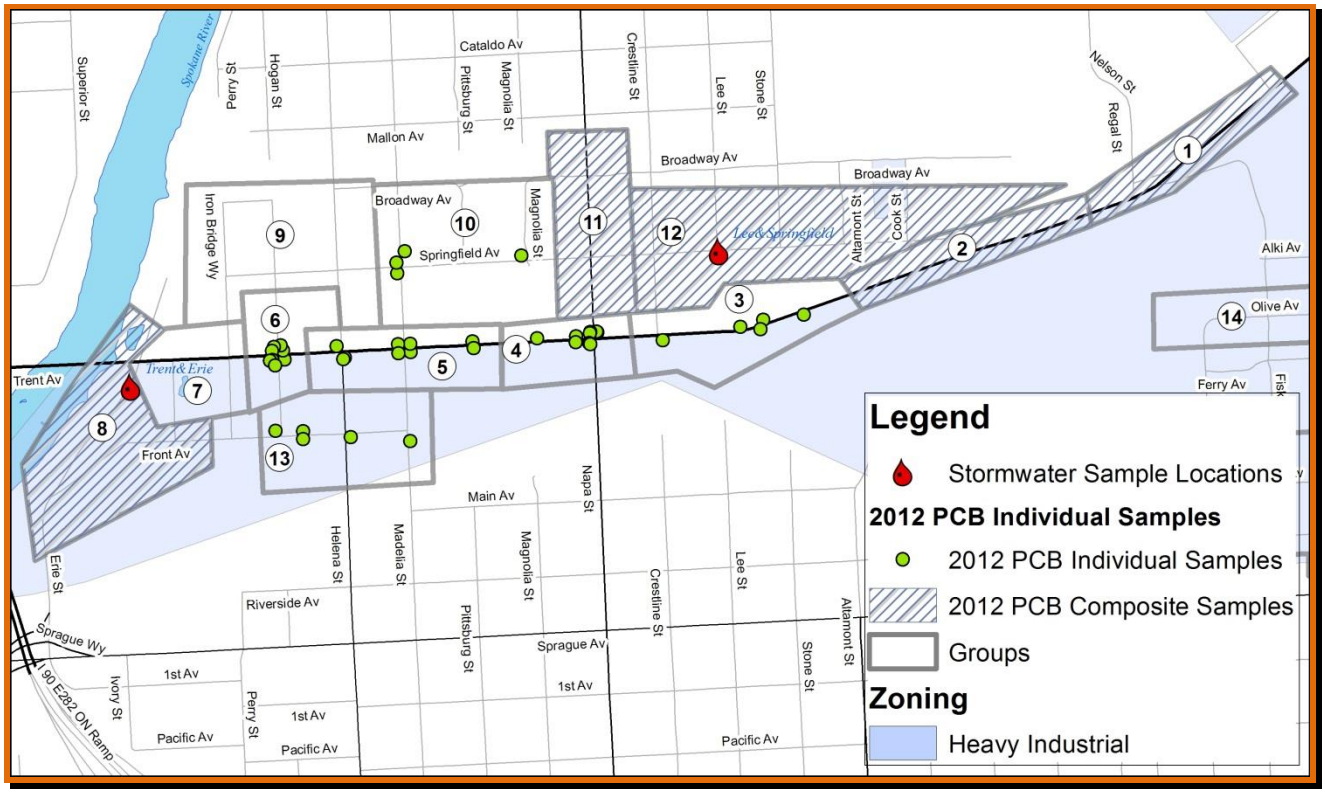
Figure 3. Map if priority area sample location with the Union Basin, 2010 and 2011.



Stormwater monitoring in the Union Basin began in fall 2012. Two samplers were installed as shown in Figure 4. Samples were collected during the 2012-2013 wet season to determine event mean concentration of PCBs in stormwater. Two additional priority areas for stormwater sampling were added in late 2012 and 2013. Samplers were installed near the outfalls of the Cochran and Washington basins. Samples were collected through water year 2014 to determine mean PCB concentrations.

PCB concentrations were the highest in the industrial Union stormwater basin, especially in the upstream sample location located near a PCB cleanup site. PCB concentrations in the commercial Washington stormwater basin were over four times lower than the Union basin. Cochran basin PCB samples were slightly lower than in the Washington basin. Reports that include detailed sampling and analysis information can be downloaded from my.spokanecity.org/publicworks/stormwater/.

Figure 4. Map if priority area sample locations within the Union Basin, 2012.



2.3.6.3 ENDING ILLICIT DISCHARGES

Windshield Investigations and Curb Markers

Windshield investigations were performed in the Union Basin priority investigation areas. Staff from Wastewater Management performed visual inspections of each parcel within the Union Basin groups. Potential for stormwater to run from the property to City right of way was assessed, and any preliminary potential sources of sediment and PCBs were noted. This information was collected to determine potential illicit discharge contributions to catch basins within the priority areas and therefore aid in illicit discharge elimination.

Curb markers were installed on all catch basin inlets in the 2010 and 2011 Basin Groups and the locations recorded during the sediment sampling process. Markers were not placed on sumps located in the middle of the street. After markers were installed in the Union Basin priority area, a larger effort was undertaken throughout the City. Areas with high pedestrian traffic, downtown, and around schools were targeted first. Installation of curb markers is now a part of regular maintenance activities throughout the City.

Spokane River Regional Toxics Task Force

The City of Spokane is actively engaged in a regional effort to address PCBs and dioxins in the Spokane River watershed, called the Spokane River Regional Toxics Task Force (SRRTTF). The Toxics Task Force is currently working to identify the unknown sources of PCBs in the Spokane River and develop a cleanup plan aimed at meeting applicable water quality standards. Background information and current activities can be found on the website, www.srrttf.org. The SRRTTF contracted with an independent community technical advisor to assist in tracking sources of PCBs and developing control methods.

In 2014, the SRRTTF performed a low-flow synoptic sampling survey to assess contributions to the river from groundwater and dry weather wastewater discharges, and to identify unknown sources reaching the river through groundwater. Wet weather sampling is tentatively being planned for 2015-2016 to assess contributions from stormwater, snowmelt, and other wet weather contributions. Future studies include filling the data gaps from other sources such as air and dust particles and understanding the potential complications from fish stocking activities. The knowledge gained from these studies will aid in identification of the greatest sources of PCBs and therefore the most effective control methods.

Local Source Control

Local source control efforts are an effective means of pollution prevention by reaching out to businesses and the general public to make them aware of their environmental impacts and how to mitigate them. In Spokane much of the work is performed by the Urban Waters Initiative, a cooperation between the Department of Ecology and the Spokane Regional Health District. The City worked with the Urban Waters initiative to define a target area for business inspections. Initially, the Union stormwater basin was targeted for a voluntary business inspection and technical assistance visit. After the Union stormwater basin was complete, the team moved onto the Cochran stormwater basin. Because the Cochran basin is so large, the most concentrated commercial areas were given first priority, such as the area along Division street.

EnviroStars Waste Directory

The Spokane River Forum administers the EnviroStars program in Spokane, a small business certification program to provide assistance and incentives for reducing hazardous materials and waste. In 2014, the Spokane EnviroStars Waste Directory website was developed, spokaneriver.net/wastedirectory/. Businesses and households can use this resource to understand their waste and learn how to properly dispose of it.

Union Basin Disconnection Grant

The City of Spokane was awarded a grant from the Department of Ecology in 2013 to reduce or eliminate PCB discharges from the Union basin to the Spokane River. Detailed design of the stormwater system began in 2013 and continued through 2014. The concept is to collect, treat, and infiltrate stormwater runoff in the basin using low impact development techniques such as tree filter boxes and vegetated infiltration swales.

PCB Product Sampling Grant

In late 2013, the City of Spokane was awarded an additional PCB-related grant from the Department of Ecology. This Grant of Regional or Statewide Significance is aimed at defining the true sources of PCBs to stormwater from

products purchased and used by municipalities. Products that may come into contact with stormwater, such as road paint, deicer, and dust suppressants, were sampled and analyzed for PCBs.

Approximately 40 different products were sampled in 2014, and nearly each product contained significant amounts of PCB in comparison to water quality standards. The final report will be uploaded to the City's website, my.spokanecity.org/publicworks/. A PCB page is continually being developed to house this and other PCB reports, and will include public information such as why PCBs are an issue and tips on how to reduce exposure to PCBs.

Products with the highest overall PCB loading, such as hydroseed, motor oil, and magnesium chloride deicer and dust suppressant, are the initial target focus pollution prevention efforts. The City is working with the SRRTTF, WSDOT, Department of Ecology, and other interested parties around the state to further understand PCB sources in these products and identify management practices to reduce them.

2.4 Construction Site Stormwater Runoff Control

Permit Requirements (S5.B.4)

- Implement an ordinance or other regulatory mechanism to require ESCs, and other construction-phase stormwater pollution controls at new development and redevelopment projects. The ordinance shall require construction operators to prepare and adhere to a *Construction Stormwater Pollution Prevention Plan* (Construction SWPPP) and application of BMPs to protect water quality.
- Include a permitting process with *Stormwater Site Plan* review, site inspection and enforcement capability to meet the required standards.
- Implement a procedure for keeping records of inspections and enforcement actions by staff, including inspection reports, warning letters, notices of violations and other enforcement records.
- Provide training for all staff involved in plan review, field inspection, and enforcement to carry out the provisions of this SWMP. Keep training records including dates, course or activity descriptions, names and positions of attended staff.
- Provide information to construction site operators about training available on how to install and maintain effective erosion and sediment controls.

2.4.1 Introduction

Development projects in urban areas generally result in the replacement of open land with impervious surfaces that prevent infiltration. This creates changes in the patterns of stormwater runoff, which can lead to flooding problems at the project site and on properties downstream. Further, this can affect water quality as sediment and pollutants are transported into streams, wetlands, lakes, and groundwater.

The *Spokane Regional Stormwater Manual (SRSM)* was developed in joint cooperation by the Cities of Spokane and Spokane Valley and Spokane County. The manual establishes standards for stormwater design and management to protect water quality, natural drainage systems and down-gradient properties as urban development (and redevelopment) occurs. The Manual meets or exceeds applicable criteria from the Washington State Department of Ecology's *Stormwater Management Manual for Eastern Washington (SWMMEW)*. Portions of the manual relevant to meeting Permit requirements are highlighted in this document.

2.4.2 Current Activities

The SRSM outlines erosion and sediment control (ESC) requirements, which are equivalent to Core Element #2, Construction Stormwater Pollution Prevention, in Appendix 1 of the Permit. An ESC plan is a requirement of the construction permit process and is equivalent to the Permit's Construction Stormwater Pollution Prevention Plan (Construction SWPPP). Controlling erosion and preventing sediment and other pollutants from leaving the project site during the construction phase is achievable through implementation and selection of BMPs that are appropriate both to the site and to the season during which construction occurs.

The SRSM highlights four objectives of the ESC Plan:

- Protect existing or proposed stormwater management infrastructure;
- Minimize the impacts of erosion, sedimentation and increased runoff caused by land-disturbing activities on private property, public roads and rights-of-way, and water bodies;
- Protect the health, safety and welfare of the general public;
- Protect water quality.

An ESC Plan is required for land disturbing activities 5,000 square feet or greater and projects identified as special sites of any size. Special sites are defined in SMC 17D.090.080 and may include sites with greater than 10% slope, highly erosive soils, slope lengths greater than 300 feet, or disturbance of natural vegetative buffer within 50 feet of a wetland or water body. If an ESC Plan is not required, the proponent is still responsible to control erosion and sediment during construction.

2.4.2.1 ORDINANCE (S5.B.4.A.)

The ESC Ordinance, SMC Chapter 17D.090 ESC, was passed in March of 2010. The ordinance references relevant documents such as the SRSM and SWMMEW, required drainage plans and submittals, maintenance and performance standards in compliance with the Permit.

2.4.2.2 PROCEDURES FOR SITE PLAN REVIEW (S5.B.4.B.)

Erosion and sediment control (ESC) plans are reviewed by the Development Services Center to ensure the proposed controls prevent erosion and keep pollutants from leaving the project site during construction. Commercial application submittal requirements can be found on the City's website, https://my.spokanecity.org/business. An ESC Plan is required as one of the minimum site plan elements.

2.4.2.3 SITE INSPECTION AND ENFORCEMENT (S5.B.4.C.)

Inspectors and field engineers from the Development Services Center inspect privately constructed infrastructure. The City of Spokane also has two stormwater inspectors located at the Wastewater Management Department who inspect development sites during construction and when illicit discharge calls are received by the general public. Engineering Services provides construction oversight for public capital improvement projects on City-owned land. The Engineering Services inspectors verify proper installation and maintenance of required erosion and sediment controls for NPDES Construction Stormwater General permitted development sites and capital improvement projects during construction.

Records of inspections and enforcement actions by Wastewater Management staff are maintained concurrently with the Illicit Discharge program. Many of the erosion and sediment control violations, such as track-off of sediments

from the construction site to the street, are considered illicit discharges. These are logged in a database (Complaint Tracker) and on employee time sheets. WWM also maintains records of inspection reports and notices of violations.

Records of inspections and enforcement actions by Engineering Services and the Development Services Center are maintained in daily inspection logs as well as digitally in a program called Accela, which can be found online at https://aca.spokanepermits.org.

2.4.2.4 TRAINING AND INFORMATIONAL MATERIALS (S5.B.4.D.)

Informational materials regarding erosion and sediment control are available to construction site operators, design professionals, and other members of the public in the Development Services Center lobby at City Hall. In addition to highlighting erosion and sediment control requirements, brochures direct the target audience to the SRSM. The SRSM details erosion and sediment control requirements equivalent to Appendix 1 of the NPDES Phase II Municipal Stormwater Permit and BMPs in Department of Ecology's SWMMEW.

2.5 Post-construction Stormwater Management

Permit Requirements (S5.B.5)

- Implement an ordinance that requires post-construction stormwater controls at new development and redevelopment projects.
- Implement procedures for site plan review.
- Implement procedures for site inspection and enforcement of post-construction stormwater control measures.
- Provide training for staff involved in post-construction stormwater management.
- Provide information to design professionals about available training and compliance with BMPs described in the Spokane Regional Stormwater Manual.
- Establish record-keeping methods.

2.5.1 Introduction

This section identifies post-construction stormwater requirements, including adoption of the Stormwater Facilities Ordinance, site plan review, site inspection and enforcement of control measures, training, and record keeping. The SRSM, introduced in section 2.4, is used to implement the post-construction stormwater runoff program. The Manual meets or exceeds applicable criteria from the Washington State Department of Ecology's SWMMEW.

2.5.2 Current Activities

The SRSM outlines the post-construction stormwater program. Chapter 2, Basic Requirements, defines the eight basic requirements for stormwater management for new development and redevelopment projects. Within the City of Spokane, the threshold for requiring compliance with the Basic Requirements is the "addition or replacement of any impervious surfaces."

Basic Requirements include:

No. 1 – Drainage Submittal;
No. 2 – Geotechnical Site Characterization;
No. 3 – Water Quality Treatment;

No. 4 – Flow Control;
No. 5 – Natural and Constructed Conveyance Systems;
No. 6 – Erosion and Sediment Control;
No. 7 – Source Control; and
No. 8 – Operation and Maintenance.

The Stormwater Site Plan referenced in the municipal stormwater permit (S5.B.5.b) is analogous to the Drainage Submittal in the SRSM (2.2.1 Basic Requirement No. 1). A Concept Drainage Report, a requirement of a Drainage Submittal, is generally required for large projects or those located in environmentally sensitive areas to preliminarily assess drainage requirements and potential impacts. A Drainage Report, another requirement of a Drainage Submittal, is required for most projects and is used to identify drainage impacts from the project as well as determine necessary stormwater runoff treatment and controls. The Drainage Report also assesses operation and maintenance requirements, inspection requirements, and erosion and sediment control.

2.5.2.1 STORMWATER FACILITIES ORDINANCE (S5.B.5.A.)

The Stormwater Facilities Ordinance, SMC Chapter 17D.060, was adopted and effective in March of 2010. The ordinance references relevant design documents such as the SRSM and the City of Spokane design standards and specifications, enforcement authority, runoff and infiltration controls, and natural location of drainage requirements.

2.5.2.2 PROCEDURES FOR SITE PLAN REVIEW (S5.B.5.B.)

Drainage submittals are reviewed by the Planning department for code requirements such as critical areas of management, buffers, impervious area creation, building and landscape design and building setbacks. Then, Development Services Center reviews Drainage Submittals for civil plan requirements as described in City Engineering Design Standards and the SRSM.

Engineering Services reviews plans for City Capital Improvement Projects and stormwater plans for the public right-of-way to ensure consistency with Design Standards.

The Development Services Center reviews and approves the drainage submittal for private commercial and residential developments. In 2011, a Stormwater Intake Checklist was added to the Engineering Services website to ease the review process (http://www.spokaneengineering.org/permit-information). The drainage submittal requires a Drainage Report, Drainage Plan, Grading Plan, Swale Details, and Erosion and Sediment Control Plans and Details. The City requires developers to submit a maintenance plan for all facilities during the plan review. A draft copy of the Conditions, Covenants and Restrictions (CC&Rs) for the homeowners' association in charge of operating and maintaining the drainage facilities is required.

The developer must address any comments resulting from City staff review and submit revised plans to the City. After confirming that staff comments have been adequately addressed, the Development Services Center will send the developer a letter accepting the design and permitting construction.

2.5.2.3 SITE INSPECTION AND ENFORCEMENT (S5.B.5.C.)

There are three inspectors and a field engineer from the Development Services Center who inspect privately constructed infrastructure. Two stormwater inspectors from the Wastewater Management Department inspect privately constructed stormwater controls. Engineering Services provides construction oversight for public capital improvement projects on City-owned land.

Private development sites are inspected upon completion of construction. If there are deficiencies, a punch list is created by the Engineering Services inspectors to be completed by the developer. Final acceptance does not occur until all deficiencies have been remedied.

2.5.2.4 TRAINING FOR STAFF AND PROFESSIONALS (S5.B.5.D., S5.B.5.E.)

The Development Services Center is responsible for providing information to construction site operators and design professionals about training available regarding how to (1) install and maintain effective erosion and sediment controls, (2) comply with the requirements of Appendix 1 of the Permit and (3) apply the BMPs described in the SRSM. The City must keep copies of information provided to construction site operators. If information is distributed to a large number of design professionals at once, the dates of the mailings and lists of recipients also must be kept.

Staff and professional training is provided for employees and design professionals to aid in reaching water quality goals, ensure permit compliance, and reduce pollution to stormwater runoff. Five training modules were developed, including NPDES Overview, Operations and Maintenance, Facility Inspections, Site Plan Review, and Illicit Discharge. Training was also provided for low impact development. Records are kept including training materials, the date of training, and attendees.

2.5.2.5 EASTERN WASHINGTON LID GUIDANCE MANUAL

The Eastern Washington Low Impact Development (LID) Guidance Manual was adopted and effective in 2013 as a supplemental guidance for the design, construction, and maintenance of LID stormwater best management practices. The manual was a regional effort led by Spokane County in conjunction with many Eastern Washington municipalities, including the City of Spokane, the Washington Stormwater Center, Department of Ecology, and regional LID experts. It builds on the practices of stormwater pollution prevention, flow control, and treatment, promoting the use of natural features and managing stormwater as close to where it falls as possible. The manual can be downloaded here: http://www.wastormwatercenter.org/ew-lid-guidance-manual/.

The City of Spokane adopted this manual in the Spokane Municipal Code (SMC 17D.060.300). LID remains optional in Eastern Washington, but is encouraged in the City of Spokane in part by the adoption of this manual. It provides an understanding of LID practices applicable in Eastern Washington and design guidance that both developers and City review engineers can follow.

2.6 Pollution Prevention & Good Housekeeping for Municipal Operations

Permit Requirements (S5.B.6)

- Implement Operations and Maintenance (O&M) Plans for municipally-owned facilities. The O&M Plan shall include appropriate pollution prevention and good housekeeping procedures for the following facilities and/or activities:
  - Stormwater collection and conveyance system
  - Roads, highways and parking lots
  - Vehicle fleets
  - Municipal buildings
  - Parks and open space
  - Construction projects

- Industrial activities
- Material storage areas, heavy equipment storage areas and maintenance areas
- Flood management projects
- Other facilities that would reasonably be expected to discharge contaminated runoff

- Provide training for employees who have primary construction, operations or maintenance job functions that are likely to impact stormwater quality

2.6.1 Introduction

An operation and maintenance (O&M) program has been developed and implemented that includes a training component and has the ultimate goal of preventing or reducing pollutant runoff from municipal operations.

2.6.2 Current Activities

In coordination with each pertinent City department, Wastewater Management developed a Stormwater Pollution Prevention Operations and Maintenance (O&M) Plan. The O&M Plan was updated in 2013 to include all pertinent City activities in one comprehensive document. The Wenatchee O&M Plan template provided by the Department of Ecology was used.

The O&M Plan highlights pollution control, good housekeeping, BMPs and source control measures that are implemented at public facilities. Basic principles of the O&M Plan are shown below. Recordkeeping and inspection requirements as well as responsible departments are listed within the O&M Plan. The updated 2013 O&M Plan can be viewed on the Wastewater Management website, https://beta.spokanecity.org/publicworks/stormwater/management/

2.6.2.1 STORMWATER COLLECTION AND CONVEYANCE SYSTEM

Stormwater treatment and flow control facilities owned by the City were inspected by Wastewater Management at least once during the first Permit cycle. After major storm events, at a minimum for the 10-year recurrence interval, spot checks of these facilities are conducted. The second permit cycle requires that each facility be inspected at least once every two years. Maintenance concerns are reported after each inspection and addressed as necessary.

The MS4 conveyance systems, including streets, catch basins, curbs, gutters, ditches, and storm drains, are also inspected by Wastewater Management. Wastewater Management purchased and is utilizing a database to assist with documenting inspections. The City is divided into four quadrants. Maintenance crews inspect the sewer and stormwater systems in each quadrant until inspection of the system is complete before restarting the process. Catch basins are inspected for proper function, structural stability, and debris buildup. A work order is processed for any required maintenance work. Catch basins on steep hills and in problem flooding areas are inspected twice a year (Spring and Fall).

Numerous bioinfiltration swales are located throughout the City. Adjacent property owners and Planned Unit Developments (PUDs) are responsible for maintenance of most swales. WWM is responsible for maintenance of a portion of the swales. The swales maintained by WWM are either planted in dry land grass and maintained as needed or planted in turf grass and maintained on a regular schedule. Turf grass is mowed regularly to maintain a height of two to three inches. For curb cut inlets, maintenance crews remove grass, sediment and debris to prevent buildup and clogging of the inlet. Curb cut inlets are inspected as maintenance crews work through their designated quadrants of the City, or if there is flooding problems.

Culverts are inspected on a three-year cycle by the City's Street Department. Wastewater Management staff clean out culvers as needed upon request.

2.6.2.2 DECANT FACILITY

The City received a grant from the Department of Ecology to construct a Vactor waste decant facility at the Playfair site, located at 402 N. Lee, in Spokane, Washington (WA). Waste generated from cleaning catch basins and other stormwater management and treatment facilities are transferred to the decant facility. At the facility, the liquids are decanted from the solid waste. Liquids are conveyed to an evaporation pond, and solids are transported to a landfill. Procedures for using the decant facility are incorporated into the O&M Plan.

2.6.2.3 ROADS, HIGHWAYS AND PARKING LOTS

The City of Spokane Street Maintenance Division is responsible for cleaning, repairing and performing preventative maintenance on the 2017 lane miles of paved streets and 61 lane miles of gravel streets. Various divisions within the Streets Department are responsible for maintaining the following: street sweeping, leaf pick up, weed control, street markers, asphalt repair, paving and bridge maintenance, de-icing operations and snow removal.

2.6.2.4 VEHICLE FLEETS, HEAVY EQUIPMENT STORAGE AREAS AND MAINTENANCE AREAS

The City of Spokane Fleet Services conducts routine vehicle maintenance on City vehicles including heavy equipment. Fleet Services also conducts major vehicle engine maintenance and/or repairs on vehicles. Vehicle maintenance BMPs are followed to prevent stormwater pollution from cleaning solvents, leaking vehicle parts and vehicle fluids.

The City of Spokane Fleet Services stores numerous heavy and small equipment as well as vehicles on impervious areas such as concrete or asphalt. Oils, greases, metals, vehicle fluids and suspend solids can contribute to stormwater pollution. These facilities are considered high-use sites and have oil/water separators installed.

Fleet Services' Broadway facility has a covered designated area wash bay for trucks, equipment, and vehicle washing. The wash bay is connected to the sanitary sewer and is equipped with an oil/water separator for pretreatment of wash water. Sewer Maintenance cleans and removes accumulated sediment as needed. BMPs are followed for proper washing and storage of equipment.

SWPPPs have been prepared for facilities with material storage areas, heavy equipment storage areas, and maintenance areas. However, there are no known municipal facilities which discharge runoff to the storm sewer system. At this time, we are unaware of any municipal facilities that require industrial stormwater permits.

2.6.2.5 MUNICIPAL BUILDINGS

Facility operations have the potential to pollute stormwater without proper BMP utilization. Measures are taken to control window washing, carpet and floor cleaning, exterior building and rooftop cleaning and maintenance, painting, trash and dumpster management, remodeling and retrofitting, parking lot maintenance, and landscape maintenance.

2.6.2.6 PARKS AND OPEN SPACE

Pesticides, herbicides, and fertilizers contain pollutants such as nutrients and toxins. City of Spokane Parks Operations only utilizes store-bought products (i.e. Trimec, Tripleshot, Foundation, Speedzone, Roundup®, fertilizers). Small amounts of such products are applied to stormwater facilities in the field for routine maintenance. By law, when applying any Restricted Use Pesticide (RUP), the applicator must be certified. BMPs are utilized to minimize the impact of pesticides, herbicides, and fertilizers.

Landscaping waste can consist of, but is not limited to, leafy and woody debris from clipping, cutting, mowing and other maintenance activities. These materials can accumulate in the storm system and/or discharge into receiving waters. To ensure that these waste materials do not enter the storm drainage system, proper disposal is necessary.

2.6.2.7 CONSTRUCTION PROJECTS

Municipal construction projects are subject to the same requirements as those projects proposed by private developers. During construction, erosion and sediment controls are used to prevent sediment-laden stormwater from flowing away from the site and into the stormwater collection and conveyance system. Construction NPDES permits are obtained from the Department of Ecology for projects disturbing more than one acre.

2.6.2.8 STAFF TRAINING (S5.B.6.B.)

The City provides training for employees with primary construction, operation, or maintenance job functions likely to impact stormwater quality. Target employees were identified to participate in the training sessions. Training addresses the importance of protecting water quality, the requirements of the Permit, operation and maintenance requirements, inspection procedures, ways to perform job activities to prevent or minimize impacts to water quality, and procedures for reporting such water quality concerns as potential illicit discharges. Follow-up training will be provided as needed to address changes in procedures, methods or staffing.

Training is generally provided in conjunction with other permit training requirements. Records are kept including training materials, the date of training, and attendees.

3.0 TOTAL MAXIMUM DAILY LOAD REQUIREMENTS

Permit Requirements (S7)

Section S7 applies only if an applicable Total Maximum Daily Load (TMDL) is approved for stormwater discharges from MS4s as listed in Appendix 2 of the permit.

- Comply with the specific requirements in Appendix 2 (WRIA 54 Spokane River and Lake Spokane)
  - Develop and implement a monitoring program for phosphorus, ammonia, CBOD, and flow rates in the Cochran Basin.
  - Evaluate results with respect to the Waste Load Allocations in the TMDL.
  - If the monitoring results indicate that WLAs are being exceeded, prepare an Action Plan.

3.1 Current and Planned Activities

The NPDES permit cycle beginning in August 2014 includes requirements for the Spokane River Dissolved Oxygen (DO) TMDL. This TMDL was approved by the Environmental Protection Agency mid way through the

first permit cycle in 2010. Stormwater monitoring requirements are included in the 2014-2019 permit for parameters affecting DO in Lake Spokane: phosphorus, ammonia, and carbonaceous biochemical oxygen demand (CBOD).

Monitoring requirements do not take effect until the second half of 2015. However, the City has collected preliminary information on these and other stormwater constituents in several stormwater basins. The information was collected primarily for the purpose of assessing and comparing pollutant loads from the MS4, combined sewer system, and water reclamation facility. An Integrated Clean Water Plan was developed to aid in prioritization of pollutant load reductions from these three systems. More information on the Integrated Clean Water Plan can be found here: my.spokanecity.org/publicworks/wastewater/integrated-plan/.

4.0 MONITORING AND ASSESSMENT

Permit Requirements (S8)

- In each annual report, provide a description of any stormwater monitoring or stormwater-related monitoring studies performed by the permittee or on behalf of the permittee during the reporting period.
- Coordinate with other permittees to select, propose, develop, and conduct Ecology-approved studies to assess effectiveness of permit-required SWMP activities and BMPS.
    - In each annual report, describe participation in the effectiveness studies planning efforts and related outcomes.

4.1 Stormwater Monitoring and Related Studies

4.1.1 Integrated Clean Water Plan

The City has collected monitoring information on several of its MS4 basins to inform efforts of the Integrated Clean Water Plan. The information was collected primarily for the purpose of assessing and comparing pollutant loads from the MS4, combined sewer system, and water reclamation facility. The Integrated Clean Water Plan was developed to aid in prioritization of pollutant load reductions from these three systems. More information on the Integrated Clean Water Plan, including monitoring results, can be found here: my.spokanecity.org/publicworks/wastewater/integrated-plan/.

4.1.2 PCBs in Products

The City of Spokane is also part of a regional effort to reduce polychlorinated biphenyls (PCBs) known as the Spokane River Regional Toxics Task Force (srrttf.org). To complement this effort and assess true sources of PCBs to the storm sewer system, the City received a grant from the Department of Ecology to test about 40 different municipal products. Sampling was performed in late 2014, and showed that PCBs were present in nearly all products tested, including motor oils and lubricants, deicer, road paints, pesticides, asphalt based materials, and hydroseed. The results will be used to inform pollution prevention management decisions. Additional investigations with the SRRTTF will potentially aid manufacturers in producing lower-PCB products.

4.1.3 Sharp Avenue

A pervious pavement field testing project is proposed at Sharp Avenue between Division and Hamilton Streets. Questions remain as to the suitability for pervious concrete and porous asphalt in eastern Washington. The City is

working with Gonzaga University to design and monitor pervious pavement installations for durability and water quality. In 2014, the students prepared a mock RFP, feasibility study report, and interim report with recommendations for pervious pavement design alternatives and monitoring setup. The City of Spokane applied for an Ecology grant to construct the project.

4.1.4 Biochar

Another project with Gonzaga University students as well as the Lands Council is the study of biochar for stormwater treatment. Laboratory bench scale studies were performed with two different biochar mixes (Kentucky blue grass and wood-based biochars) ad various combinations of supplemental material, such as oyster shells and iron. Synthetic stormwater was pulsed through the systems and pollutant removal was measured. Results from the study will be published in 2015.

To test the use of biochar in storm gardens, a field application was planned and construction began in late 2014. Three adjacent storm gardens will be located along Garland Avenue near Belt that contain the two different biochars. The cell containing the wood biochar mix has sampling ports, and samples will be collected in 2015.

4.1.5 WSU

Another educational institution interested in the study of porous pavements is Washington State University, in cooperation with the Center for Environmentally Sustainable Transportation in Cold Climates (CESTiCC). Research is primarily focused on the roadway sub-base effects from infiltrating water through porous pavements. The City worked with WSU researchers to design a monitoring system for the Finch Arboretum porous asphalt parking lot, which is planned to be constructed in 2015.

4.1.6 Lincoln SURGE

The Lincoln Spokane Urban Runoff Greenways Ecosystem (SURGE) project on is a series of storm garden bulb outs along Lincoln Street between 19th and 29th Avenue. Each storm garden has an underdrain that connects to Cannon Hill Park Pond. To better understand the treatment capability of the storm gardens, stormwater samples are being collected in the influent and effluent as well as in the pond for comparison. A few samples were collected in spring and fall of 2014, and sampling will continue through spring 2015 in order to obtain a statistically significant number of samples to calculate treatment capacity of the storm gardens.

4.1.7 South Hill Wetland Mitigation

The South Hill Wetland Mitigation project was a visually monitored project of the wetland mitigation area and buffer impacts. Monitoring occurred throughout 2015. It was mitigated at a 2:1 replacement ratio as required by local code to create a minimum wetland replacement area of 14,890 square feet. The plan proposed 18,568 square feet of wetland mitigation area as compensation for wetland and buffer impacts. The herbaceous species were filling in nicely and surpassed the percent cover specified in the mitigation plan. Replacement plantings of larger container stock will be utilized in 2016. The site was in full compliance with the terms of the mitigation plan.

4.2 Eastern Washington Effectiveness Studies

Each City and County in Eastern Washington has been asked to participate in preparation of studies to test the effectiveness of stormwater management program components. A total of twelve to fifteen study ideas are to be submitted to Ecology. Eight to twelve of these studies will be implemented.

The City of Spokane Valley received a grant from Ecology and has been coordinating the first phase of this effort. In 2014, permittees developed a long list of potential study ideas and began to refine the list. Potential studies may involve:

- Public education and outreach strategies that provide the most benefit
- Catch basin cleaning and street sweeping effectiveness
- Most beneficial frequency of maintenance practices
- IDDE techniques that provide the most benefit
- Planting options for vegetated swales
- Pollutant loading from various land uses specific to eastern Washington
- Checklists for reporting requirements
- Effective design of BMPs

Permittees will continue to develop the list and refine study ideas in 2015 and 2016. A ranked list of detailed study design proposals will be submitted to Ecology by June 30, 2016.

5.0 SWMP PLAN

The Stormwater Management Program (SWMP) Plan is a list of activities for the upcoming calendar year. The following table includes a list of planned activities for each of the SWMP elements for 2016.

Table 2. Stormwater Management Program (SWMP)

Permit Component	Description	SWMP Section #	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
S5.B.1: Public Education and Outreach														
S5.B.1.a,b.	Implement Educational Program	2.1												
	Attend public events													
	Cable 5 videos and tips													
	Cleanwater/stormwater pollution prevention interpretive signs along centennial trail													
	Educational materials to development/construction community													
S5.B.2: Public Involvement and Participation														
S5.B.2.a.	Involve public through ordinance process (should any arise)	2.2												
	Stormwater pledges at general public and student events													
	Manhole cover art contest													
S5.B.2.b.	Post SWMP and plan to website with public comment opportunity													
S5.B.3: Illicit Discharge Detection and Elimination														
S5.B.3.a.	Maintain map of the MS4	2.3												

	Conduct outfall field surveys													
S5.B.3.c.	Implement IDDE Program													
	Install curb markers													
	PCB product testing (City and SRRTTF)													
	Formalize procedures for conducting MS4 investigations													
	Field assess 10% of MS4													
	Maintain hotline and respond to IDDE complaints													
	Employee training													
S5.B.4: Construction Site Storm Water Runoff Control														
S5.B.4.b.	Review construction plans and SWPPPs	2.4												
S5.B.4.c.	Inspect construction sites and keep records													
	CESCL training for City Staff													
S5.B.4.d.	Provide information on available training to contractors													
S5.B.5: Post-construction SWM for New/Re-development														
S5.B.5.a.	Allow LID	2.5												
	Require projects to retain 10-year 24-hr storm													
S5.B.5.b.	Site plan review													

S5.B.5.c.	Inspect post-construction stormwater controls														
S5.B.5.f.	Maintain project records														
S5.B.6: Pollution Prevention and Housekeeping															
S5.B.6.a.	Implement O&M Plan	2.6													
	Operate new decant facility														
	Obtain construction NPDES permit as applicable														
	Inspect at least 50% of treatment and flow control facilities														
	Inspect 25% of catch basins														
S5.B.6.b.	Staff O&M training														
S7: Compliance with TMDL Requirements															
Appx 2	Revise Cochran Basin QAPP as needed	3													
	Implement Cochran Basin QAPP														
S8: Monitoring and Program Evaluation															
S8.A	PCB Product sampling	4.1													
	Sharp Avenue monitoring preparation														
	Biochar study														
	Finch Arboretum porous asphalt monitoring														

	Lincoln SURGE monitoring													
	Cochran Basin QAPP monitoring preparation													
	Ash Station PCB project preparation													
S8.B.	Refine effectiveness study questions with eastern WA permittees	4.2												

HISTORY OF REVISIONS

This SWMP is a living document and revisions will be completed on an as needed basis.

Table 3. History of Revisions

Revision:	Affected Page:	Revision Date:	Completed By:	Change Descriptions:
0	All	3/2004	Brown & Caldwell	Create Manual
1	All	09/2008	AP	Revised entire document
2	All	10/2010	CW and FH	Revised entire document
3	All	03/2011	LS	Revised entire document
4	All	03/2012	LS	Revised entire document
5	All	03/2013	LS	Revised entire document
6	All	03/2014	LS	Revised entire document
7	1, 5, 8, 25, 27, 30, 31	01/2016	AP	Coordination methods, Riverton Basin Stormwater, Manhole Cover Art contest, 4.1.7 S. Hill Wetland Mitigation, SWMP Plan, History of Revisions

ACRONYMS

BMP:	Best Management Practice
CFR:	Code of Federal Regulation
CSO:	Combined Sewer Overflow
CWA:	Clean Water Act
ESC:	Erosion and Sedimentation Control
GIS:	Geographic Information System
LID:	Low Impact Development
MS4:	Municipal Separate Storm Sewer System
NPDES:	National Pollutant Discharge Elimination System
O&M:	Operation and Maintenance
RCW:	Revised Code of Washington
SRSM:	Spokane Regional Stormwater Manual
SMC:	Spokane Municipal Code
SMP:	Stormwater Management Plan
SWMP:	Stormwater Management Program
SWPPP:	Stormwater Pollution Prevention Plan
TMDL:	Total Maximum Daily Load
UIC:	Underground Injection Control
WAC:	Washington Administrative Code

DEFINITIONS

Best Management Practice: The utilization of methods, techniques and/or products that have been demonstrated to be the most effective and reliable in minimizing environmental impacts.

CWA: The federal Clean Water Act (formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972) Pub. L. 92-500, as amended in Pub. L. 95-217, Pub. L. 95-576, pub. L. 96-483, and Pub. L 97-117, 33 U.S.C 1251 *et seq*.

Development: Any proposed land use, zoning, or rezoning, comprehensive plan amendment, annexation, subdivision, short subdivision, planned unit development, planned area development, conditional use permit, special use permit, shoreline development permit, or any other property development action permitted or regulated by the Spokane Municipal Code (SMC).

Discharge (v): Disposal, injections, dumping, spilling, pumping, emitting, emptying, leaching or placing of any material so that material enters and exits from the MS4 or from any other publicly owned or operated drainage system that convey storm water. The term includes other verb forms where applicable.

Discharge (n): Runoff, excluding offsite flows, leaving the proposed development through overland flow, built conveyance systems or infiltration facilities.

Discharger: When used in the context of stormwater management and the SMC of 17D.060 and 17D.090, means any person who discharges to the City's MS4 or any other publicly owned or operated drainage system that conveys, manages or disposes of stormwater flows.

Drainage: (1) The process of removing surplus ground or surface water by artificial means, (2) the manner in which the waters of an area are removed, or (3) the area from which waters are drained; a drainage basin.

Erosion and Sedimentation Control: Any temporary or permanent measures taken to reduce erosion, control siltation and sedimentation, and ensure that sediment-laden water does not leave a site.

Groundwater: Water in a saturated zone or stratum beneath the surface of the land or below a surface water body.

Heavy Equipment Maintenance or Storage Yard: An uncovered area where heavy equipment (e.g. mowers, excavators, dump trucks, backhoes, or bulldozers) is washed or maintained, or where at least five pieces of heavy equipment are stored regularly or on a long term basis.

Illicit Connection(s): Any man-made conveyance connected to the municipal separate storm sewer system (MS4 system) in violation of the National Pollutant Discharge Elimination System (NPDES) permit requirements.

Illicit Discharge: The introduction or discharge of anything into the municipal separate storm sewer system (MS4 system) in violation of the National Pollutant Discharge Elimination System (NPDES) permit requirements.

Impervious Surface: A hard surface area that either prevents or retards the entry of water into the soil mantle. Common impervious surfaces include, but are not limited to, rooftops, walkways, patios, driveways, parking lots, storage areas, concrete, or surfaces that impede the natural infiltration of stormwater.

Industrial Activity: Manufacturing, processing or raw materials storage areas at an industrial plant. These activities may be required to have Department of Ecology's NPDES permit coverage in accordance with 40 CFR 122.26.

Low Impact Development: A stormwater management and land development strategy applied at the parcel and/or subdivision scale that emphasizes conservation and use of on-site natural features integrated with engineered, small-scale hydrologic controls to more closely mimic pre-development hydrologic conditions.

Material Storage Facilities: An uncovered area where bulk materials (liquid, solid, granular, etc.) are stored in piles, barrels, tanks, bins, crates, or other means.

Municipal Separate Storm Sewer System (MS4): A conveyance or system of conveyances, including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains, (1) owned or operated by a state, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State Law) having jurisdiction over disposal of wastes, stormwater, or other wastes, including special districts under State Law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to waters of the United States, (2) designed or used for collecting or conveying stormwater, (3) which is not a combined sewer, and (4) which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2.

National Pollutant Discharge Elimination System (NPDES): The national program for issuing, modifying, revoking, and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under sections 307, 402, 318, and 405 of the Federal Clean Water Act, for the discharge of pollutants to surface waters of the state from point sources. These permits are referred to as NPDES permits and, in Washington State, are administered by the Washington State Department of Ecology (Ecology).

NPDES Eastern Washington Phase II Municipal Stormwater Permit (WAR04-6505): A permit issued to the City of Spokane from the Washington State Department of Ecology, granting authority to discharge stormwater into state surface waters. Permit also addresses water quality issues.

Outfall: A point source ad defined by 40 CFR 122.2 at the point where a municipal separate storm sewer discharges to waters of the State and does not include open conveyances connecting two municipal separate storm sewers, or pipes, tunnels, or other conveyances which connect segments of the same stream or other waters of the State and are used to convey waters of the State.

Permittee: Any Primary Permittee, Co-Permittee, or Secondary Permittee unless specifically stated otherwise for a particular section of permit WAR40-6505.

Pollutant: (1) Any substance prohibited or limited by federal, state or local regulations, released or discharged in conjunction with development. (2) Any substance, released or discharged, that causes or contributes to violation of water quality standards.

Runoff: Water that travels across the land surface, or laterally through the ground near the land surface, and discharges to water bodies either directly or through a collection and conveyance system, includes stormwater and water that travels across the land surface from other sources.

Spokane Regional Stormwater Manual: A technical document establishing standards for stormwater design and management to protect water quality, natural drainage systems, and down-gradient properties as urban development occurs.

Stormwater: Any runoff flow occurring during or after any form of natural precipitation, and resulting from such precipitation, including snowmelt. Stormwater further includes any locally accumulating ground or surface waters,

even if not directly associated with natural precipitation events, where such waters contribute or have potential to contribute to runoff onto the public right-of-way, public storm or sanitary sewers, or flooding or erosion on public or private property.

Stormwater Management Program (SWMP): A set of actions and activities designed to reduce the discharge of pollutants from the regulated small MS4 to the MEP, and to protect water quality; it comprises the components listed in S5 or S6 of permit WAR04-6505 and any additional actions necessary to meet the requirements of applicable TMDLs.

Total Maximum Daily Load (TMDL): A water cleanup plan. A TMDL is both a calculation of the maximum amount of a pollutant that a water body can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources. A TMDL is the sum of the allowable loads of a single pollutant from all contributing point and non-point sources. The calculation includes a margin of safety to ensure that the water body can be used for its state-designated purposes. The calculation also accounts for seasonable variation in water quality. Water quality standards are set by states, territories, and tribes. They identify the uses for each water body—such as drinking water supply, contact recreation (swimming), and aquatic life support (fishing)—and the scientific criteria to support that use. The Clean Water Act, Section 303, establishes the water quality standards and TMDL programs.

REFERENCES

Brown, E., D. Caraco, and R. Pitt. 2004. *Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments*. Center for Watershed Protection, Ellicott City, MD. [http://cfpub.epa.gov/npdes/stormwater/menuofbmps/illicit.cfm]

Casco Bay Estuary Partership (CBEP). *Guidelines and Standard Operating Procedures: For Stormwater Phase II Communities in Maine.* [http://www.cascobay.usm.maine.edu/publications.html].

City of Spokane, City of Spokane Valley, and Spokane County. (2008). *Spokane Regional Stormwater Manual.* http://www.spokanewastewater.org/Docs/Stormwater/Spokane_Regional_Stormwater_Manual.pdf.

Mays, L.W. (Ed.). 2001. *Stormwater collection systems design handbook*. New York: McGraw-Hill.

Washington State Department of Ecology, AHBL, and HDR. (2013). *Eastern Washington Low Impact Development Guidance Manual.*

Washington State Department of Ecology. (2007). *Eastern Washington Phase II Municipal Stormwater Permit.*

Washington State Department of Ecology. (2006). *Guidance for UIC Wells that Manage Stormwater.* Publication No. 05-10-067.

Washington State Department of Ecology. (2008). *Municipal stormwater general permit: Guidance for cities and counties.*

Washington State Department of Ecology. (2004). *Stormwater Management Manual for Eastern Washington.* http://www.ecy.wa.gov/programs/wq/stormwater/tech.html.

2014 Annual Report

June, 2014

Adaptive Management Plan for Reducing PCBs in Stormwater Discharges

REPORTING PERIOD: MAY, 2013 TO MAY, 2014

Prepared by:
City of Spokane
Wastewater Management Department

Contents

APPENDIX A: Known Contaminated Sites (Ecology Database)

APPENDIX B: PCB Homologue Patterns

2014 Annual Report

ADAPTIVE MANAGEMENT PLAN FOR REDUCING PCBS IN STORMWATER DISCHARGES

INTRODUCTION

Polychlorinated biphenyls (PCBs) are manmade compounds that have been identified ubiquitously throughout the environment. PCBs were sold under the trade name of "Aroclor" and were typically used in transformer fluids, adhesives, cements, additives, lubricants and fire retardants until manufacturing of PCBs was banned in the US in 1977. However, they persist in the environment and bio-accumulate in aquatic ecosystems as concentrations accumulate in organisms through the food chain. Although manufacturing of PCBs was banned in the 1970's, new sources of PCB contamination still exist in the environment. PCBs can be produced inadvertently in manufacturing processes that involve hydrocarbons, chlorine and heat such as pigments, printing inks, agricultural chemicals, plastics and detergent bars. Recycling facilities may process PCB contaminated materials such as paper products and asphalt roofing. Materials containing less than 50 parts per million (ppm) are not regulated under the Toxics Substances Control Act (TSCA) and are not considered "PCB-contaminated" (40 CFR 761.3). For comparison, current EPA human health surface water quality standards for PCBs is 170 picograms per liter, equivalent to 0.00000017 ppm (National Toxics Rule, 40 CFR 131.36). The Spokane Tribe adopted a water quality standard of 1.3 picograms per liter (0.0000000013 ppm) due to higher fish consumption rates used to derive the standard.

One pathway for PCBs to enter surface water bodies is through stormwater. Runoff from precipitation may collect pollutants along roadways, parking lots and other contributing areas, enter storm drains, and then discharge to water bodies with little pre-treatment. In addition to a separate storm sewer system, the City of Spokane also has a combined sanitary and storm sewer where stormwater and sewage are combined in the same pipes. When storm events exceed the capacity of the combined sewer system, it overflows and discharges into the Spokane River in what is called a Combined Sewer Overflow (CSO). The Spokane River courses through the City of Spokane, with nearly 100 stormwater and CSO outfalls along the 18 mile reach.

To assess concentration of PCBs in some common stormwater contaminants, samples of off-the-shelf motor oil, transmission fluid, and shredded tire scraps were sent for laboratory analysis in 2011. Table 1 shows results of this informal investigation. The shredded tire sample could not produce a definitive result due to sample matrix interference.

Table 1. Oil and Transmission Fluid Sample PCB Concentrations

Sample	Total PCB, micrograms per kilogram (ppb) (EPA Method 1668)
Pennzoil SAE5W-30	37.8
Quaker State SAE5W-30	14
Valvoline Mercon V	49.5
Red Line D4 Automatic Transmission Fluid	8.8
Valvoline Full Synthetic 5W-30	116

STUDY AREA

The Spokane River begins at the outlet of Lake Coeur d'Alene in north Idaho, about 12 miles east of the Washington-Idaho border. Its basin encompasses more than 6,000 square miles. The River flows through the Cities of Coeur d'Alene, Post Falls, Liberty Lake, Spokane Valley, and urban areas of Spokane County before flowing through the City of Spokane. Downstream of the City of Spokane is Long Lake and the Spokane Indian Reservation before the Spokane River discharges to the Columbia River. Mean monthly flow rates in the river, as measured at the USGS Spokane River at Spokane gage, range from 1,700 cubic feet per second (cfs) in August to 17,700 cfs in May with a median peak spring flow of 25,000 cfs (USGS, 2012). Much of the Spokane region upstream of Long Lake is situated over the Spokane Valley Rathdrum Prairie (SVRP) Aquifer, a sole-source aquifer contributing drinking water to nearly half a million people. The Spokane River and SVRP Aquifer are an intimately linked water resource. Figure 1 shows the Spokane River basin and SVRP aquifer.

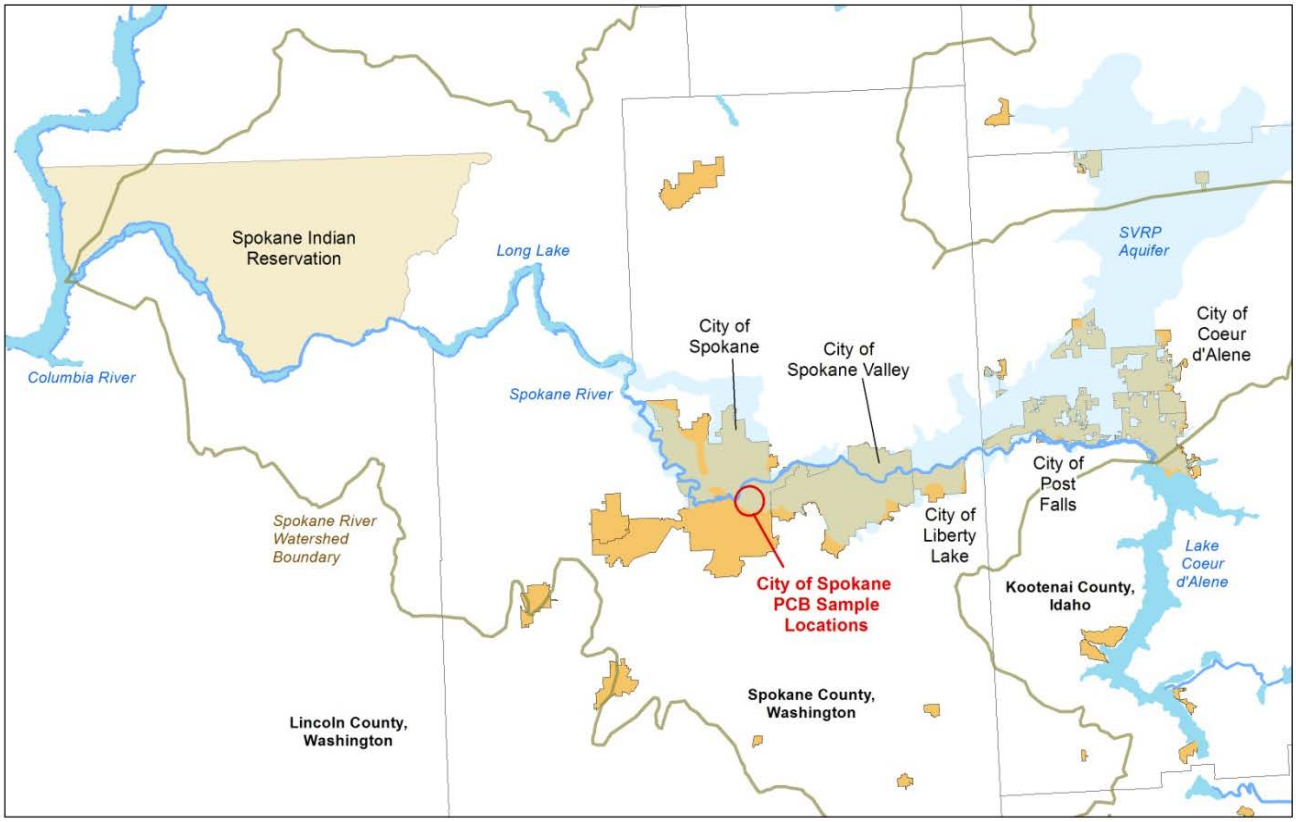


Figure 1. Spokane River Vicinity Map

BACKGROUND: PCBS AND THE SPOKANE RIVER

Several segments of the Spokane River violate water quality standards for the presence of PCBs and have been placed on the state Water Quality Assessments (303(d)) list of impaired water bodies. In 2007, the Washington State Department of Ecology (Ecology) published the "Spokane River PCB TMDL Stormwater Loading Analysis" (Parsons, 2007). In 2011, Ecology published the "Spokane River PCB Source Assessment, 2003-2007," originally as a draft PCB Total Maximum Daily Load (TMDL) (Ecology, 2011 A). However, rather than develop a PCB TMDL, Ecology elected to pursue an innovative straight-to-implementation strategy. The intent is to more directly approach PCB loading to the Spokane River instead of spending a decade or more establishing a TMDL and wasteload allocations before taking any actions to solve the problem. NPDES permits issued to waste discharge facilities in 2011, including the City of Spokane, require the formation of a regional task force and establishment of performance-based PCB limits within the first permit cycle. Thus, the Spokane River Regional Toxics Task Force was officially formed in early 2012. The City of Spokane is a Task Force member, addressing both wastewater and stormwater discharges.

REGULATORY REQUIREMENTS

In the 2007 and 2011 reports, Ecology concluded that there were significant concentrations of PCBs in both stormwater and CSO discharges and that PCBs in these systems needed to be reduced in order to meet both the State of Washington's and Spokane Tribe's water quality standards. The City of Spokane is subject to the regulatory requirements imposed by the NPDES Municipal Stormwater Permit. Specifically, section S.4, entitled "Compliance with Standards" allows permittees to follow an adaptive management plan compliance pathway when there is evidence that stormwater discharges may be causing or contributing to a violation of water quality standards. The City's adaptive management plan is intended to address this compliance pathway, and is also designed to reduce PCBs in stormwater that enters the combined sewer system as well as to support compliance with the NPDES Wastewater Permit that governs discharges from the Riverside Park Water Reclamation Facility and CSO outfalls. The City negotiated the Adaptive Management Plan with the Spokane Riverkeeper, Center for Justice and Gonzaga University Law School Environmental Law Clinic as a part of a Consent Decree resolving a Notice of Intent to Sue served on the City pursuant to the Clean Water Act. The Adaptive Management Plan's core goals and principles were based on these organizations' proactive interest in addressing PCBs in the City's stormwater discharges.

ADAPTIVE MANAGEMENT

The goal of the adaptive management plan is to reduce PCBs in stormwater through three main strategies: (1) to further analyze and interpret existing PCB data; (2) to identify likely sources of PCBs and prioritize the design and implementation of appropriate remedial actions and BMPs; and (3) to develop and design an adaptive approach for additional data collection and remedial action to further reduce PCBs in the Spokane River.

Phase I of the Adaptive Management Plan focuses on remedial maintenance, sampling, and analysis of existing information. Work began in 2010. Priority areas of investigation were selected where the highest PCB concentrations have been found in previous studies and where land use practices are likely to contribute elevated levels of PCBs. The Union stormwater basin, a separated stormwater basin covered by the NPDES Municipal Stormwater Permit, was selected for this purpose. For the CSO discharges covered under the NPDES Wastewater Permit, the portion of the CSO 34 basin located in the heavy industrial zone was selected. In 2011, remedial maintenance and sampling shifted south (upstream) in the CSO 34 basin, where light industrial and other mixed land uses are found. Because fewer PCBs were found in this area, sampling was again focused on the heavy industrial zones and Union basin in 2012 and 2013. Figure 2 shows the location of sampling activities. The following sections highlight the elements of the adaptive management plan.

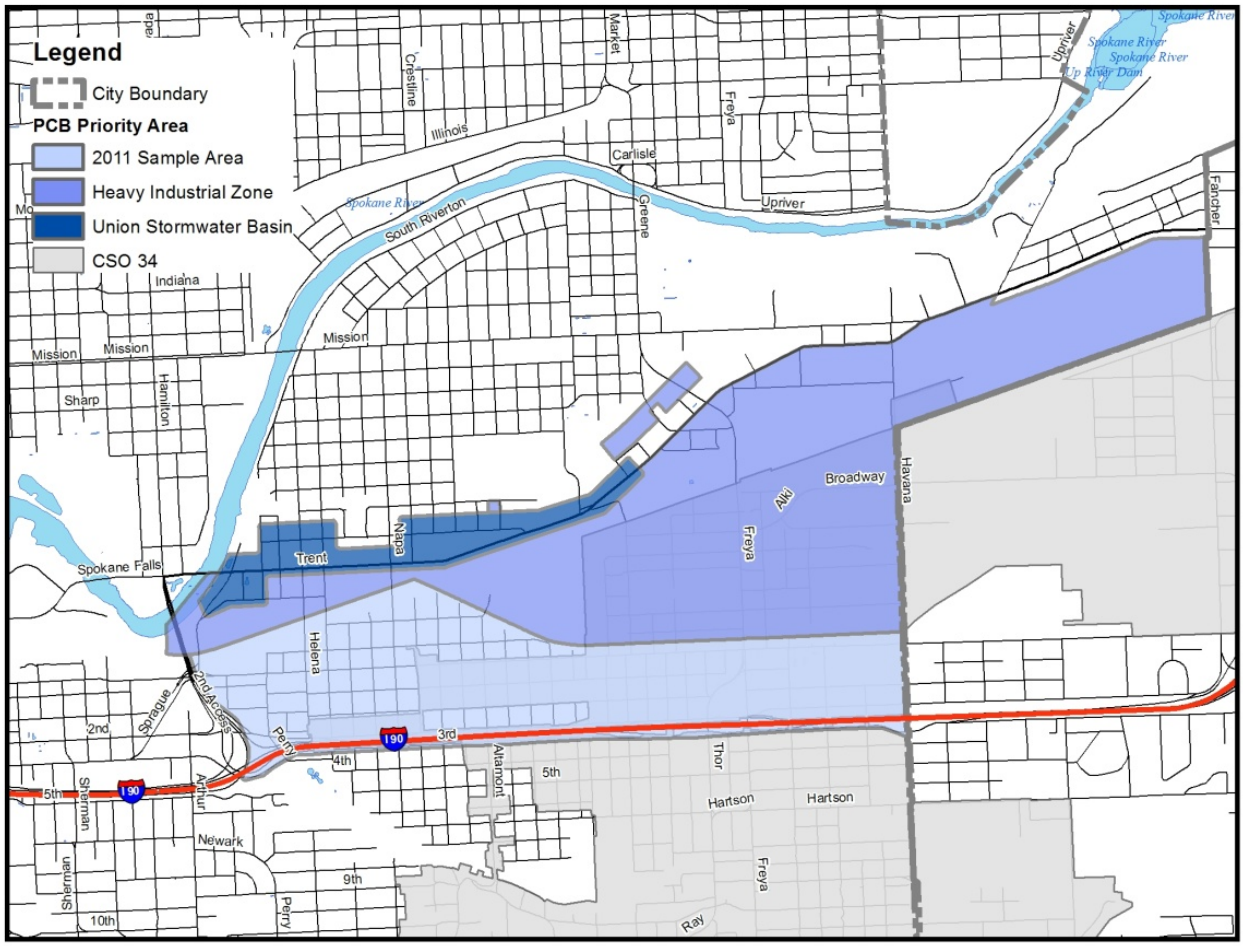


Figure 2. Priority Areas of Investigation

Research and Reconnaissance

Windshield Evaluations

Properties located within the 2010 priority sample areas were visually inspected to determine potential sources of PCBs to stormwater. Information gathered during evaluations included pictures of the site, type of business, paved or unpaved driving surfaces, stormwater flow direction and downstream inlets (if any), potential for sediment tracking onto City right of way, and potential current and past potential sources of PCBs.

For a site to contribute PCB to catch basins, stormwater may either flow off the property into City right of way, or soil could be tracked off the property into City right of way, where stormwater could then wash it into catch basins. Sediments are more likely to be contaminated with PCBs where past land uses and business operations have been associated with PCBs, such as handling transformers, paints and coatings,

electrical transmission and distribution, industrial machinery, scrap yards, wood treatment, rail yards, used oil spread for dust control, and many other heavy industrial operations.

It is the City's policy that private properties contain all stormwater generated on site. In general, stormwater from most properties observed in the windshield survey did not flow onto City right of way except for on small portions of the property such as approaches that are sloped downhill toward the street. Several of the sites are not fully paved and allow minor sediment tracking into the right of way. A network of railroad properties crosses this heavy industrial area and there are several automotive repair and storage areas. However, the stormwater inspectors who performed the windshield evaluations did not detect any significant locations where high PCB loads are likely contributing to the storm sewer system. Rather, it is more likely a patchwork of smaller sources as well as widespread, low-level contamination from historic land uses.

Known Contaminated Site Research

Several properties in the vicinity are known to be contaminated with PCBs and other toxics of concern. Databases were queried to identify suspected and confirmed contaminated site locations, such as Ecology's Integrated Site Information System (ISIS) and Facility/Site Database. Maps showing these locations in the vicinity of the project area are shown in Appendix A (Ecology, 2011 B). PCB cleanup site locations relative to the City's catch basin sampling locations are shown in Figures 4, 5, and 6. Note that the Ecology PCB cleanup sites are located in areas containing the highest catch basin sediment PCB concentrations.

Catch Basin Sediment Sampling

Because PCBs in stormwater are typically adsorbed to sediments, sediments were removed from stormwater catch basins and sampled for PCBs. Data from these locations are useful in measuring how much PCBs are removed from the system and may also be useful in tracing on-going sources of PCB to the stormwater catch basins. In collaboration with Ecology's Urban Waters Initiative, standard operating procedures were developed and staff was provided with extensive training prior to sampling.

Prior to sampling, standing water in each catch basin was removed. Four sediment samples were collected from random locations in each catch basin and mixed thoroughly using a stainless steel spoon and bowl. A one-liter laboratory prepared jar was filled with the sample, then stored in a cooler on ice (between 0 and 6 degrees Celsius). After all catch basins in the group were sampled, the contents of each sample were added to a stainless steel bowl and homogenized with a stainless steel spoon. Three laboratory-prepared jars were filled with the homogenized sample and stored in a cooler on ice. Two jars were sent for laboratory analysis and one was kept in case of future need, stored in a freezer. Samples were allowed ½ inch headspace to allow for expansion. Equipment was carefully decontaminated before and after each sample to prevent inadvertent mixing and contamination. After sampling, equipment was decontaminated, rinsed with laboratory grade acetone, and wrapped with aluminum foil, shiny side out.

Sample Quality Control

The detection limits necessary for this analysis are approaching the limits of current technology. For each set of samples, the laboratory analyzes a blank sample by running clean water through the laboratory equipment. These blank samples quantify PCBs introduced to the sample from laboratory equipment, which can affect sample analysis in this ultra-low detection method. Flags were noted in the catch basin sample data where an individual congener had less than five times the concentration detected in the blank sample. These congeners were subtracted from the total PCB concentration to come up with the reported values.

Remedial Maintenance

After sampling, remedial maintenance was performed on each catch basin. Before the large volume of catch basin sediments could be handled and disposed, samples were first sent to the laboratory for preliminary Aroclor analysis, with a detection limit of 0.1 milligrams per kilogram (mg/kg) per EPA Method 8082. None of the samples exceeded Ecology's residential cleanup standard of 1.0 mg/kg, so sediments were approved for disposal at the City's North Side Landfill. Remedial maintenance was then performed by pumping out sediments from each catch basin using vactor trucks for disposal at the landfill. The catch basins were then cleaned to prevent any residual PCB contamination from being detected in future catch basin samples.

Urban Waters Coordination

The City has worked in coordination with Ecology's Urban Waters Program staff to identify likely sources of PCBs in the priority areas of investigation. The most recent information published by Urban Waters can be found in the report, "Spokane River Urban Waters Source Investigation and Data Analysis Progress Report (2009-2011)" (Ecology, 2012). Specifically, the "PCB Section" discusses related investigations in the Union Basin and CSO 34.

SUMMARY OF CATCH BASIN SAMPLING ACTIVITIES AND RESULTS (2010-2012)

Composite Samples

In 2010, all 432 catch basins located in the Union Basin and Heavy Industrial CSO 34 priority areas were sampled followed by remedial maintenance to remove all sediments. Due to lab analysis costs and quantity of samples, the sample area was broken into 41 groups, each having an average of about 10 catch basins. In 2011, sampling and remedial maintenance was performed upstream in the CSO 34 basin. The area is zoned light industrial, commercial, and residential. A total of 333 catch basins were sampled, divided into 35 groups for composite sampling. Sample group locations are shown in Figure 3. 2010 sample groups are shown in green and 2011 in purple. Groups are delineated by basin type, including CSO, drywell, and separated stormwater.

Samples from all catch basins in each group were composited. After initial Aroclor analysis was performed to determine remedial maintenance measures, samples were sent to Pacific Rim Laboratories

for congener analysis using EPA Method 1668. This method allows for detailed analysis of 209 PCB congeners to a detection limit of 0.003 micrograms per kilogram (ug/kg), or parts per billion.

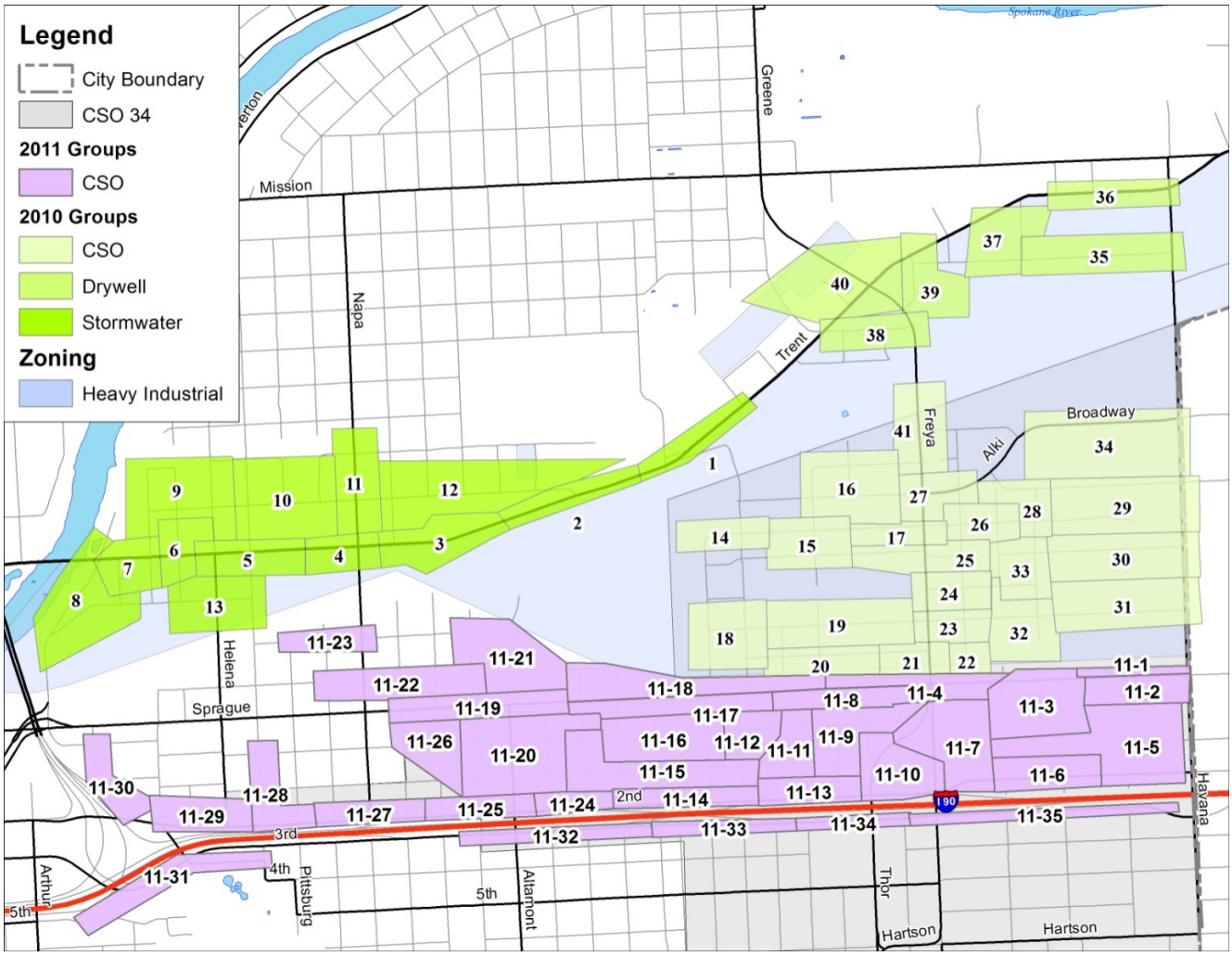


Figure 3. Group Composite Sample Locations

None of the sample detections in the Aroclor analysis exceeded the 1 mg/kg threshold, so all catch basin sediments were disposed at the North Side Landfill. Results from the 2010 and 2011 composite sampling are shown in Figure 4. To compare known sources of PCB contamination, Ecology PCB cleanup sites are also shown in Figure 4.

Nearly 280,000 pounds of sediment were removed from catch basins in 2010. Based on the congener analysis, a total of about 26 grams of PCBs were removed from the system and prevented from entering the Spokane River or aquifer. About 268,000 pounds of sediment were removed from the 2011 composite group sampled catch basins. The total mass of PCBs in these sediments was about 3.7 grams. Because a similar volume of sediment was removed in 2011 and 2010, it can be inferred that PCB sources are fewer in the 2011 sample area.

Individual Catch Basin Sediment Samples

In addition to composite sediment sampling in 2011, sediment samples were collected from individual basins from the highest concentration 2010 groups located in the separate stormwater or CSO areas. Analysis results showed that PCB concentrations were detected in the individually-sampled catch basins, within the range of concentrations observed the previous year (see Figure 4). Therefore, there is some form of a continual source of PCBs to catch basin sediments in these areas.

2012 Catch Basin Sampling

2012 sampling focused on the higher PCB concentration areas in the 2010 sample groups (the Union Basin and heavy industrial CSO 34) to determine if there are ongoing PCB sources. Where each catch basin within the group designation had enough sediment to sample, a composite sample was collected and analyzed for PCB Aroclors and congeners, followed by remedial maintenance. Sampling was intended to match previous group or individual samples for a more direct comparison of PCB sources from year to year.

Results of 2012 catch basin sediment sampling are shown in Figure 5. The composite sample PCB concentrations decreased slightly. However, PCBs were still present in all locations. This suggests that remedial maintenance may be reducing PCB concentrations; however, there is an ongoing and diffuse source of PCBs. Comparisons in catch basins sampled more than once are shown in the following tables.

About 39,600 pounds of sediment were removed from the 2012 sampled catch basins. The total mass of PCBs in these sediments was about 2.7 grams.

Table 2. Group Composite Sample Comparisons (2010 and 2012)

Group Number	2010 Concentration (ug/kg)	2012 Concentration (ug/kg)	% Reduction
Group 1-C	754.0	464.0	38%
Group 2-C	296.0	126.0	57%
Group 8-C	115.0	87.9	24%
Group 11-C	179.0	74.0	59%
Group 12-C	731.0	612.0	16%

Table 3. Individual Sample Comparisons (2011 and 2012)

Group Number	2011 Concentration (ug/kg)	2012 Concentration (ug/kg)	% Reduction
Group 13-id-3	1185.0	767.0	35%
Group 13-id-4	279.0	120.0	57%
Group 13-id-11	5.0	5.6	-12%
Group 24-id-10	103.0	69.4	33%
Group 24-id-11	121.0	95.1	21%
Group 25-id-1	115.0	93.9	18%

NOTES:
C = COMPOSITE SAMPLE;
ID = INDIVIDUAL SAMPLE;
UG/KG = MICROGRAMS PER KILOGRAM (PARTS PER BILLION)

Confirmation Sample

To date, all of the catch basin sediment samples have been collected in the Union Basin, heavy industrial zone, or the CSO 34 basin. To confirm that the PCB concentration in these samples are greater than typical catch basin sediment concentrations in other areas of the city, a catch basin was selected for PCB sampling in north Spokane. The selected catch basin was chosen in a residential area where the catch basin cleaning schedule was consistent with the previous 2010 PCB catch basin cleaning. The catch basin chosen for this confirmation sample is located at the intersection of Garland and Normandie. The PCB concentration was 13.1 ug/kg, which is lower than the majority of the PCB concentrations in the priority area of investigation.

Source Investigations

Individual catch basin sediment sampling in 2012 identified select catch basins that had relatively high PCB concentrations compared to others. On April 25, 2013, staff from the City of Spokane, Spokane Riverkeeper, and Urban Waters conducted a site visit in the Union Basin. The goal of the site visit was to identify potential sources of PCBs to catch basins, particularly those with the highest concentrations. No obvious sources could be identified. It was observed that the historic industrial land use and associated legacy sources are ubiquitous in the area.

The highest catch basin sediment concentration observed in 2012 was in Group 6 at the northeast corner of Hogan and Trent. Sample 6-id-5 had a concentration of 1551 ug/kg PCBs. The contributing area to this catch basin is the east half of Hogan north of Trent. An adjacent vacant field east of Hogan was also identified as a potential source of runoff to the catch basin. Soil samples were collected on the east side of the sidewalk and in the crack between the road and the sidewalk by Urban Waters and split samples were collected by the City of Spokane and analyzed using EPA Method 8082. All three of the City's samples were non-detect, indicating that the adjacent field is not a likely source of PCBs. Ecology used a lower detection limit for EPA Method 8082, and were able to detect PCBs in the samples. However, the results were in the low-part per billion range (ug/kg), confirming that this location is likely not a

substantial source of PCBs to the catch basin at Hogan and Trent. No obvious sources are apparent in this location. It is possible that an intermittent or mobile source contributed to the high PCB concentration.

City Parcel PCB Cleanup Site

The City Parcel PCB Cleanup Site was formerly owned by Spokane Transformer, whose transformer repair and recycling activities contaminated site soils with PCBs. In 2008, remediation was performed at the site, removing soils with greater than 10 mg/kg PCBs. This is the equivalent of 10,000 parts per billion. Although remedial actions were performed on the City Parcel property, relatively high PCB concentrations were detected in the catch basins receiving stormwater from the vicinity of the site. The basin immediately downstream of the site is a drywell with an overflow structure that connects to the storm sewer system, which had a PCB sediment concentration of 3,285 ppb. The City inserted a plug into the overflow pipe, effectively disconnecting the City Parcel site's stormwater from directly entering the storm sewer system. However, soils from the site and vicinity may migrate to the storm sewer system through wind-blown and track-off mechanisms.

The City Parcel cleanup focused on soils within the property boundaries and did not extend into adjacent properties or right-of-way. Confirmation samples collected during cleanup activities were greater than 1 mg/kg (1,000 ppb) on the north and west sides of the property adjacent to City right-of-way, indicating that the PCB contamination may have extended beyond the property boundaries. Ecology is planning to conduct additional sampling in summer 2014 to identify the extent of contamination beyond the City Parcel property.

Storm Sewer Construction Materials Investigation

The City of Tacoma has tracked PCBs in its storm sewer system leading to the Thea Foss Waterway using sediment traps (Tacoma, 2014). The City thoroughly cleaned the entire storm sewer system in this area to remove legacy contamination; however, after the cleaning, PCBs were still detected. After further investigation, a high source of PCB, up to 260 ppm, was detected in crack sealant used in a 1970's construction project.

In June 2010, the City of Spokane evaluated the storm sewer system in the Union Basin for the presence of PCB-containing materials and legacy contamination in the pipes. The area of focus was the storm sewer system downgradient of the City Parcel site, along Springfield Avenue from Cook Street to Crestline Street (1,100 feet of pipe) plus the pipes connecting to catch basins in the three intersections. First, a pig was pulled through the storm sewer pipes, but this smeared sediments all over the pipes. To remedy this, crews used a hydrovac to clean all of the pipes in the Union Basin. A TV camera was then used to verify the pipes were cleaned. There was no visual presence of sediment or products such as the crack sealer that was found in Tacoma. The City of Spokane has not installed sealant between the road asphalt and concrete curb in this area. Similar to Tacoma's results, PCBs were still detected in sediments and stormwater after the pipes were thoroughly cleaned.

As part of the PCB product sampling project discussed below, the City plans to sample PVC pipe, cured-in-place pipe liner, short line pipe repair material, asphalt sealer, and crack sealer for the presence of PCBs.

STORMWATER SAMPLING

Stormwater sampling began in fall 2012. Samples were initially collected in the Union stormwater basin, a municipal separate storm sewer (MS4) basin. Automatic flow-weighted composite samplers and flow monitors were installed in two locations within the Union stormwater basin as shown in Figure 5. Stormwater sampling may provide data that can be used to estimate PCB loadings from basins as well as track the stormwater PCB concentration over time.

The City, in coordination with Ecology's Urban Waters Initiative, developed a monitoring and sampling plan for stormwater sampling. The City's stormwater sampling equipment near the Union Basin outfall was installed in the same location where Urban Waters has been collecting stormwater samples. Therefore, the City's sampling data can be more closely correlated to data collected by Urban Waters. The upstream stormwater sampling equipment was installed near the intersection of Lee and Springfield. This is just downstream of a former PCB Cleanup Site known as City Parcel (formerly owned by Spokane Transformer). The catch basin closest to the City Parcel site had a relatively high PCB concentration during 2010 catch basin sediment sampling, so the Wastewater Management Department disconnected it to prevent contaminated stormwater and sediment from reaching the river. The stormwater sampler is intended to verify if this remedial action was successful.

Additional automatic flow-weighted composite stormwater sampling equipment was subsequently installed in two more MS4 basins in the City and two CSO basins. The Cochran stormwater basin encompasses about 5,300 acres of the north side of the City of Spokane and provides a good representative stormwater sample for the City. The Washington stormwater basin is located north of downtown and is located in a more urban area. Sampling equipment was also installed just downstream of the CSO 34 regulator in spring 2013 and at the CSO 06 regulator in fall 2013. Stormwater basins and sample locations are shown in Figure 6.

Sample Quality Control

For each set of samples, the laboratory analyzes a blank sample by running clean water through the laboratory equipment to detect PCBs introduced to the sample from the equipment and/or laboratory setting. Flags were noted in the stormwater sample data where an individual congener had less than 10 times (10x) the concentration detected in the blank sample. These congeners were subtracted from the total PCB concentration to come up with the reported values.

A blank correction of 10x was used for stormwater analysis to match the quality control procedures outlined in the QAPP for the City's wastewater PCB sampling. As the Spokane region has increased its PCB sampling efforts, different entities have developed their own quality control procedures, using blank correction values ranging from zero (no correction) to 10x. The Spokane River Regional Toxics Task Force (SRRTTF) is developing a QAPP for regional sample efforts, with a draft correction value of 3x. One goal of the SRRTTF is to standardize PCB sampling and quality control procedures. When the SRRTTF has finalized this protocol, the City will adjust its blank correction procedures accordingly. It is not anticipated that the reported values will change substantially because most of the blank samples have had relatively low contamination. Reported stormwater concentrations with a blank correction of 10x are

approximately 5% lower on average than uncorrected values (ranging from no change to as much as 30% lower).

Results

PCB samples have been collected in each of the stormwater and CSO sample locations and analyzed using EPA Method 1668. Stormwater and CSO PCB sample results are shown in Table 4 and graphically in Figure 7.

Ecology's Urban Waters staff sampled stormwater near the Union basin outfall from 2009 to 2011. Samples were collected in the same location as the City's Trent & Erie samples. Results showing Ecology and City of Spokane samples chronologically are shown in Table 5. Ecology collected grab samples and the City collected composite samples, so they are not directly comparable. However, the trend shows a decreasing PCB concentration after the City plugged the connection to the Lee and Springfield drywell and initiated remedial maintenance in the Union basin in fall 2010 and again in fall 2012. The relatively high PCB concentration in September 2010 may have been caused by residual material moving through the system from remedial maintenance in the dry summer months. Also, early September is generally a 'first-flush' type of storm in the Spokane area, where late summer is typically very dry. Less than one tenth of an inch of rain fell on September 9, 2010, preceded by only one minor rain event in August and two in July.

The Liberty Lake Source Trace Study (Ecology, 2010) sampled PCBs in stormwater. The intent of the study was to identify "urban background" concentrations where there is no known point source of PCBs. Stormwater concentrations ranged from about 458 to 8,415 pg/l (parts per quadrillion, ppq). The City's PCB stormwater samples from the Cochran and Washington stormwater basins generally fall within this range (Figure 7). This indicates that there may not be significant individual PCB point sources in these basins, and that the PCB concentrations are likely coming from a plethora of nonpoint sources.

PCB concentrations in CSO 34 are somewhat elevated as compared to the Liberty Lake study, Cochran and Washington stormwater basins. CSO samples contain wastewater in addition to stormwater, so the potential PCB sources are somewhat different. CSO 34 is part of the priority study area, and has heavy industrial land use at the northern end. CSO 06 had only slightly elevated PCB concentrations as compared to Liberty Lake, Cochran, and Washington stormwater basins. CSO 06 is located in a residential area of the City.

As expected, PCB concentrations are elevated from the Liberty Lake "urban background" in the Union Basin, and are highest at the Lee and Springfield sampler next to the City Parcel PCB cleanup site. While direct drainage from the City Parcel site is prevented from entering this stormwater basin, surface soils still contain PCBs. There is the potential for wind-blown dust from this site to enter the storm system.

Correlation to Other Factors

A number of factors were plotted against PCB concentration in order to assess correlations, including total suspended solids (TSS), total storm precipitation, storm intensity, and runoff volume. It was assumed that a correlation between PCB concentration and TSS would be observed because PCBs tend to adsorb to

fine particulates. However, there was no strong correlation between the two parameters. There was also no discernible correlation to total precipitation or rainfall intensity. PCB concentrations tended to decrease with higher runoff volumes. This is expected due to dilution of a finite amount of PCBs in the system.

When PCBs were simply plotted on a time scale with climate data, patterns emerged (Figures 8 and 9). Seasonal patterns are evident, with peaks in fall and spring. The fall 'first flush' storm has a relatively higher PCB concentration as PCBs accumulate over the dry summer months. Concentrations decrease through the fall when storms are frequent. A temperature inversion occurred in January, trapping wood smoke near the ground surface that may have contributed to PCB accumulations. The highest PCB concentrations were observed after periods of high winds. April 2013 was the windiest month since February 1999. Subsequently, each of the five locations sampled in May 2013 had markedly elevated PCB concentrations. In August 2013, a large dust storm blew over the region from the Columbia Basin. The CSO 34 sample collected just days later had the highest PCB concentrations collected from that basin.

In water year 2014 (beginning October 1, 2013), a similar pattern appears to be emerging in the Cochran Basin and nearby CSO 06. Concentrations are highest at the onset of fall rain, decreasing through the fall and winter, and again increasing after a dry, windy spring.

PATTERN TRACING

PCB molecules, or congeners, can have between one and ten chlorine atoms each. Homologues are a set of congeners with the same number of chlorine atoms. *Mono*chlorobiphenyls (monoCBs) are PCBs with one chlorine, *di*chlorobiphenyls (diCBs) are PCBs with two chlorines, and so on. Homologue patterns can be useful in tracing PCB sources or differentiating separate PCB sources because they identify different mixes of PCB congeners in a sample.

Homologue patterns for catch basin sediment samples and stormwater samples are shown in Appendix B. Composite samples from 2010 and 2011 were not analyzed due to the homogenous nature of the samples. For comparison to known PCB sources, homologue patterns for the sampled oils and hydraulic fluids are shown on page B-11. Patterns for standard Aroclor mixes are shown on page B-12.

Oils and fluids were tested off the shelf, and are primarily composed of the lower-chlorinated monoCB, diCB, and triCBs. These lighter PCBs are more susceptible to evaporation and less likely to be present in sediment samples that have been sitting at the bottom of a catch basin for one or two years.

Results

Patterns are fairly consistent through most of the catch basin sediment and stormwater samples. They most closely represent the pattern for Aroclor 1260, although there tends to be a greater percentage of lower-chlorinated congeners in most of the sediment and stormwater samples. Aroclor 1260 was commonly used in transformers, hydraulic fluids, synthetic resins, and dedusting agents.

Sample "Retest 07" on page B-7 is from the catch basin immediately downstream of the City Parcel PCB cleanup site (formerly Spokane Transformer) in Group 12. The pattern very closely mimics the pattern of Aroclor 1260. Similarly, the Lee & Springfield stormwater samples (page B-2) have a very similar pattern to Aroclor 1260 as did the 2012 Group 12 composite sample (page B-10).

The 2012 Group 4 sample number 4-9 had an unusually high percentage of the "lighter" or lower-chlorinated congeners when compared to the other samples, especially monochlorobiphenyl (page B-7). However, the total concentration was relatively low at 111 ug/kg. It is located underneath a railroad bridge on Trent Avenue.

2012 Group 6 sample number 6-5 and its duplicate also had a relatively high percentage of the "lighter" congeners and was dominated by pentachlorobiphenyl (page B-8). It is located on the northeast corner of Hogan and Trent, and had the highest individual catch basin PCB concentration in 2012 of 1,551 ug/kg. The pattern is similar to Aroclor 1254, which was one of the most widely used Aroclors, and can be found in transformers, caulks, hydraulic fluids, rubbers, adhesives, inks, and cutting oils among other products.

While pattern tracing can give hints toward identifying varying PCB sources, it should be noted that this method is only approximate. The mix of PCB congeners in a compound changes over time and is altered through the environment as certain fractions adsorb to soils, are carried away in stormwater, or evaporate.

PRODUCT SAMPLING

The City of Spokane received a Grant of Regional or Statewide Significance from Ecology to sample municipal products that may come into contact with stormwater for PCBs. The analysis and homologue patterning may further assist in tracing true sources of PCBs to stormwater. Sampling is scheduled to begin in summer 2014, and will include products such as:

- Yellow and white traffic paint
- Hydrant paint
- Utility locate paint
- Dust suppressant
- Deicer
- Pesticides
- Motor oil
- Various engine oils
- Diesel and gasoline
- Asphalt sealers
- PVC pipe and pipe liners

In all, about 40 product samples will be collected and analyzed per EPA Method 1668. The full set of congeners will be analyzed to determine which congeners and/or patterns can be associated with stormwater samples. The final report will be completed by February 2015.

UNION BASIN MITIGATION

Due to the ubiquitous nature of PCB sources to stormwater, the preferred mechanism for preventing PCBs from entering the Spokane River is to disconnect the stormwater basin from its outfall. The Union Basin is relatively small, and is located in an area with good infiltration, presenting an opportunity for infiltration Best Management Practices (BMPs).

The San Francisco Estuary Institute developed a BMP Toolbox for reducing PCBs in municipal stormwater (SFEI 2010). BMPs such as vegetated swales and bioretention facilities were listed as applicable BMPs for controlling runoff from impervious surfaces.

With a grant from the Department of Ecology, the City is currently designing a system of infiltration BMPs in the Union Basin. The preliminary design consists of bio-infiltration facilities (swales) and tree box filters, a form of bioretenion. These BMPs are designed to treat and infiltrate stormwater, capturing PCBs in the treatment media and allowing the stormwater to infiltrate to the subsurface. The outfall will be disconnected, preventing untreated stormwater from entering the river.

SUPPLEMENTAL ENVIRONMENTAL PROJECTS

In addition to the Adaptive Management Plan, five supplemental environmental projects were agreed to as part of the Consent Decree.

Supplemental Environmental Project I: Low Impact Development

In the Consent Decree, the City agreed to develop a Low Impact Development (LID) ordinance. "Low Impact Development," also referred to as "green infrastructure," involves stormwater management and land development strategies that use natural or man-made features to filter and retain stormwater before it reaches the City's separate storm sewer or combined storm and sanitary sewer systems. The City of Spokane convened an LID Main Committee and Subcommittee to coordinate and develop the City's LID efforts. The committees are composed of staff from Planning, Engineering Services, Capital Programs, Wastewater Management, Legal, Communications, Parks, and the environmental community.

Public Education Campaign

A public education campaign was launched to help inform the general public about low impact development opportunities. Initial campaign materials included a utility bill insert, informational brochure, and web page. The materials were made available to the public in spring 2012 through utility bill inserts, the Engineering Services brochure kiosk, in permit information packets, and online. A PDF copy of the brochure and website materials can be viewed at www.spokanewastewater.org/LID.aspx .

Preparation of Ordinance

Originally, the Subcommittee planned to identify LID techniques appropriate for the City of Spokane and develop a draft ordinance based on these findings. However, Spokane County was awarded a grant from the Department of Ecology to produce an Eastern Washington Low Impact Development Guidance Manual. The City of Spokane joined the associated Stakeholder Advisory Group in addition to several other Eastern Washington Phase II jurisdictions.

Technical standards and guidance for using LID principles and best management practices has been developed under the Eastern Washington Low Impact Development Guidance Manual process. The City of Spokane's ordinance was developed in conjunction with the guidance manual, but as a separate process without involvement from other Phase II jurisdictions. The final guidance manual and training materials are published on the Washington Stormwater Center's website: http://www.wastormwatercenter.org/ew-lid-guidance-manual/

The City's ordinance process involved the formation of an internal Technical Advisory Committee with representatives from each pertinent City department and an external Stakeholders Group to facilitate input from the development community, utilities, the environmental community, consultants, professionals, landowners, residents, and other interested parties. These groups worked on the development of incentives for LID implementation, drafting ordinance language, and providing input on the Eastern Washington LID Guidance Manual.

The ordinance includes provisions for stormwater fee discounts, allowance for the use of pervious concrete on sidewalks, encouragement to use LID in street layout design, and adoption of the Eastern Washington LID Guidance Manual as an optional reference for guidance on the design of stormwater facilities. The ordinance was unanimously passed by City Council on August 26, 2013 and became effective October 1, 2013. The full ordinance (ORD C35021) can be downloaded at https://static.spokanecity.org/documents/publicworks/stormwater/greeninfrastructure/lid-ordinance.pdf or viewed in the Spokane Municipal Code.

Supplemental Environmental Project II: Rose Foundation

The Rose foundation for Communities and the Environment was paid $125,000 by the City of Spokane to fund environmental project activities that improve water quality within the Spokane River Watershed. Payment to the Rose Foundation was made by the City in September, 2011 by City Warrant No. 433577. The Rose Foundation advertised the grant as the "Mike Chappell fund for the Spokane River." Grant proposals to the Rose Foundation were due in April, 2012 and the Rose Foundation announced grant recipients on June 6, 2012. Funded projects include the following:

- Two Spokane River Toxics Cleanup Projects
  - Reduce PCBs and other toxics in the river through public education and building public support for Clean Water Act enforcement and creation of a statewide water quality standard protective of human health
- Spokane River Shoreline Master Program Update Project
  - Protect shoreline habitat and water quality by participating in Shoreline Master Program updates along the Spokane River
- Latah Creek Watershed Restoration Project
  - Restore, enhance, and conserve four miles of riparian zone along Latah Creek
- Industrial Stormwater Dischargers Survey
  - Survey of industrial stormwater dischargers into the Spokane River in Kootenai County and Lake Coeur d'Alene
- Spokane River Watershed Restoration Project
  - Stream bank restoration and planting of 10,000 native trees along Latah Creek
- Spokane River Stormwater Initiative
  - Ensuring stormwater permit compliance and providing educational opportunities for students at Lewis and Clark High School and Gonzaga University

Supplemental Environmental Project III: Storm Drain Marking Program

The City has implemented a storm drain marking program, used as an educational tool to help prevent polluted discharges to the storm sewer system. Three curb markers were developed, one each for the MS4, CSO, and drywell locations as shown below, respectively.

Priority was given to locations with the highest incidence of PCB discharges in stormwater. At the completion of sampling and remedial maintenance for the 2010 and 2011 sample locations, curb markers were placed at each storm inlet. Curb markers inform the public not to dump waste down the drain, and include the City's stormwater hotline phone number for reporting illicit discharges.

Priority areas were identified where the curb markers will have the most benefit. The priority locations for curb marker installations include the following:

- City of Spokane public schools
- Spokane Community College
- Problematic and high risk areas

Wastewater Management staff have completed these areas and continue to install curb markers in coordination with regular maintenance activities. As a voluntary measure, the City has elected to continue the curb marking program and plans to continue curb marking throughout the City. Over 7,000 curb markers have been installed.

Supplemental Environmental Project IV: GIS Layer

Wastewater Management has developed Geospatial Information System (GIS) layers, identifying the location of MS4 features such as pipes, catch basins, and outfalls. A read-only copy of the MS4 GIS layers were provided to the Spokane Riverkeeper in October, 2011. These layers can also be accessed by the public at the Wastewater Management web site as well as Spokane's "City Map" website, www.spokanegis.org/citymap2/.

Supplemental Environmental Project V: Stormwater Educational Guide

Funding was provided to the Spokane River Forum for producing a stormwater educational guide. The guide is intended to inform industry and the public about the effect of pollutants in stormwater on the Spokane River and regulatory requirements for stormwater management. The Spokane River Forum, City of Spokane, and Spokane Riverkeeper worked collaboratively to produce the educational guide. The guide can be obtained at City Hall or digitally on the Spokane River Forum's website, http://www.spokaneriver.net/spokanestormwater/book.swf.

ECOLOGY CONSULTATION; PUBLIC INVOLVEMENT

The Consent Decree requires the City to consult with Ecology in implementing and updating the Adaptive Management Plan. Several instances are noted above in this Annual Report where the City acted in consultation with Ecology staff.

The Consent Decree also requires the City to conduct public involvement when it issues this Annual Report. The 2014 PCB Annual Report will be presented at the July, 2014 Spokane River Regional Toxics Task Force meeting. The task force is composed of staff from Ecology, EPA, IDEQ, local jurisdictions, industries, and environmental entities involved in the identification and reduction of toxics in the Spokane River. Actions taken by the City of Spokane under the PCB Consent Decree are integral to the identification and reduction of PCB sources to the river.

The City will also present this information at StormCon, held in Portland, Oregon in August 2014. StormCon is a national annual stormwater conference that brings together industry experts to present and discuss stormwater program management needs, BMP performance case studies, water quality monitoring, research, technology, and services.

ADDITIONAL RELATED PROJECTS

Integrated Clean Water Plan

The City of Spokane adopted an Integrated Clean Water Plan in May, 2014. The plan details a strategy to manage CSO overflows, reduce stormwater flows to the Spokane River, and improve effluent from the Riverside Park Water Reclamation facility. When prioritizing projects and assessing their effectiveness in removing pollutants from the river, PCBs were a major consideration. Projects selected for optimal PCB removal were:

- Capturing, treating, and infiltrating flow from the Cochran stormwater basin
- Installing control facilities in CSO 34
- Operating membrane filtration technology at the Riverside Park Water Reclamation facility year-round instead of only during the critical season

The Integrated Clean Water Plan can be downloaded from the City's website, https://static.spokanecity.org/documents/publicworks/wastewater/integratedplan/integrated-clean-water-plan-draft.pdf

Toxics Management Plan

The NPDES Waste Discharge Permit for the Riverside Park Water Reclamation Facility (RPWRF) includes provisions for PCB sampling in the City's sewer system and preparation of a Toxics Management Plan (TMP), submitted to Ecology annually by September 15th. The TMP addresses source control and elimination of PCBs from the RPWRF to the Spokane River with the following elements:

- Identifying known and potential sources of PCBs, including industrial and commercial sources, contaminated stormwater, and contaminated soils and sediment.
- Including PCBs as an element of RPWRF's pretreatment program.
- Eliminating active sources of PCBs.
- Changing procurement practices to use PCB-free products over those regulated to only the TSCA threshold.
- Educating the public (individually or collaboratively with other Spokane River dischargers) about the difference between PCB-free products and those which may still contain PCBs below the TSCA threshold.

The City has developed a monitoring program to assess PCB concentrations in the collection system as well as the influent and effluent at the RPWRF. As data is gathered, the City will gain a better understanding of PCB loading to the RPWRF. A public education effort is also underway in coordination with the Spokane River Regional Toxics Task Force to raise awareness of PCBs in the community.

PCB Product Purchasing Ordinance

The City of Spokane passed an ordinance in June 2014 giving preference to products and packaging that do not contain PCBs. The ordinance states that no City department may knowingly purchase products containing PCBs unless it is not cost-effective (increasing the purchase price more than 25%) or feasible to do so. The City may elect to sample products or accept analysis results from suppliers or other outside sources.

The ordinance is similar to a bill recently passed by the Washington State Legislature, SB 6086, Reducing Poloychlorinated Biphenyls in Washington State. The bill became effective June 12, 2014, and gives preference to purchase of products and packaging that does not contain PCBs by Washington state agencies.

The suite of projects identified in this annual report are intended to identify and reduce PCB loading to the Spokane River. The City of Spokane continues to work with regional interests in characterizing and reducing PCBs and other pollutants as collaboration with other entities is a cornerstone of making progress in toxics reductions. Through the work of the City and in partnership with the Spokane River Regional Toxics Task Force and Ecology, these studies and activities are making progress toward reaching water quality standards for PCBs in the Spokane River.

SOURCES

Agency for Toxic Substances and Disease Registry (ASTDR). Toxological Profile for Polychlorinated Biphenyls (PCBs). U.S. Department of Health and Human Services. http://www.atsdr.cdc.gov/toxprofiles/tp17.pdf

Ecology, 2010. Liberty Lake Source Trace Study, Regarding PCB, PBDE, Metals, and Dioxin/Furan. Washington State Department of Ecology. Publication No. 10-04-027. www.ecy.wa.gov/biblio/1004027.html

Ecology, 2011 A. Spokane River PCB Source Assessment 2003-2007. Washington State Department of Ecology. Publication No. 11-03-013. www.ecy.wa.gov/biblio/1103013.html

Ecology, 2011 B. Facility/Site Database. Washington State Department of Ecology. Accessed October 25, 2011 from http://www.ecy.wa.gov/fs/

Ecology, 2012. Spokane River Urban Waters Source Investigation and Data Analysis Progress Report (2009-2011). Washington State Department of Ecology. Publication No. 12-04-025. https://fortress.wa.gov/ecy/publications/SummaryPages/1204025.html

EPA, 1996. Method 8082, Polychlorinated Biphenyls (PCBs) by Gas Chromatography. U.S. Environmental Protection Agency.

EPA, 2003. Method 1668, Revision A, Chlorinated Biphenyl Congeners in Water, Soil, Sediment, Biosolids, and Tissue by HRGC/HRMS. U.S. Environmental Protection Agency, Office of Water, Office of Science and Technology, Engineering and Analysis Division (4303T), Washington, DC. Publication No. EPA-821-R-07-004.

Fernandez, Arianne and Hamlin, Ted, 2009. Spokane Basin Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP) for the Spokane River Source Trace Study Regarding PCB, PBDE, Metal, and Dioxins/Furan Contamination. Washington State Department of Ecology, Spokane, WA.

Oregon Department of Environmental Quality. Fact Sheet: Sources of Polychlorinated Biphenyls. Retrieved April 24, 2012, from http://www.deq.state.or.us/lq/cu/nwr/PortlandHarbor/docs/SourcePCBs.pdf

Parsons, 2007. Spokane River PCB TMDL Stormwater Loading Analysis Final Technical Report. Prepared by Parsons Inc. for USEPA Region 10 and Washington State Department of Ecology, Olympia, WA. Publication No. 07-03-055. www.ecy.wa.gov/biblio/0703055.html

SFEI, 2010. A BMP Tool Box for Reducing Polychlorinated Biphenyls (PCBs) and Mercury (Hg) in Municipal Stormwater. San Francisco Estuary Institute. Oakland, CA.

Tacoma, 2014. City of Tacoma, Washington PCB Investigation. http://www.cityoftacoma.org/cms/One.aspx?portalId=169&pageId=41852

Toxnet Hazardous Substances Data Bank: Polychlorinated Biphenyls. http://toxnet.nlm.nih.gov/cgi-bin/sis/search/r?dbs+hsdb:@term+@rn+1336-36-3

U. S. Code of Federal Regulations, 2012. Title 40, Chapter 1, Subchapter R: Toxic Substances Control Act. Part 761: Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions. Retrieved April 24, 2012 from http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=/ecfrbrowse/Title40/40cfr761_main_02.tpl

USGS, 2012. USGS 12422500 Spokane River at Spokane WA. U.S. Geological Survey. Retrieved April 30, 2012, from http://waterdata.usgs.gov/wa/nwis

Table 4
Stormwater PCB Analytical Results

SAMPLE LOCATION	DATE	Hydrology		PCBs
		Volume (gal)	Precip. (in)	(pg/l)
Trent & Erie (Union Basin)	10/29/2012	157,300	0.43	37,093
	11/1/2012	22,300	0.11	43,681
	11/3/2012	73,700	0.24	47,960
	11/8-9/2012	44,900	0.34	17,473
	11/12-13/2012	61,300	0.33	48,438
	3/20/2013	85,560	0.26	19,402
	4/10/2013	8,112	0.07	13,563
	5/13/2013	56,630	0.31	47,455
Lee & Springfield (Union Basin)	10/29/2012	7,100	0.43	35,289
	11/19-20/2012	15,400	1.18	35,141
	3/20/2013	11,489	0.68	66,071
	5/21/2013	1,355	0.25	136,098
	6/19-20/2013	15,308	1.32	82,133
	8/1-2/2013	12,344	1.00	86,373
Cleveland & Nettleton (Cochran Basin)	10/15/2012	3,703,300	0.37	12,444
	10/15/2012 (Dup)	3,703,300	0.37	10,763
	10/25/2012	352,700	0.03	8,415
	11/3/2012	1,868,600	0.20	7,853
	11/8-9/2012	1,683,200	0.17	3,343
	11/12-13/2012	2,941,000	0.27	2,964
	11/19-20/2012	12,857,700	0.95	6,067
	12/4-5/2012	3,641,300	0.23	5,228
	1/8-9/2013	18,282,800	0.09	695
	1/25/2013	12,838,900	0.34	1,858
	2/22/2013	[Instrument Error]	0.18	3,863
	3/6-7/2013	3,279,000	0.25	3,226
	3/20/2013	3,504,100	0.34	5,695
	5/13/2013	1,485,700	0.25	16,288
	5/21-23/2013	1,852,000	0.29	14,592
	6/19-20/2013	17,320,000	1.69	5,557
	11/7/2013	6,037,000	0.67	15,257
	1/8-9/2014	7,060,100	0.53	4,171
	2/11-12/2014	22,144,400	0.20	4,127
	4/17-18/2014	2,643,600	0.52	10,091
Washington St Bridge (Washington Basin)	2/22/2013	260,300	0.18	7,546
	3/6/2013	486,200	0.26	3,113
	4/9/2013	36,017	0.06	3,114
	5/13/2013	213,600	0.27	12,930
	5/13/2013 (Dup)	213,600	0.27	12,473
	5/21/2013	222,600	0.27	12,669
	6/9/2013	2,886,200	1.29	3,385

CSO 34	5/21-23/2013	201,400	0.26	17,164
	6/20/13 (Grab)	[Instrument Error]	1.5	5,742
	6/20-21/13 (Composite)	[Instrument Error]	1.5	8,702
	8/1-2/2013	902,800	0.93	12,134
	9/4/2013	147,500	0.36	23,311
CSO 06	11/7/2013	208,500	0.58	12,680
	1/8-9/2014	266,600	0.44	8,634
	2/11-12/2014	1,392,550	0.21	8,460
	4/24/2014	61,504	0.41	15,862
Equipment Blank	8/24/2012	--	--	168
Trip Blank	3/19/2013	--	--	123
Equipment Blank	3/19/2013	--	--	66

Notes:
pg/l = picograms per liter (parts per quadrillion); gal = gallons; in = inches
Samples analyzed per EPA Method 1668
Blank correction: congeners with 10x laboratory blank detection > sample result not counted in total

Table 5

Union Basin Outfall PCB Analytical Results, Stormwater

SAMPLE ORGANIZATION	DATE	Sample Type	Precipitation (inches)	PCBs (pg/l)
Ecology (UNIONLPT Sample Location)	6/8/2009	Grab	0.29	73,000
	10/2/2009	Grab	0.11	58,200
	2/16/2010	Grab	0.12	460,000
	4/29/2010	Grab	0.48	60,600
	Union Basin Pipe Cleaning and Lee/Springfield Plug Installed June 2010; Remedial Maintenance July-Aug 2010			
	9/9/2010	Grab	0.06	256,000
	1/7/2011	Grab	0.19	55,300
City of Spokane (Trent & Erie Sample Location)	10/29/2012	Composite	0.43	37,346
	Union Basin Remedial Maintenance 10/29/12 to 11/5/12			
	11/1/2012	Composite	0.11	43,841
	11/3/2012	Composite	0.24	47,972
	11/8/2012	Composite	0.34	18,113
	11/12/2012	Composite	0.33	48,862
	3/20/2013	Composite	0.26	19,403
	4/10/2013	Composite	0.07	13,766
	5/13/2013	Composite	0.31	47,455

Notes:

pg/l = picograms per liter (parts per quadrillion)

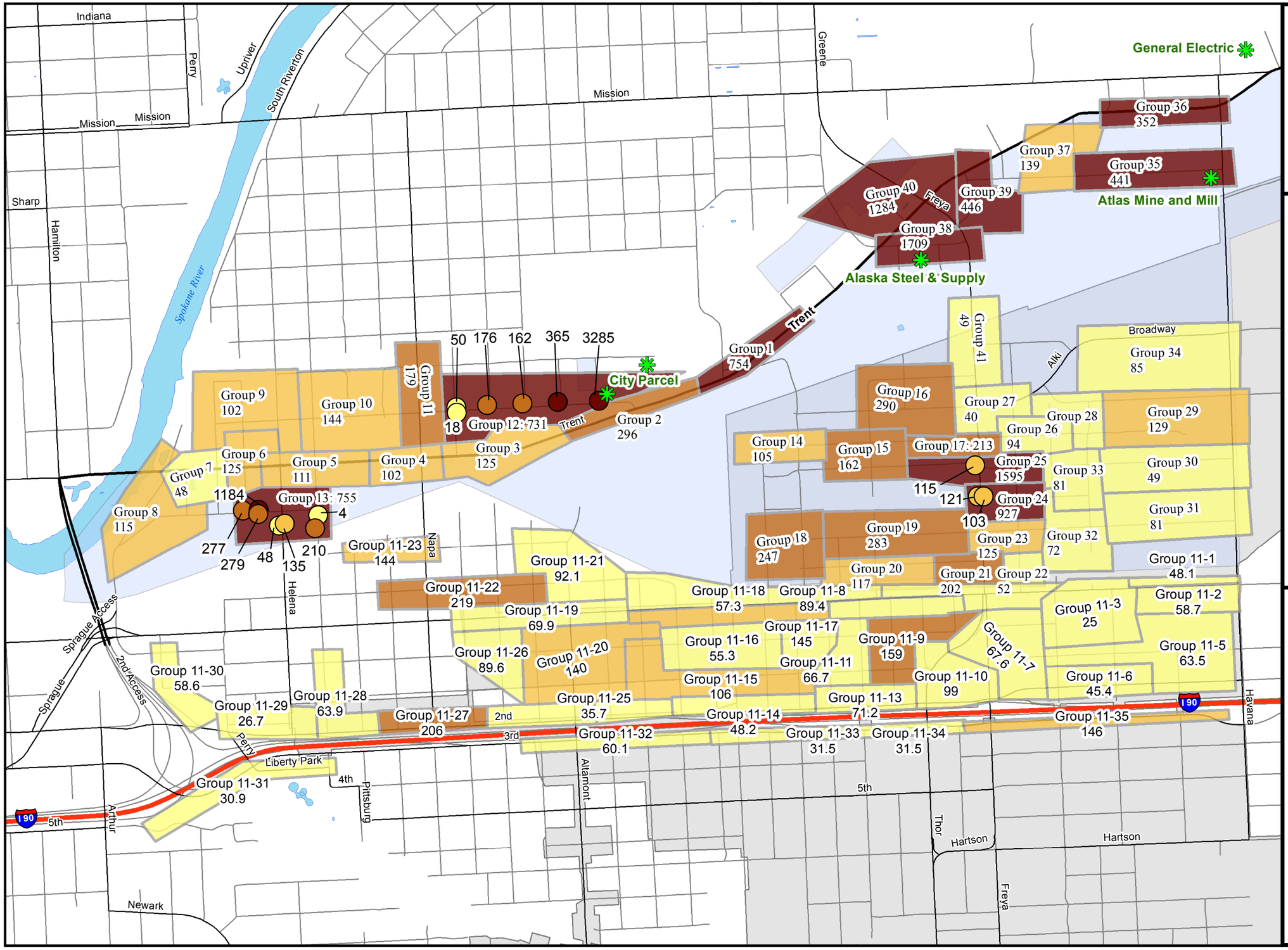
Samples analyzed per EPA Method 1668

Ecology blank correction: congeners with 5x laboratory blank detection > sample result not counted in total

City Blank correction: congeners with 10x laboratory blank detection > sample result not counted in total

Figure 4
Group Composite and Individual PCB Samples 2010-2011

Congener Analysis (Pacific Rim Lab)



Legend

- Ecology PCB Cleanup Sites

PCB Concentration (ug/kg)

- 0 - 100
- 101 - 150
- 151 - 300
- 301 - 1709
- City Boundary

Zoning

Zoning

- Heavy Industrial

Basin Boundary

- CSO 34

Concentrations are in micrograms per kilogram (ug/kg), equivalent to parts per billion (ppb).

0 500 1,000 Feet

N W E S

Geographic Information System

Map Produced: 6/10/2014 LMS

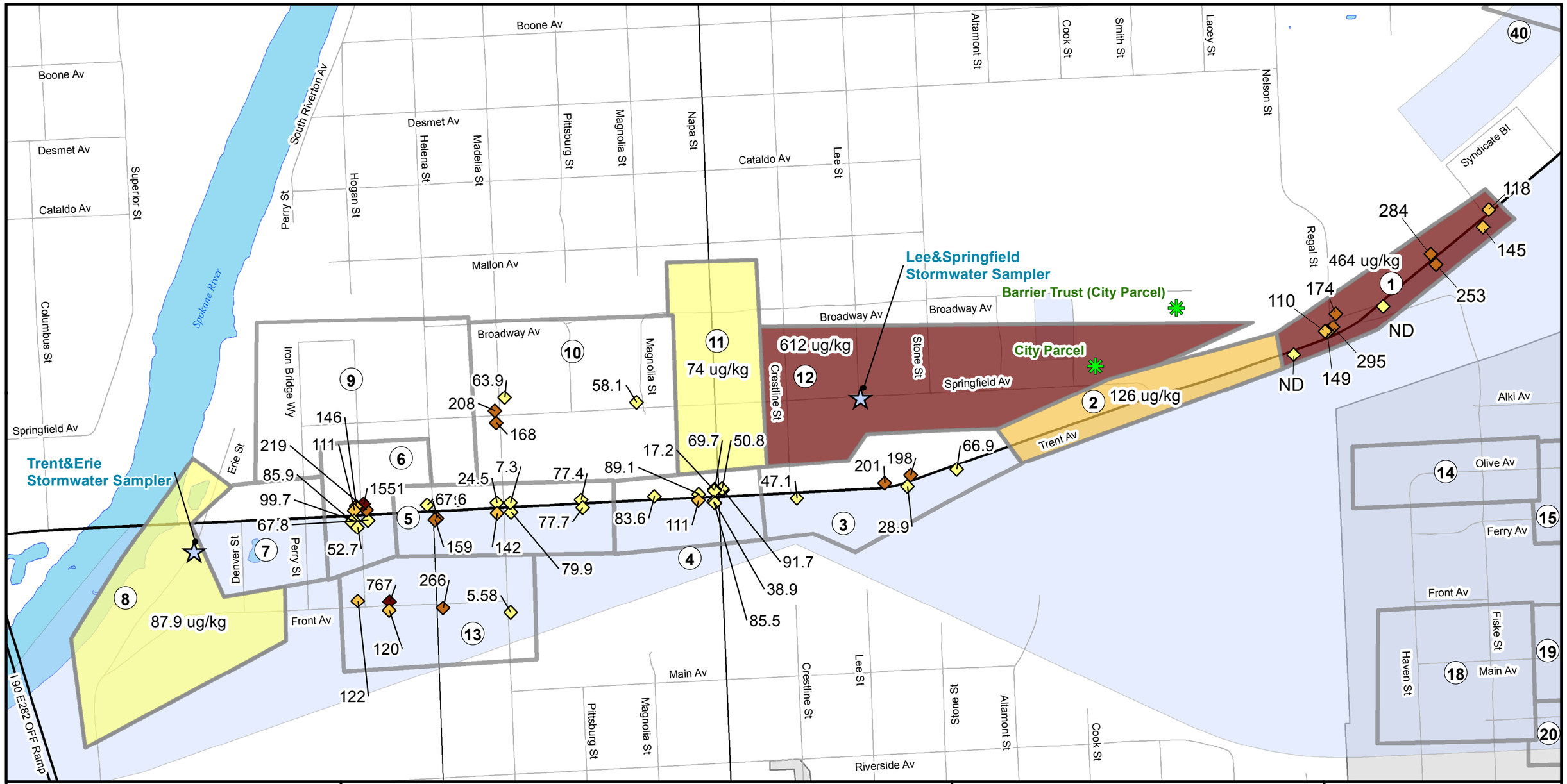


Figure 5
Union Basin
PCB Samples
2012

Congener Analysis
(Except Group 1 Individual Samples)

Legend

Groups

2012 PCB Individuals (ug/kg)
- 5.58 - 100
- 100 - 150
- 150 - 300
- 300 - 1551

2012 PCB Composites (ug/kg)
- 74 - 100
- 100 - 150
- 150 - 300
- 300 - 612

ug/kg = ppb
ug/kg: micrograms per kilogram
ppb: parts per billion

Zoning
- Heavy Industrial

CSO Basin
- CSO 34

Stormwater Sample Locations

Ecology PCB Cleanup Sites

500 250 0 500 Feet

N W E S

Geographic Information System

Map Produced: 06/12/2014 LMS

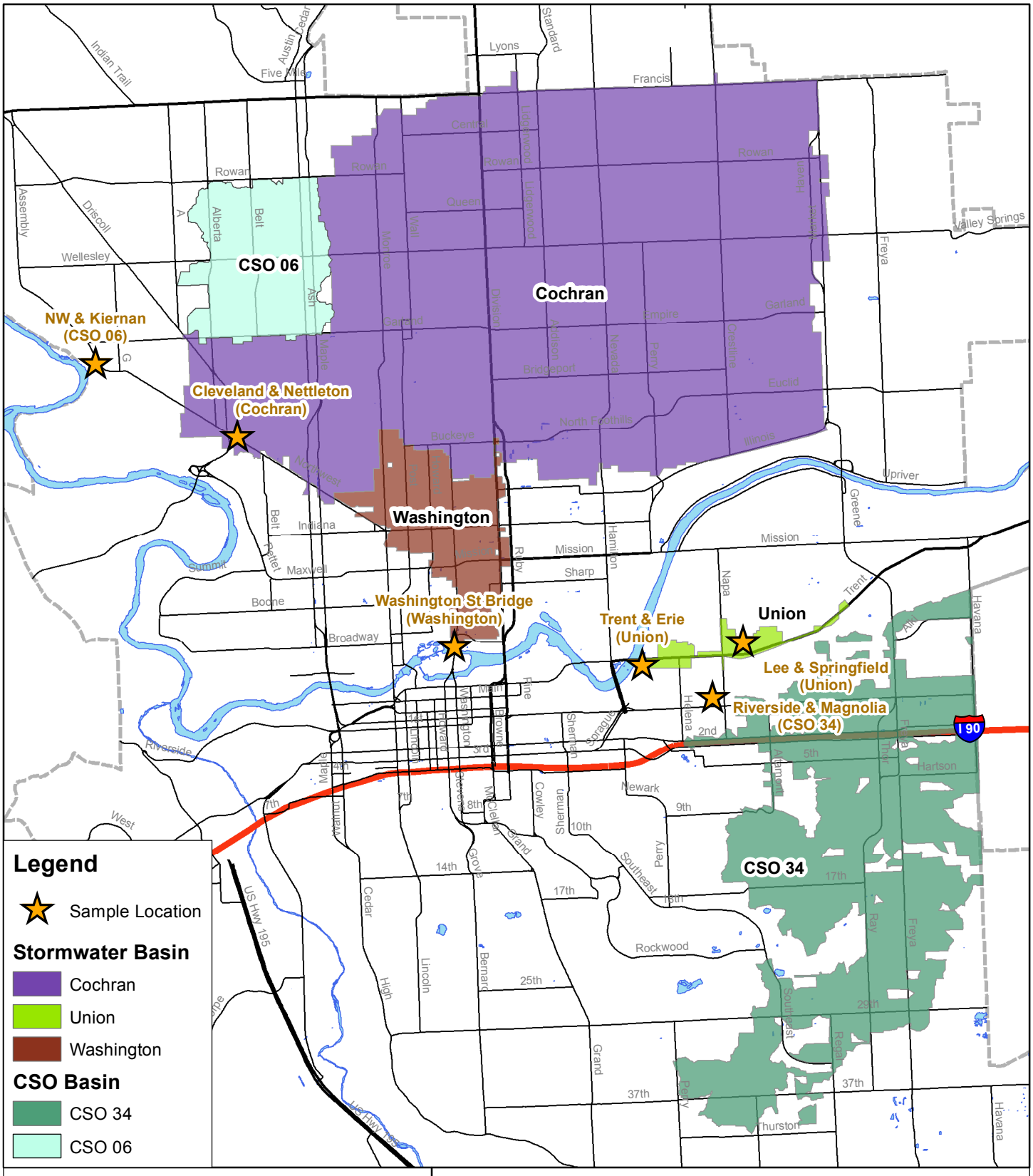


Figure 6
Stormwater/CSO Sample Locations and Drainage Basins

5,000 2,500 0 5,000 Feet

N W E S

THIS IS NOT A LEGAL DOCUMENT: The information shown on this map is compiled from various sources and is subject to constant revision. Information shown on this map should not be used to determine the location of facilities in relationship to property lines, section lines, streets, etc.

Figure 7. Stormwater/CSO PCB Concentrations

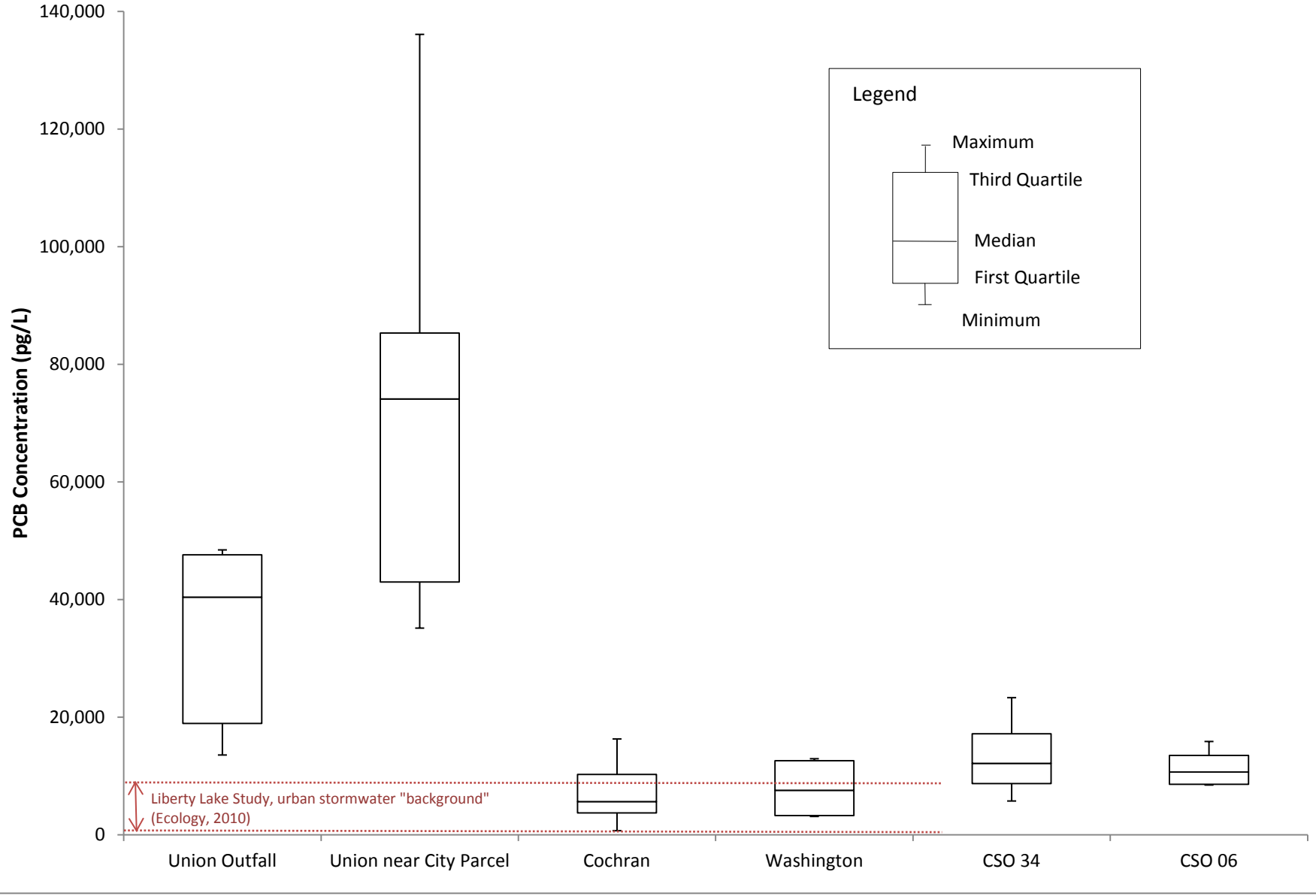


Figure 8: Temporal Trends, PCBs

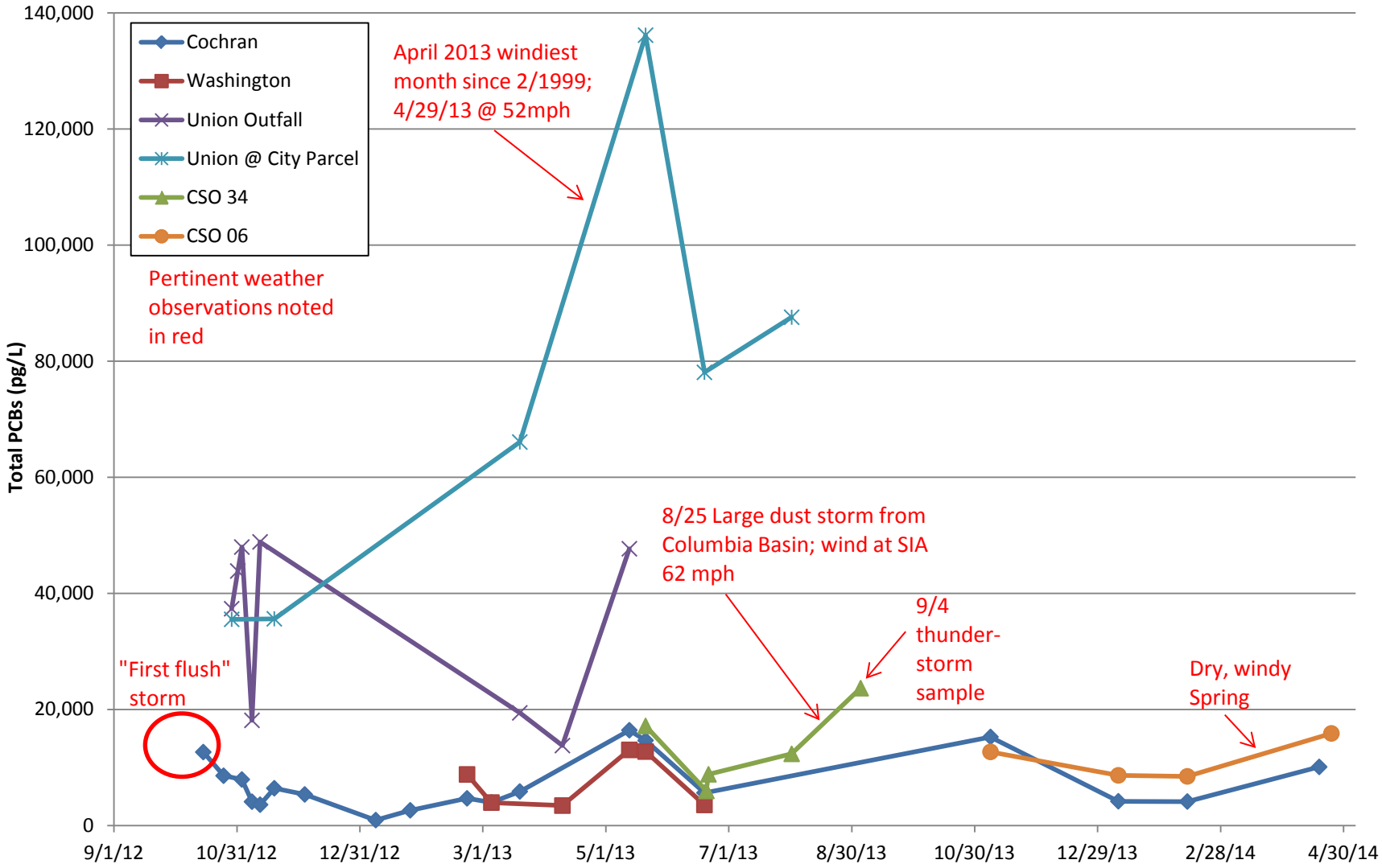
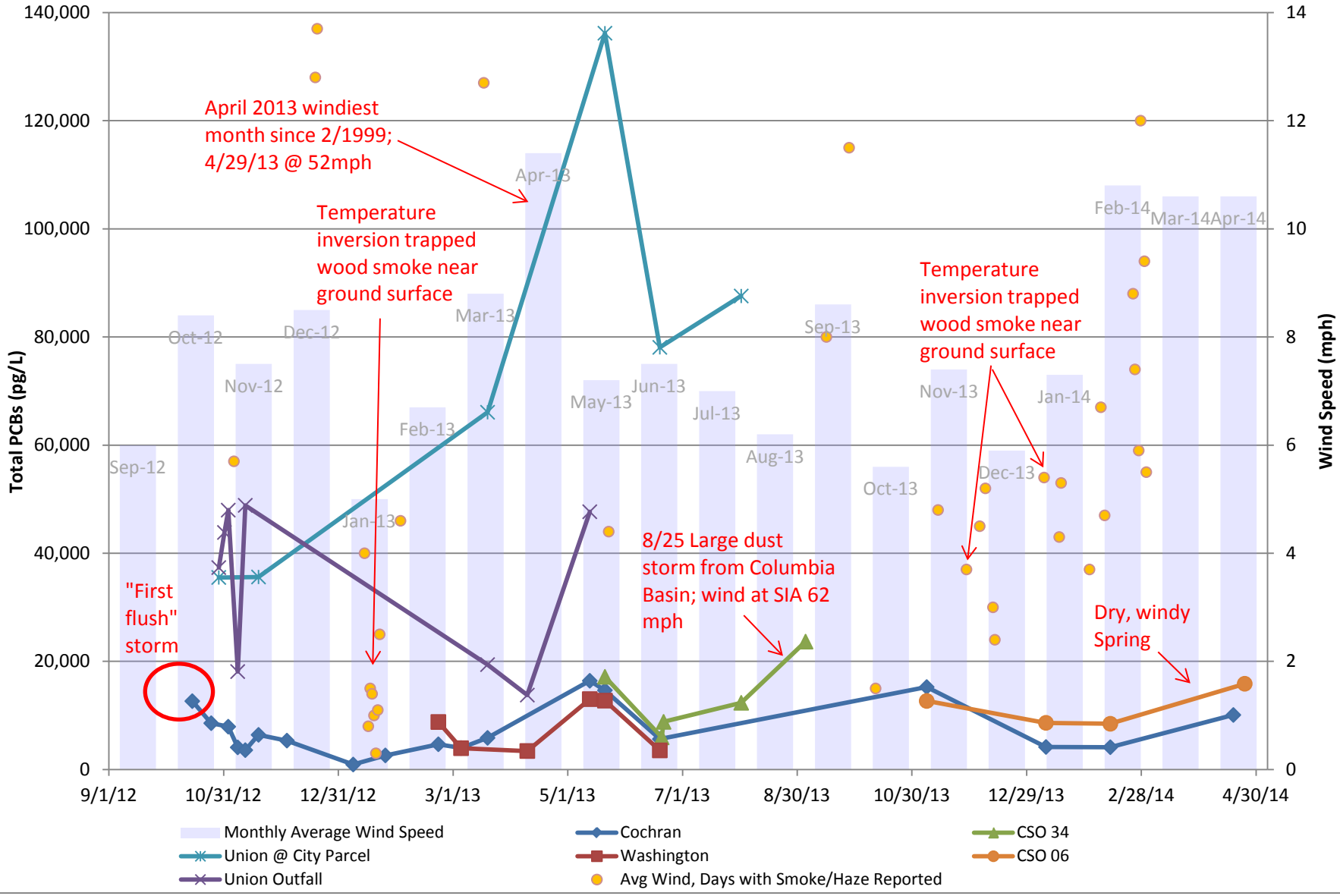


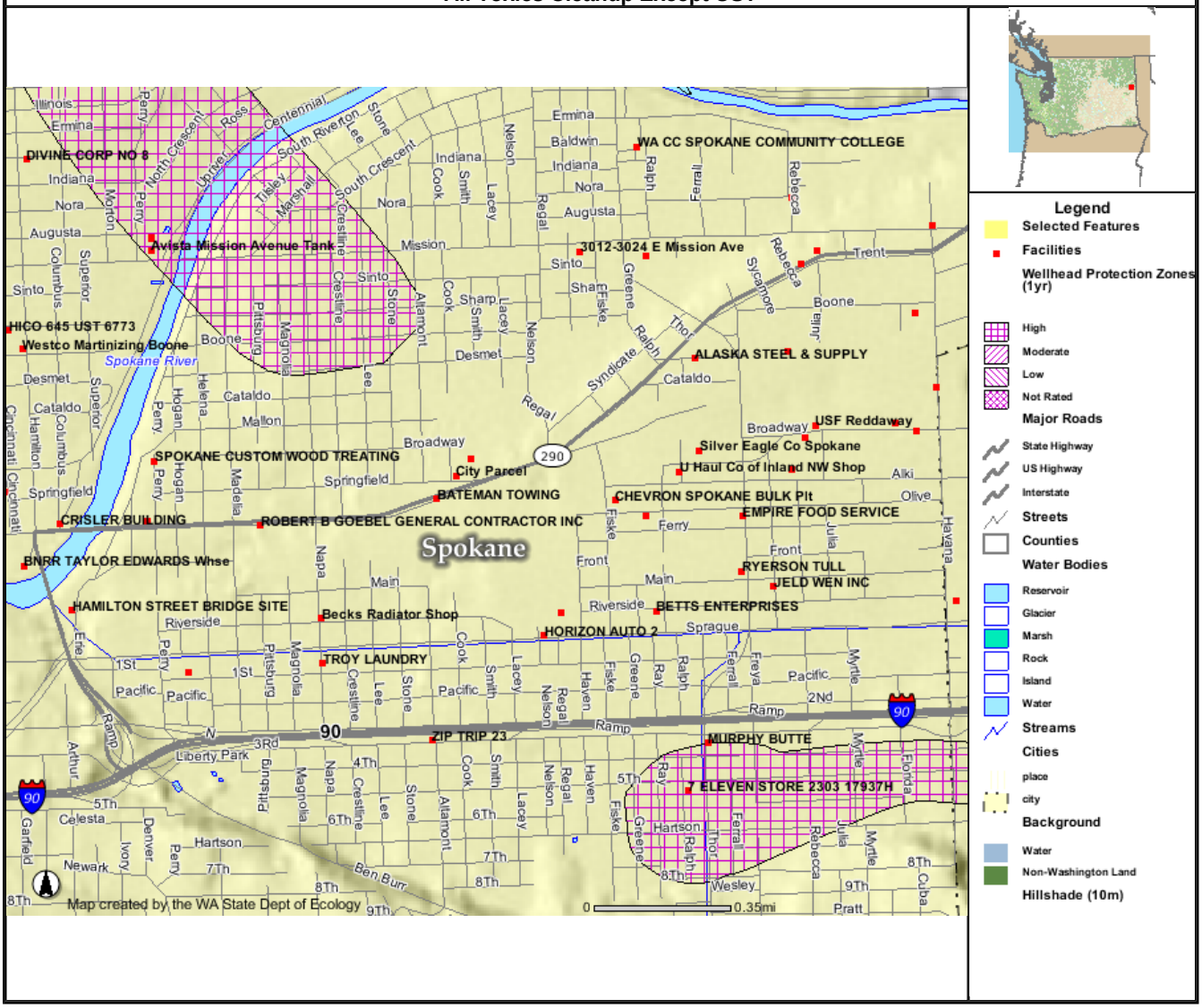
Figure 9: Temporal Trends, PCBs and Wind



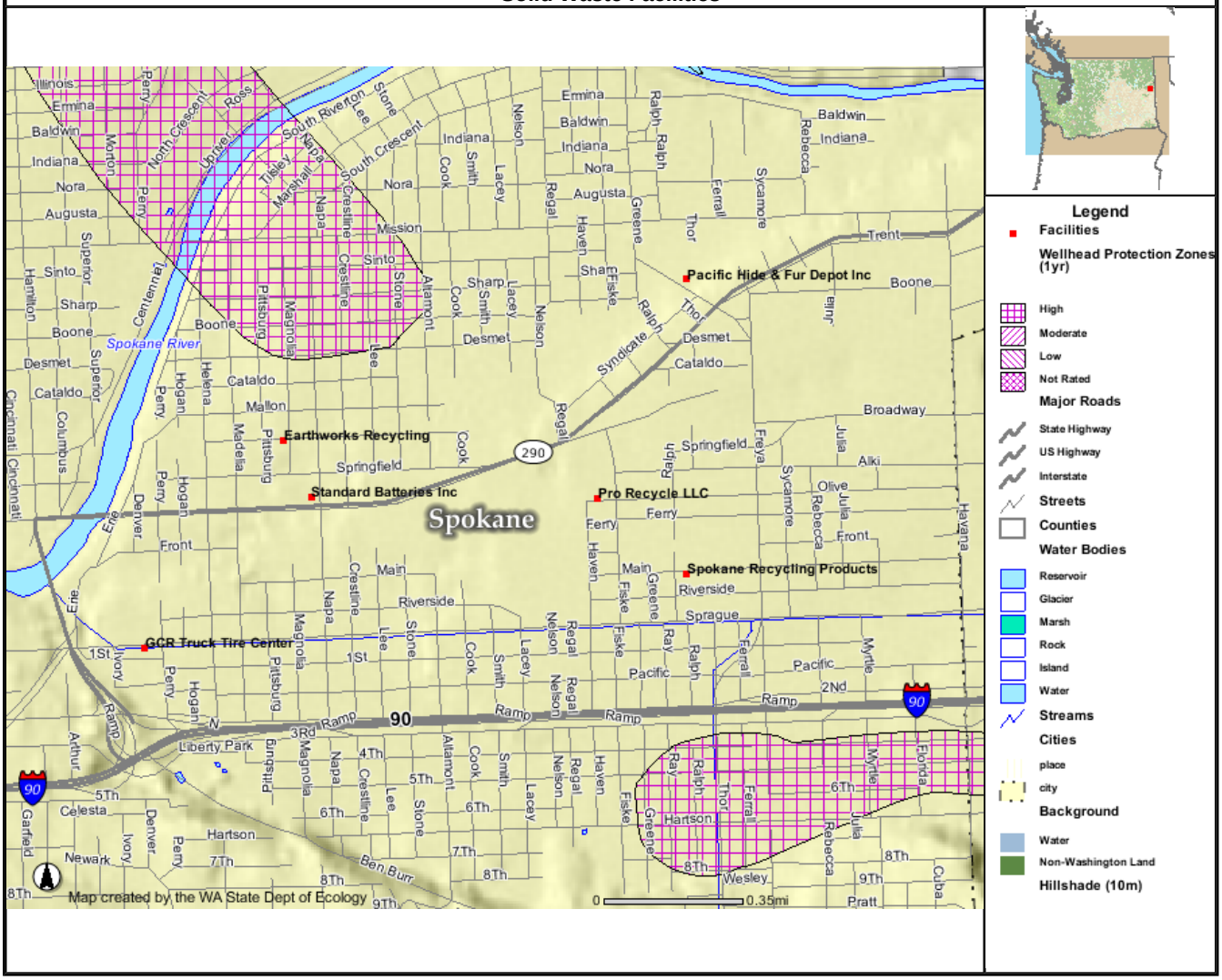
Appendix A

KNOWN CONTAMINATED SITES (ECOLOGY DATABASE)

All Toxics Cleanup Except UST

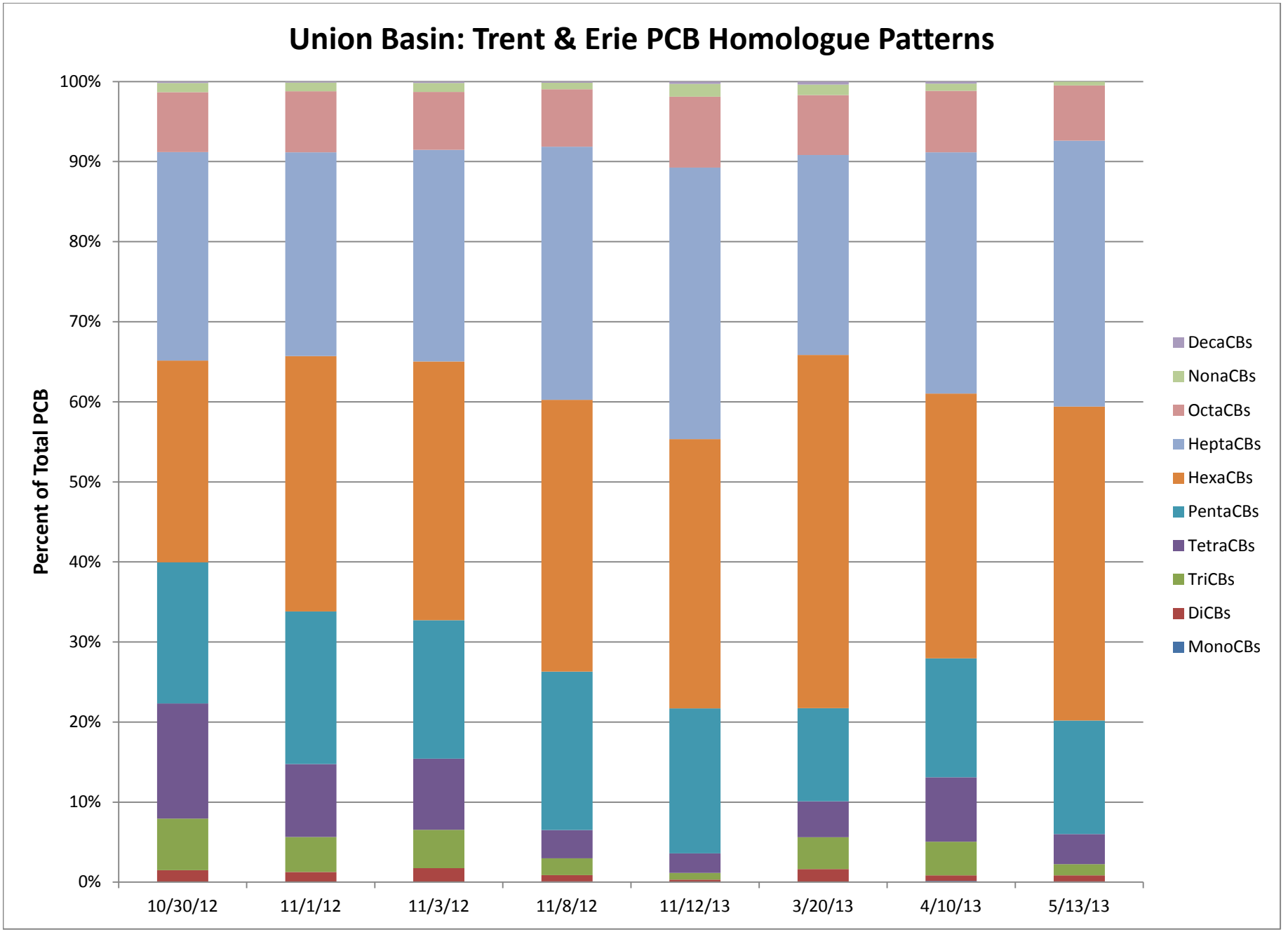


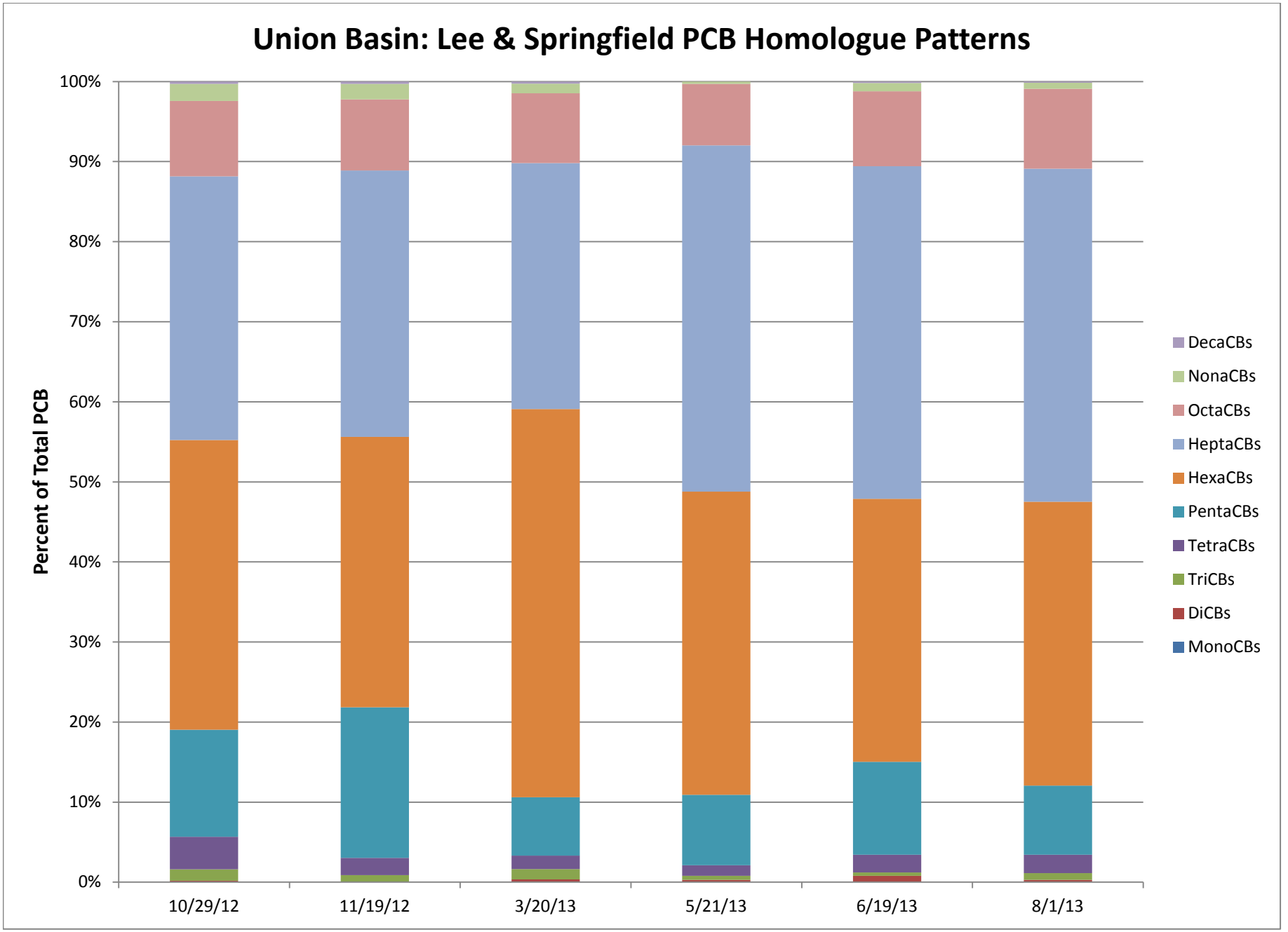
Solid Waste Facilities

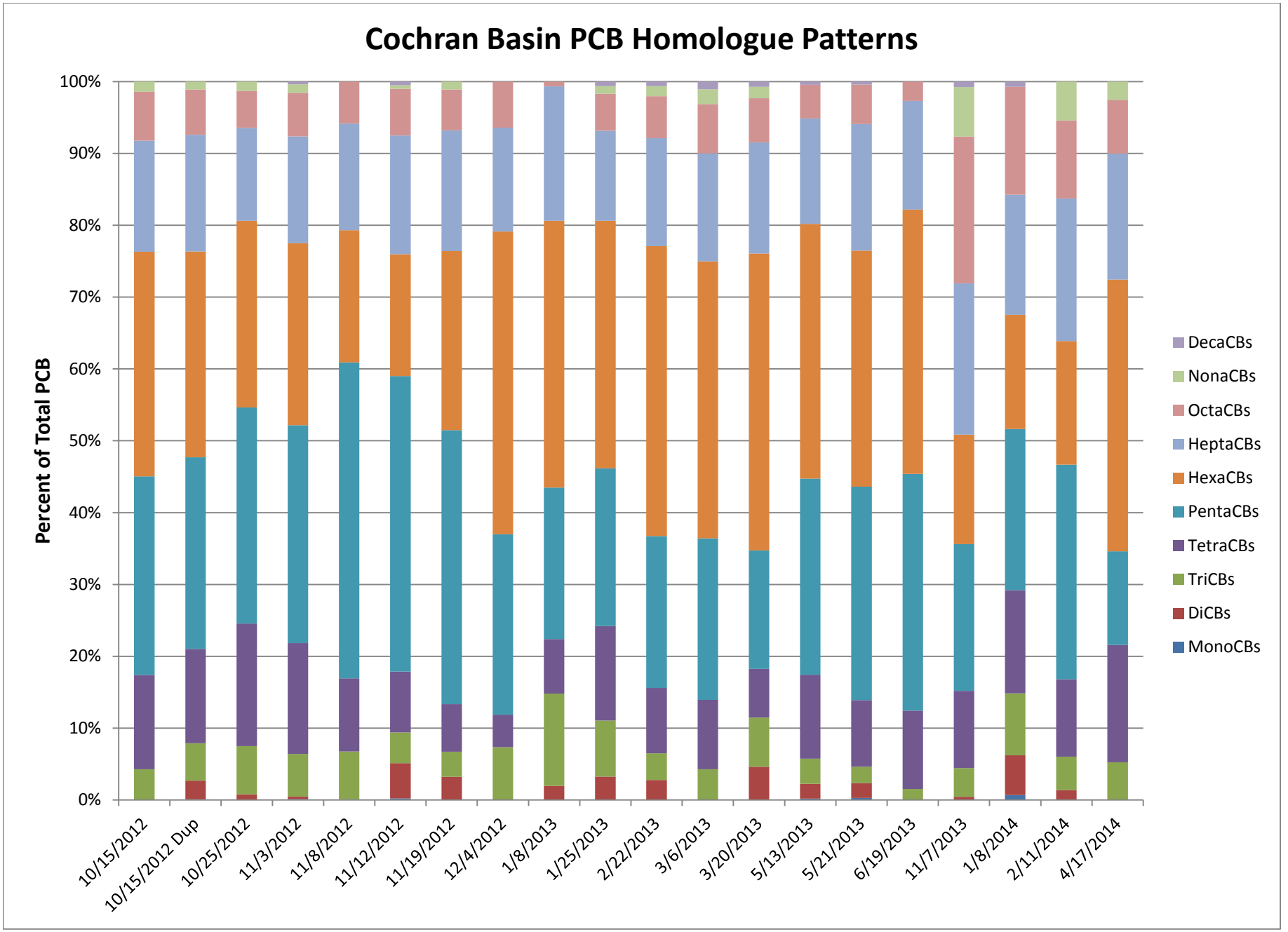


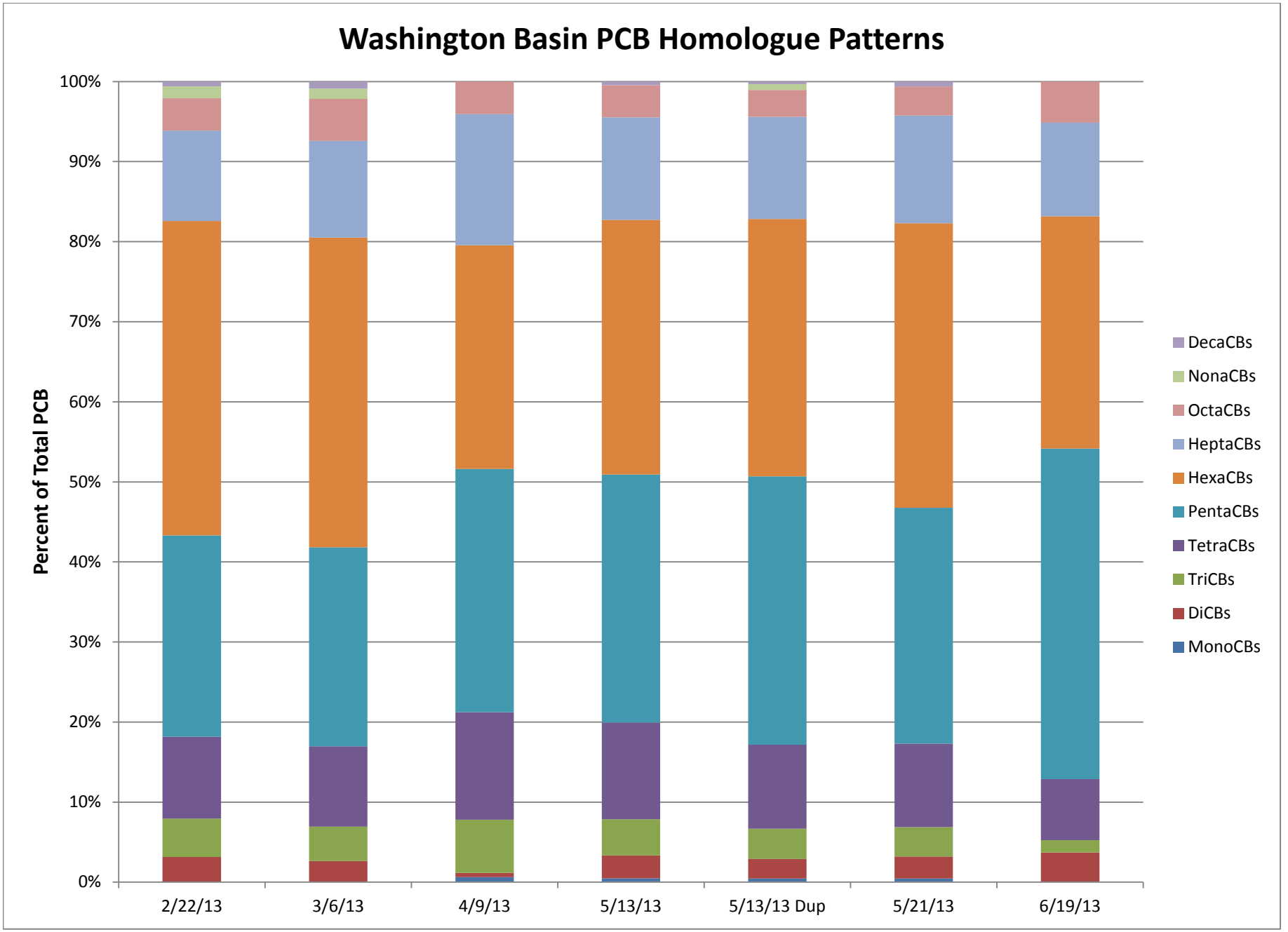
Appendix B

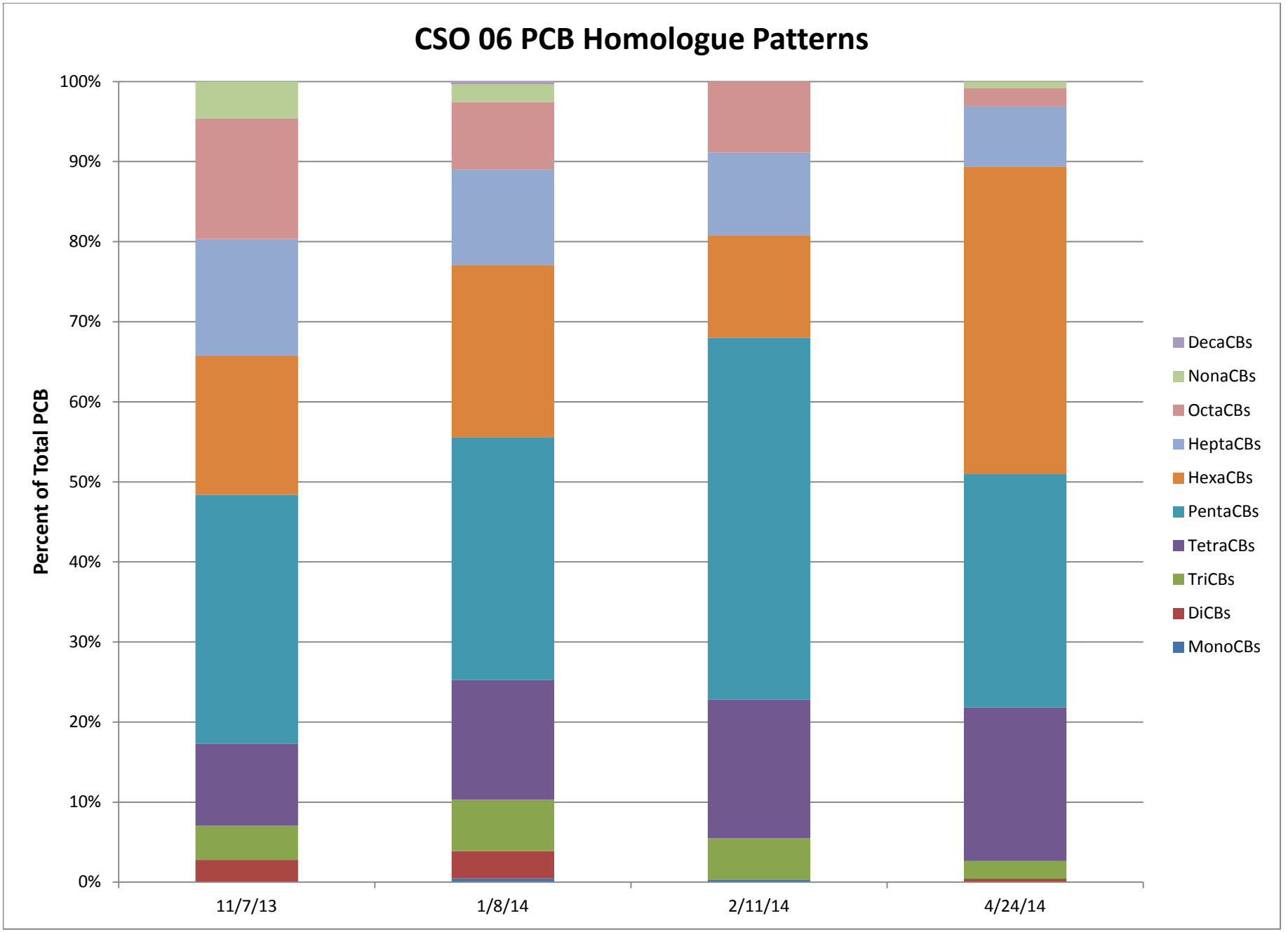
PCB HOMOLOGUE PATTERNS

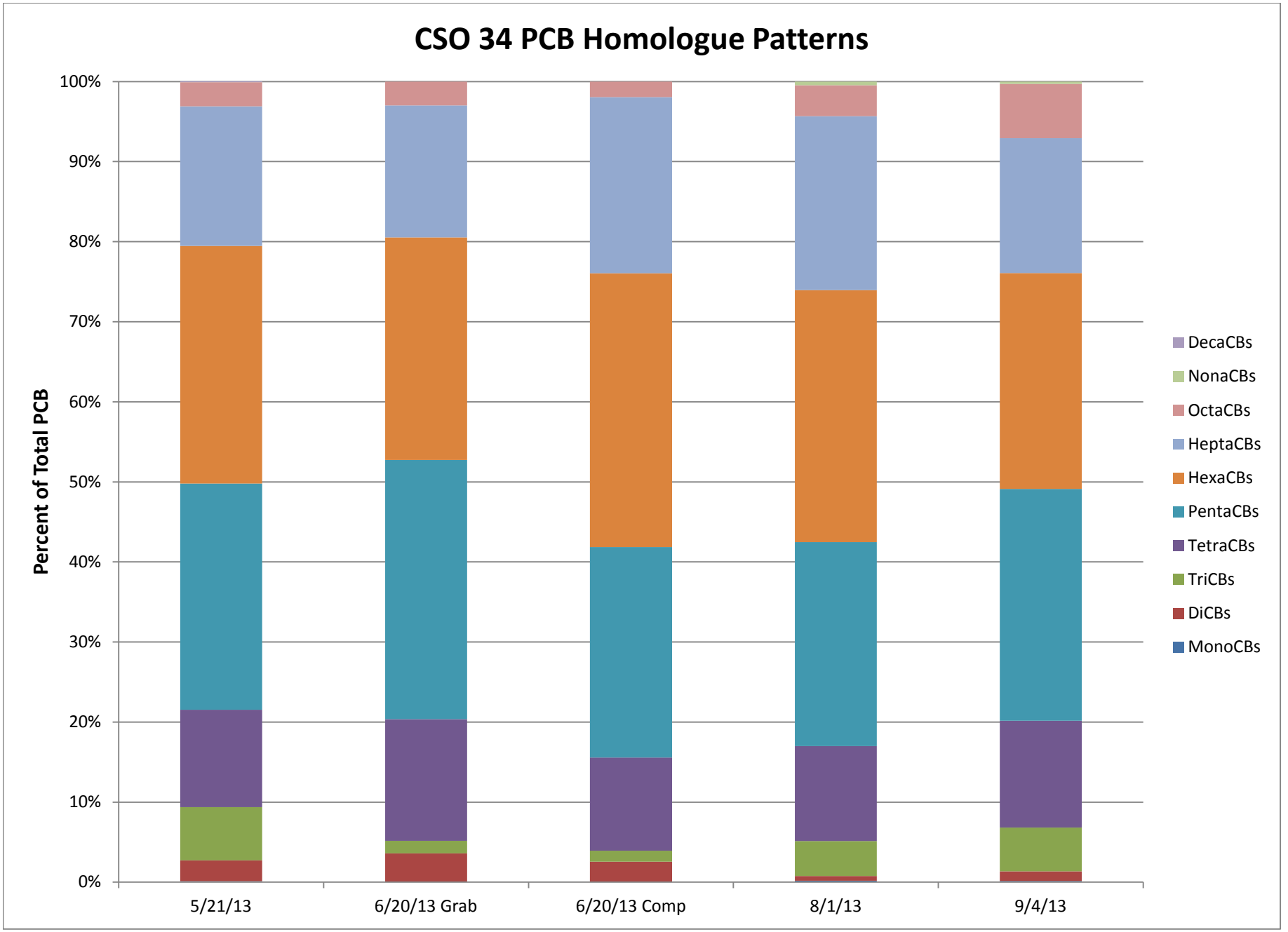

Union Basin: Trent & Erie PCB Homologue Patterns
Percent of Total PCB
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
10/30/12
11/1/12
11/3/12
11/8/12
11/12/13
3/20/13
4/10/13
5/13/13
DecaCBs
NonaCBs
OctaCBs
HeptaCBs
HexaCBs
PentaCBs
TetraCBs
TriCBs
DiCBs
MonoCBs

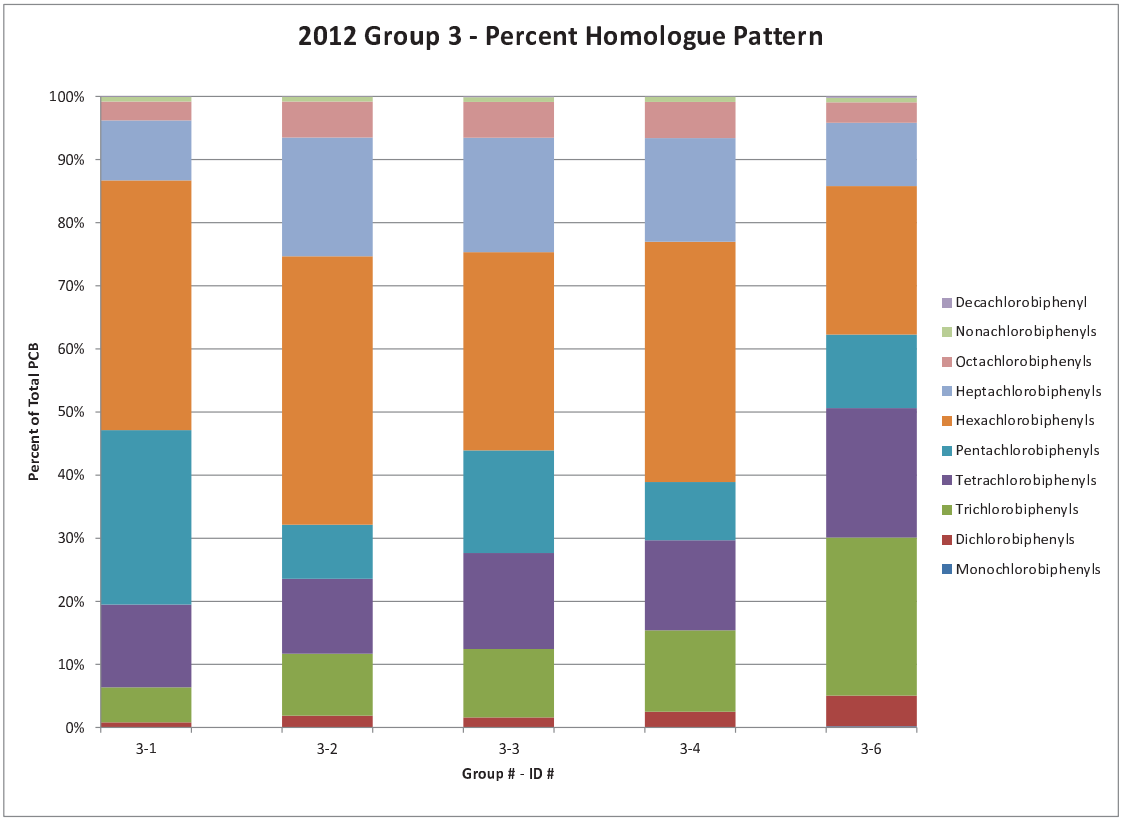

Union Basin: Lee & Springfield PCB Homologue Patterns
Percent of Total PCB
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
10/29/12
11/19/12
3/20/13
5/21/13
6/19/13
8/1/13
DecaCBs
NonaCBs
OctaCBs
HeptaCBs
HexaCBs
PentaCBs
TetraCBs
TriCBs
DiCBs
MonoCBs

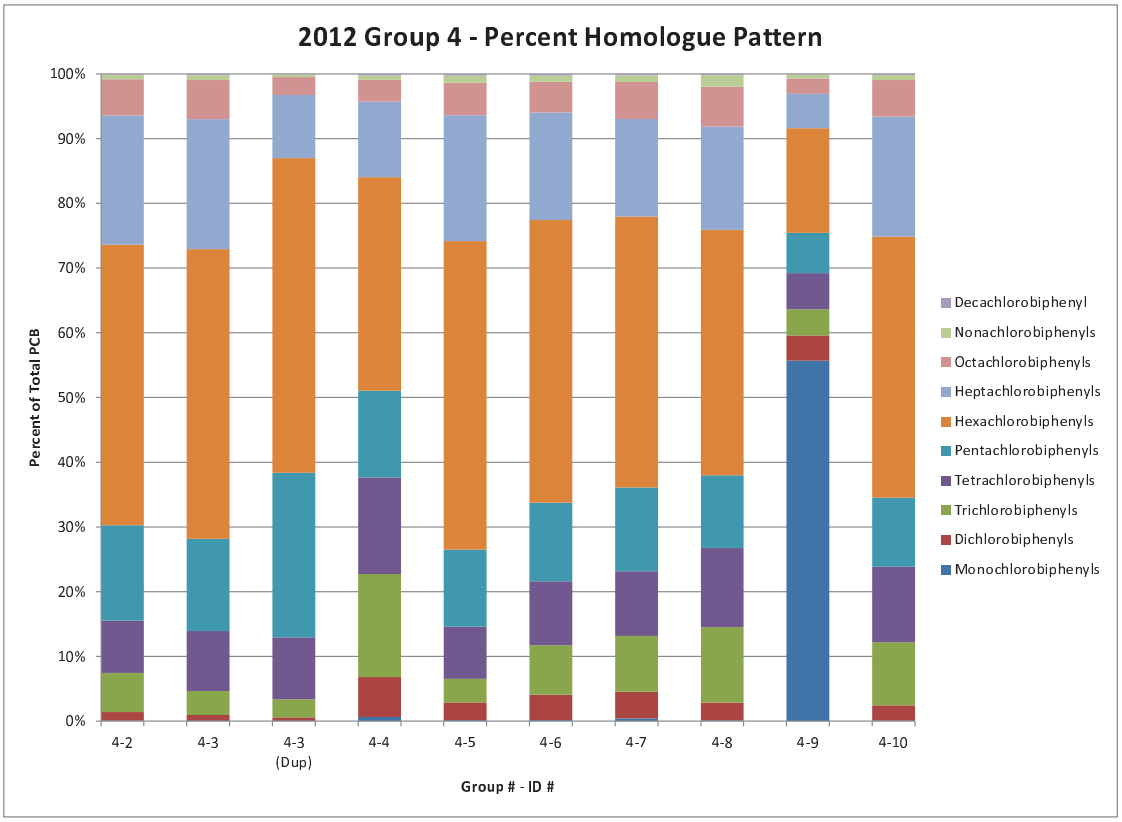

Cochran Basin PCB Homologue Patterns
Percent of Total PCB
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
10/15/2012
10/15/2012 Dup
10/25/2012
11/3/2012
11/8/2012
11/12/2012
11/19/2012
12/4/2012
1/8/2013
1/25/2013
2/22/2013
3/6/2013
3/20/2013
5/13/2013
5/21/2013
6/19/2013
11/7/2013
1/8/2014
2/11/2014
4/17/2014
DecaCBs
NonaCBs
OctaCBs
HeptaCBs
HexaCBs
PentaCBs
TetraCBs
TriCBs
DiCBs
MonoCBs

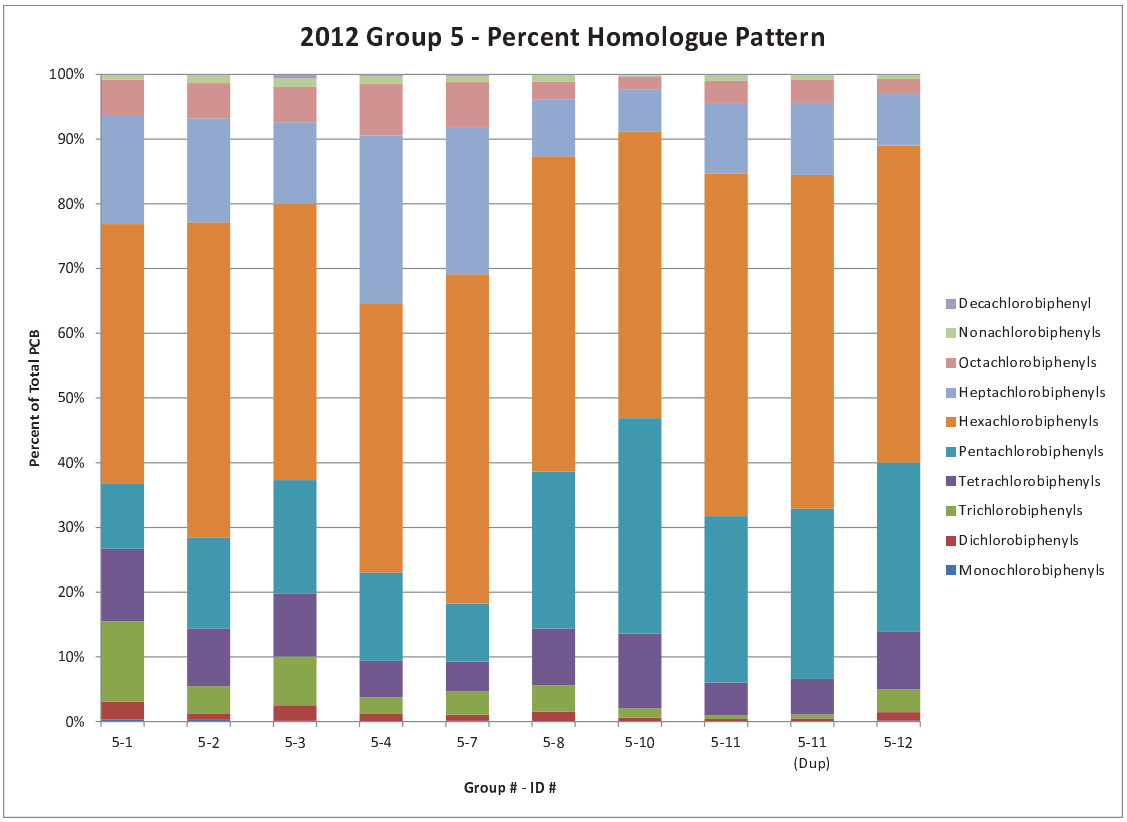

Washington Basin PCB Homologue Patterns
Percent of Total PCB
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2/22/13
3/6/13
4/9/13
5/13/13
5/13/13 Dup
5/21/13
6/19/13
DecaCBs
NonaCBs
OctaCBs
HeptaCBs
HexaCBs
PentaCBs
TetraCBs
TriCBs
DiCBs
MonoCBs

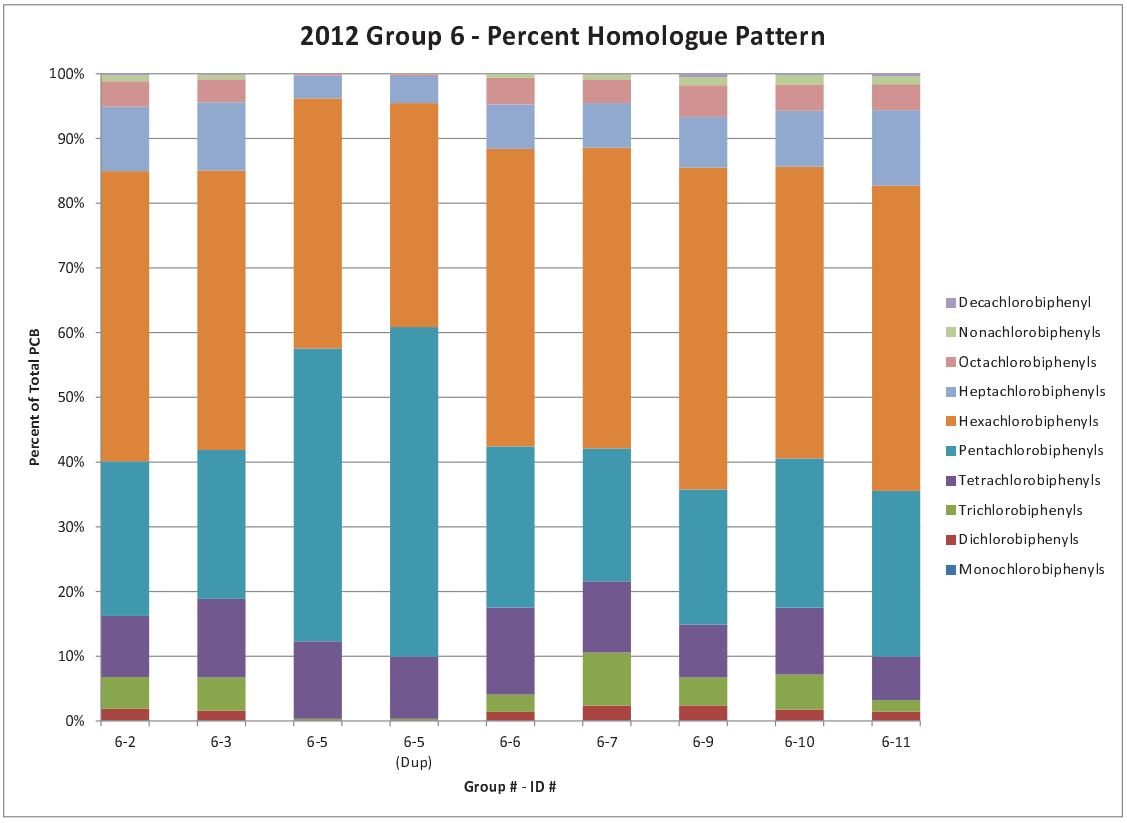

CSO 06 PCB Homologue Patterns
Percent of Total PCB
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
11/7/13
1/8/14
2/11/14
4/24/14
DecaCBs
NonaCBs
OctaCBs
HeptaCBs
HexaCBs
PentaCBs
TetraCBs
TriCBs
DiCBs
MonoCBs

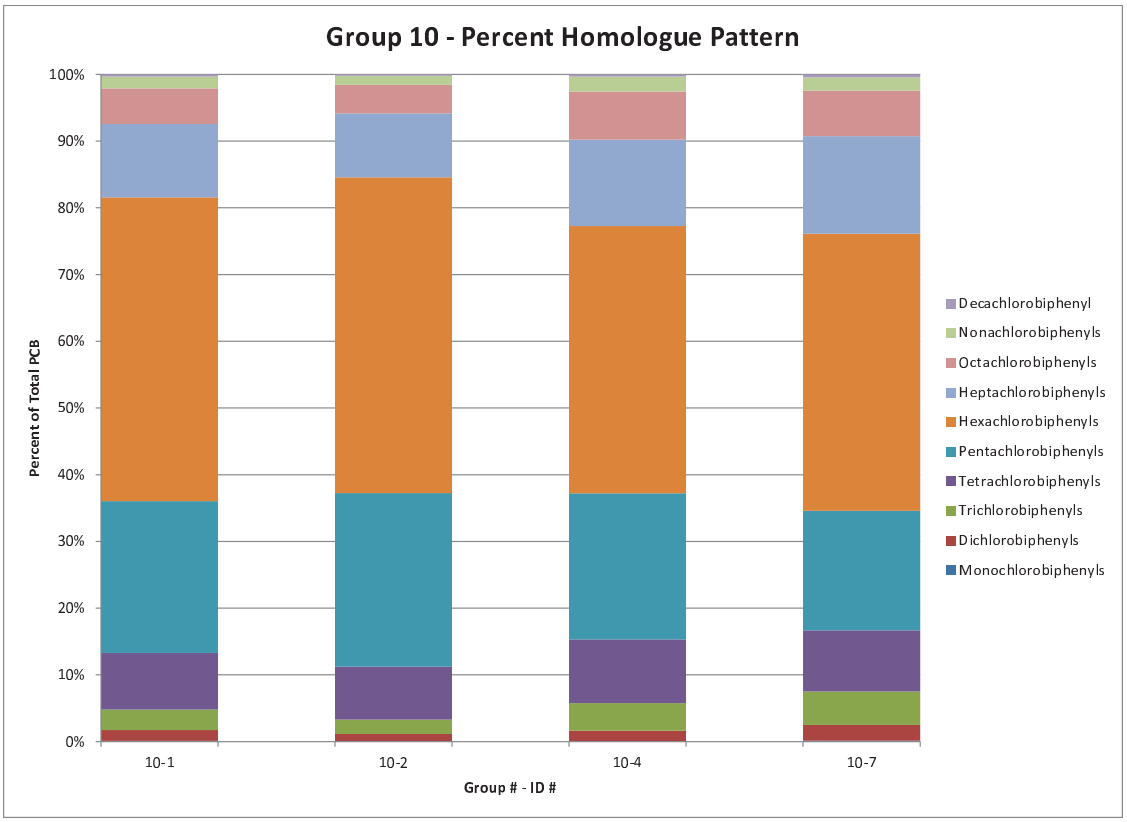

CSO 34 PCB Homologue Patterns
Percent of Total PCB
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
5/21/13
6/20/13 Grab
6/20/13 Comp
8/1/13
9/4/13
DecaCBs
NonaCBs
OctaCBs
HeptaCBs
HexaCBs
PentaCBs
TetraCBs
TriCBs
DiCBs
MonoCBs

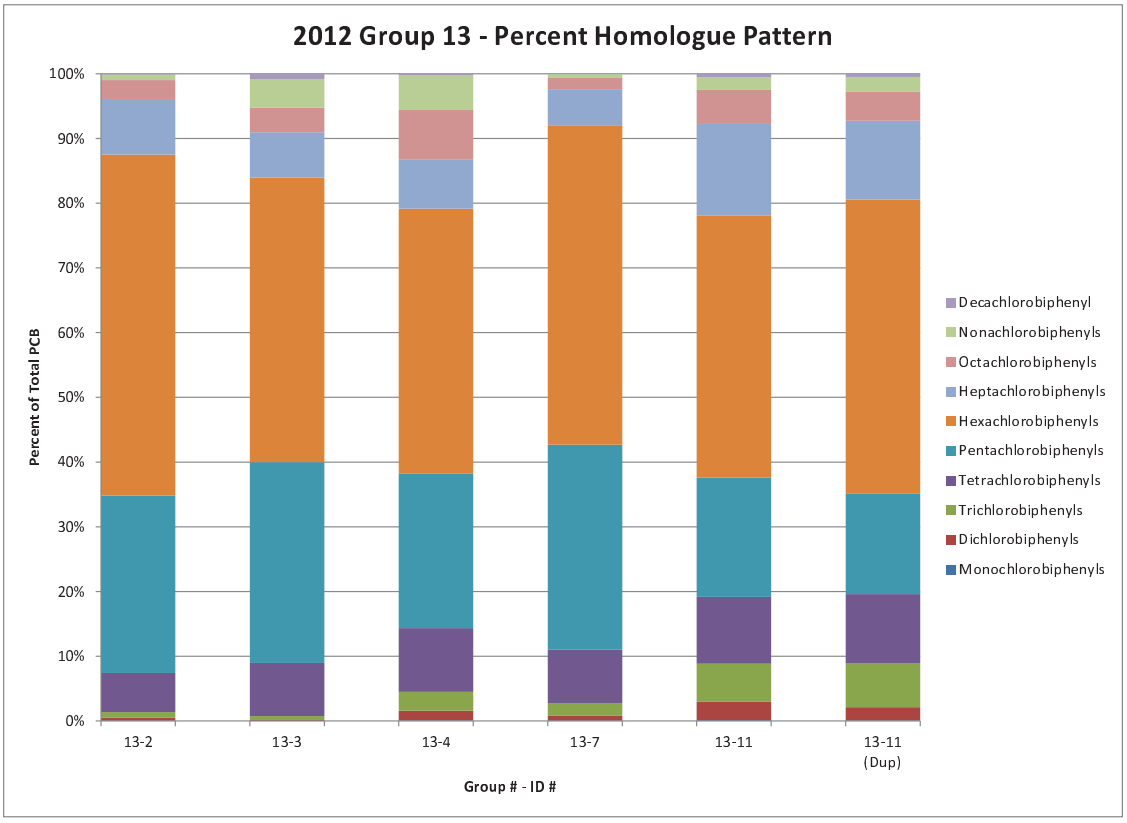

2012 Group 3 - Percent Homologue Pattern
Percent of Total PCB
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
3-1
3-2
3-3
3-4
3-6
Group # - ID #
Decachlorobiphenyl
Nonachlorobiphenyls
Octachlorobiphenyls
Heptachlorobiphenyls
Hexachlorobiphenyls
Pentachlorobiphenyls
Tetrachlorobiphenyls
Trichlorobiphenyls
Dichlorobiphenyls
Monochlorobiphenyls

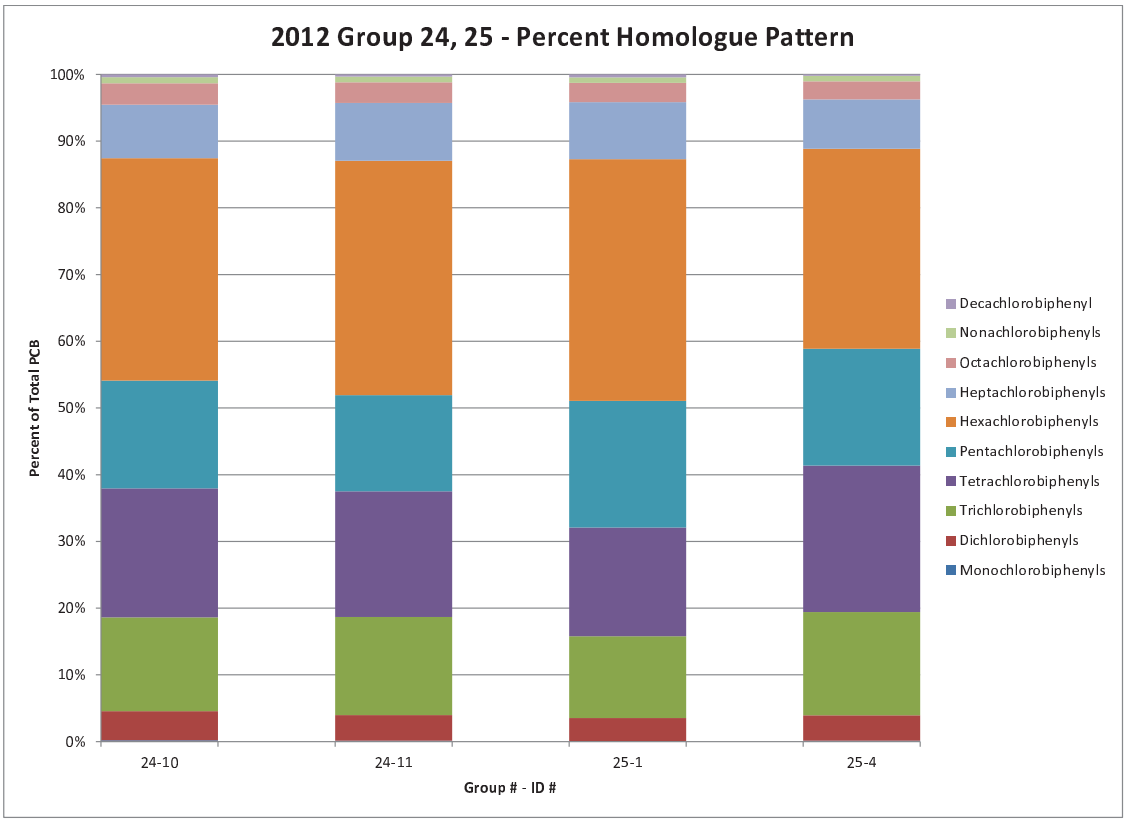

2012 Group 4 - Percent Homologue Pattern
Percent of Total PCB
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
4-2
4-3
4-3 (Dup)
4-4
4-5
4-6
4-7
4-8
4-9
4-10
Group # - ID #
Decachlorobiphenyl
Nonachlorobiphenyls
Octachlorobiphenyls
Heptachlorobiphenyls
Hexachlorobiphenyls
Pentachlorobiphenyls
Tetrachlorobiphenyls
Trichlorobiphenyls
Dichlorobiphenyls
Monochlorobiphenyls

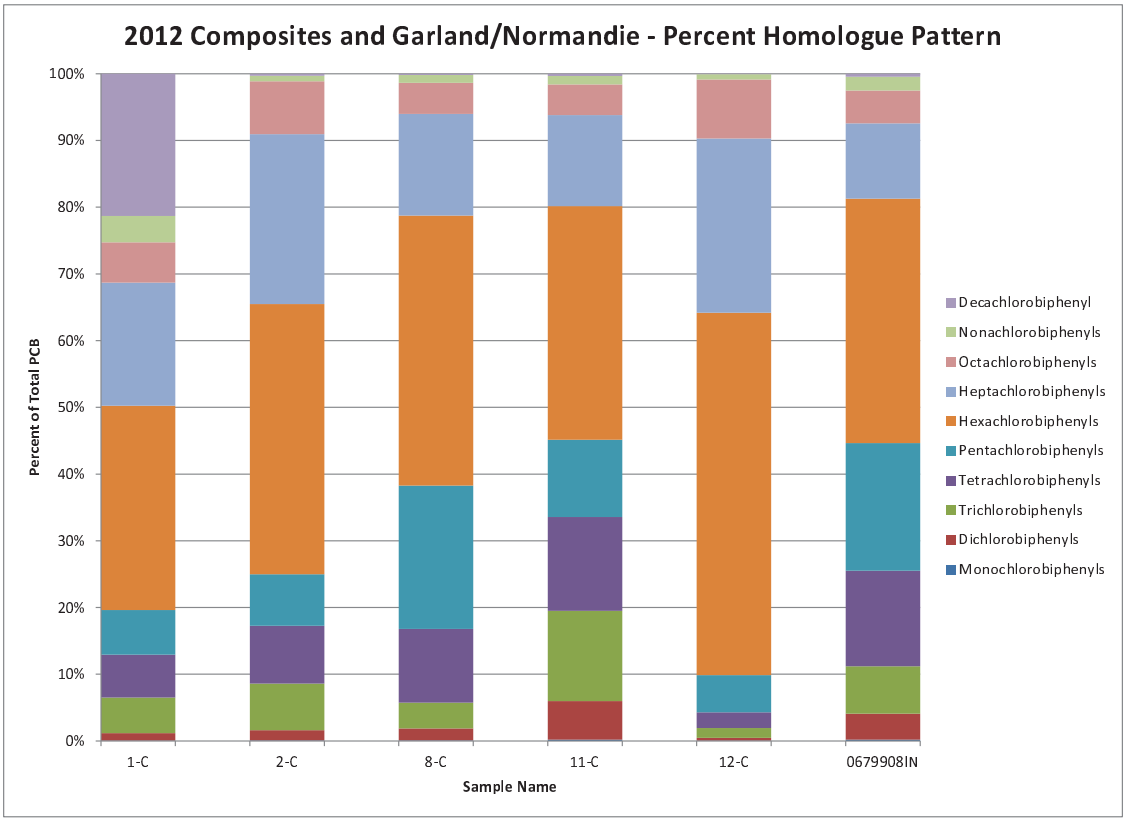

2012 Group 5 - Percent Homologue Pattern
Percent of Total PCB
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
5-1
5-2
5-3
5-4
5-7
5-8
5-10
5-11
5-11 (Dup)
5-12
Group # - ID #
Decachlorobiphenyl
Nonachlorobiphenyls
Octachlorobiphenyls
Heptachlorobiphenyls
Hexachlorobiphenyls
Pentachlorobiphenyls
Tetrachlorobiphenyls
Trichlorobiphenyls
Dichlorobiphenyls
Monochlorobiphenyls

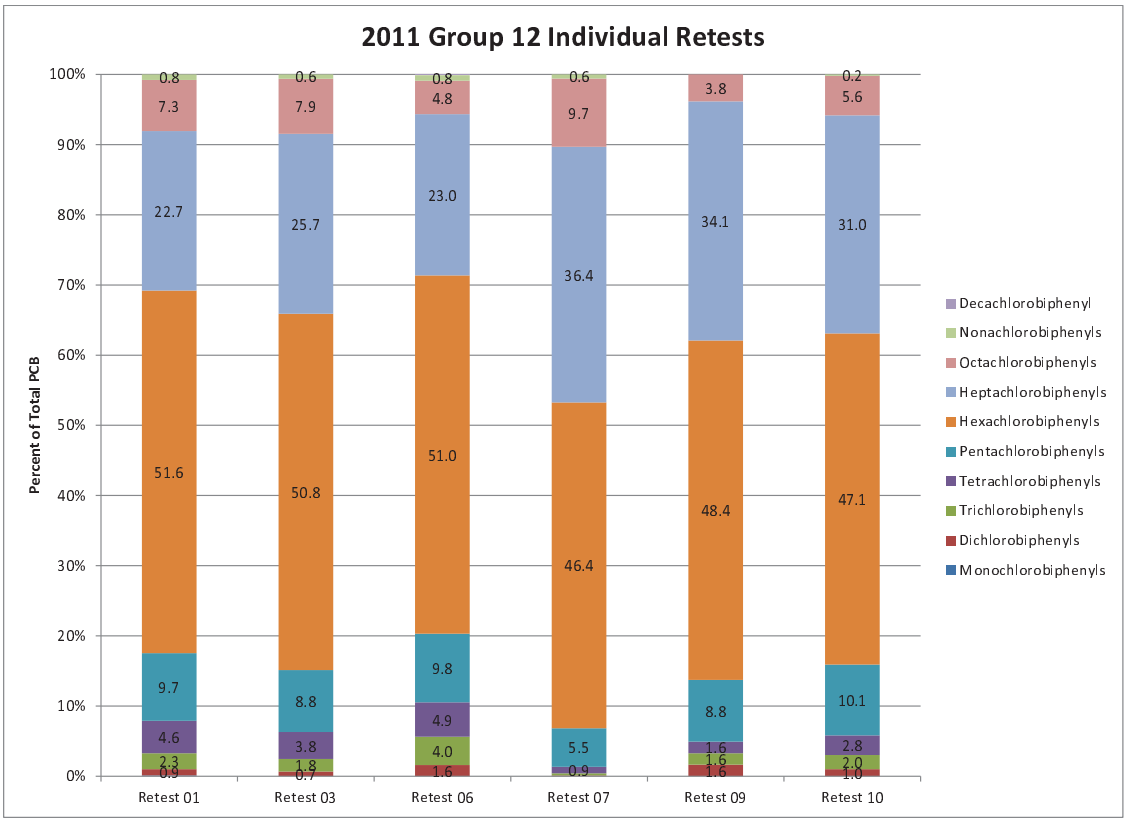

2012 Group 6 - Percent Homologue Pattern
Percent of Total PCB
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
6-2
6-3
6-5
6-5 (Dup)
6-6
6-7
6-9
6-10
6-11
Group # - ID #
Decachlorobiphenyl
Nonachlorobiphenyls
Octachlorobiphenyls
Heptachlorobiphenyls
Hexachlorobiphenyls
Pentachlorobiphenyls
Tetrachlorobiphenyls
Trichlorobiphenyls
Dichlorobiphenyls
Monochlorobiphenyls

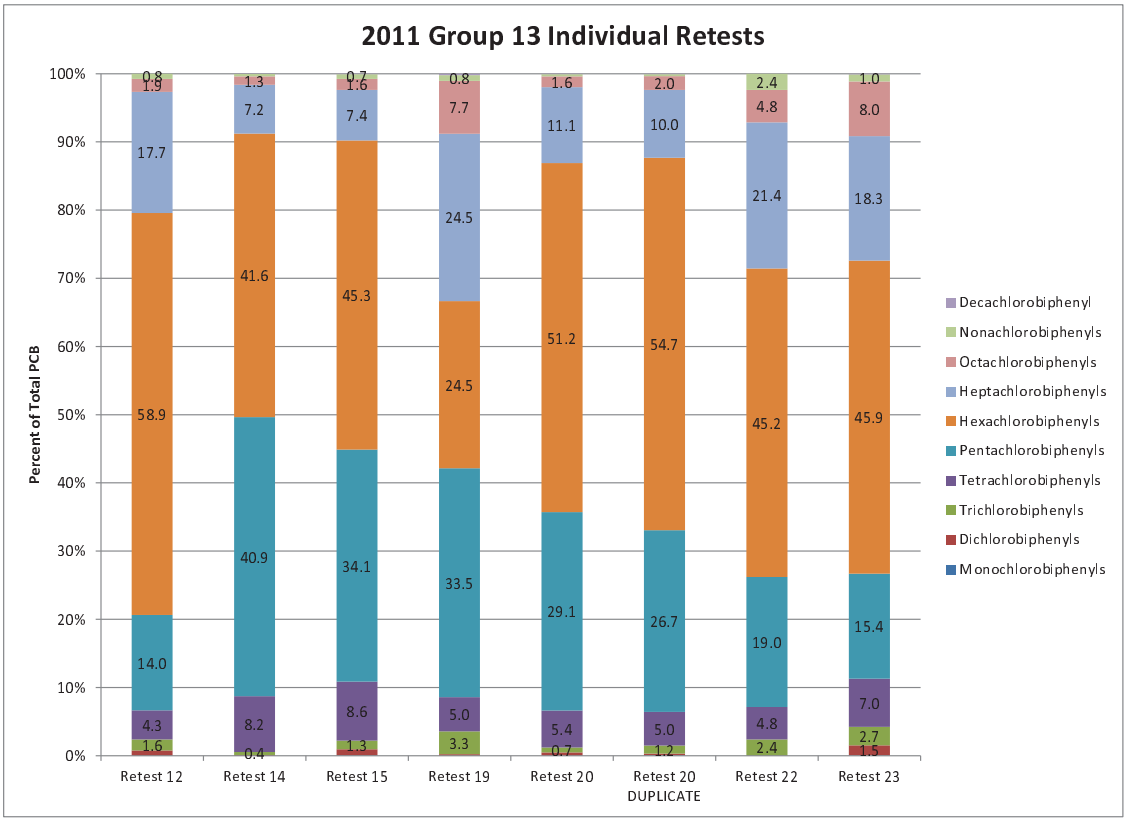

Group 10 - Percent Homologue Pattern
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Percent of Total PCB
10-1
10-2
10-4
10-7
Group # - ID #
Decachlorobiphenyl
Nonachlorobiphenyls
Octachlorobiphenyls
Heptachlorobiphenyls
Hexachlorobiphenyls
Pentachlorobiphenyls
Tetrachlorobiphenyls
Trichlorobiphenyls
Dichlorobiphenyls
Monochlorobiphenyls

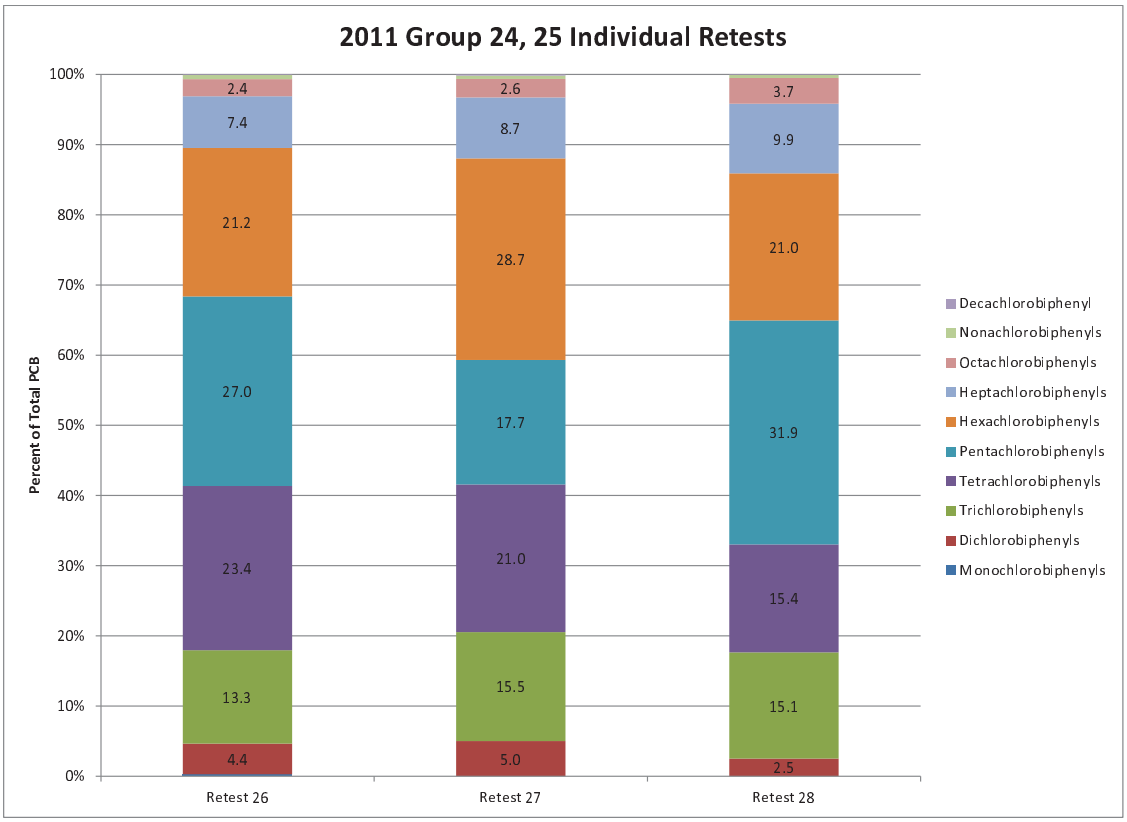

2012 Group 13 - Percent Homologue Pattern
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Percent of Total PCB
13-2
13-3
13-4
13-7
13-11
13-11 (Dup)
Group # - ID #
Decachlorobiphenyl
Nonachlorobiphenyls
Octachlorobiphenyls
Heptachlorobiphenyls
Hexachlorobiphenyls
Pentachlorobiphenyls
Tetrachlorobiphenyls
Trichlorobiphenyls
Dichlorobiphenyls
Monochlorobiphenyls

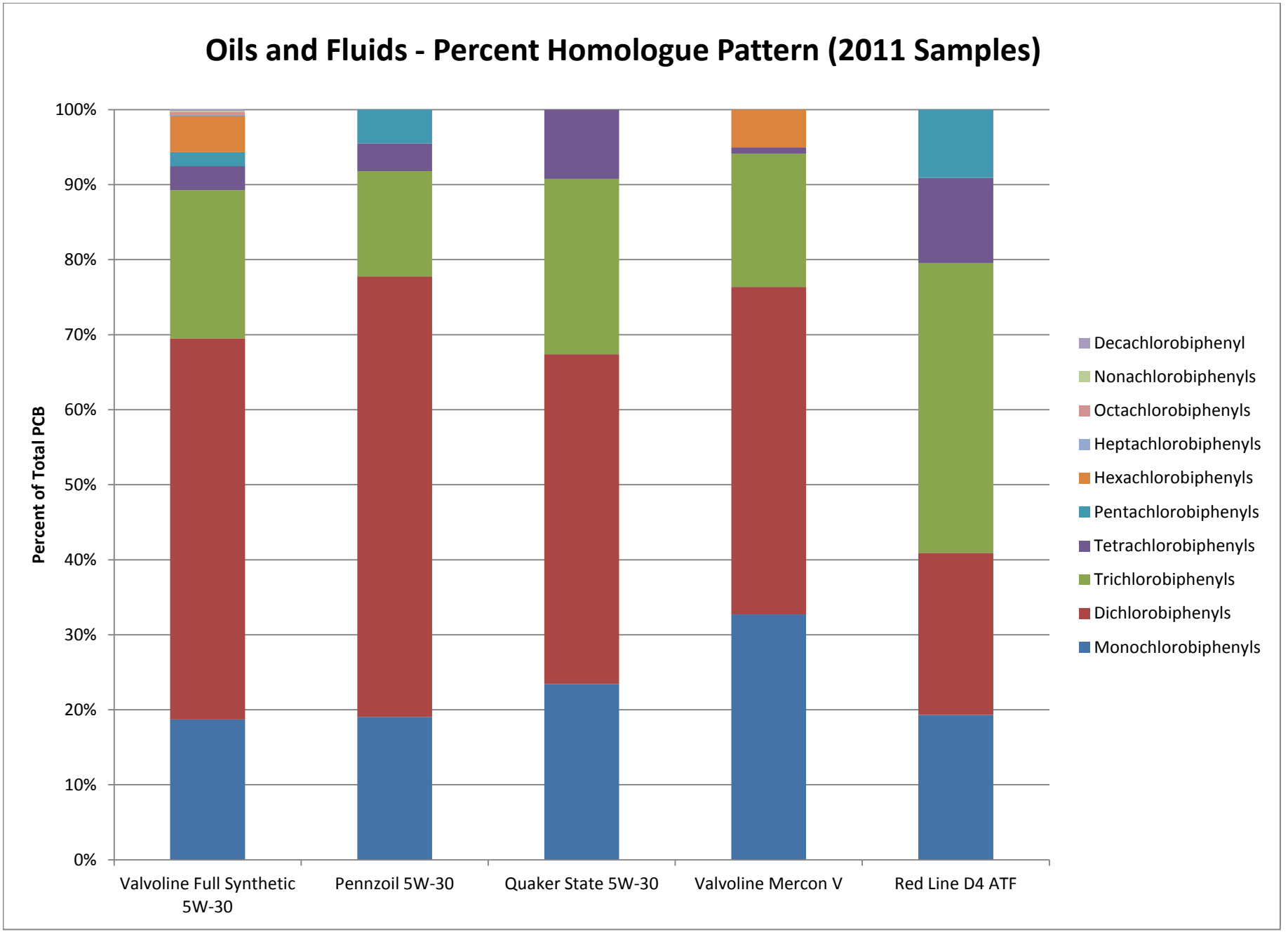

2012 Group 24, 25 - Percent Homologue Pattern
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Percent of Total PCB
24-10
24-11
25-1
25-4
Group # - ID #
Decachlorobiphenyl
Nonachlorobiphenyls
Octachlorobiphenyls
Heptachlorobiphenyls
Hexachlorobiphenyls
Pentachlorobiphenyls
Tetrachlorobiphenyls
Trichlorobiphenyls
Dichlorobiphenyls
Monochlorobiphenyls

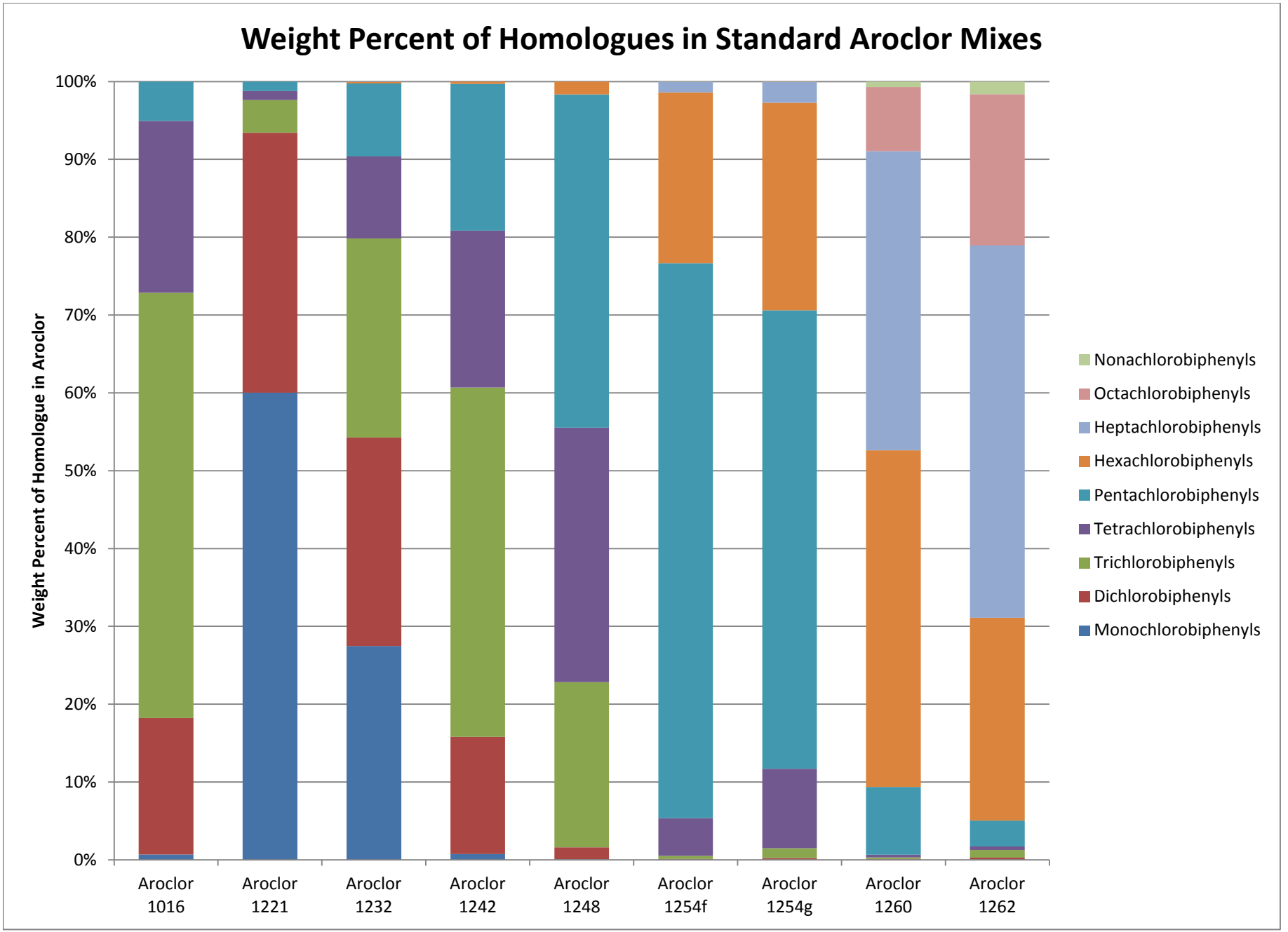

2012 Composites and Garland/Normandie - Percent Homologue Pattern
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Percent of Total PCB
1-C
2-C
8-C
11-C
12-C
0679908IN
Sample Name
Decachlorobiphenyl
Nonachlorobiphenyls
Octachlorobiphenyls
Heptachlorobiphenyls
Hexachlorobiphenyls
Pentachlorobiphenyls
Tetrachlorobiphenyls
Trichlorobiphenyls
Dichlorobiphenyls
Monochlorobiphenyls


2011 Group 12 Individual Retests
Percent of Total PCB
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Retest 01
Retest 03
Retest 06
Retest 07
Retest 09
Retest 10
0.8
7.3
22.7
51.6
9.7
4.6
2.3
0.9
0.6
7.9
25.7
50.8
8.8
3.8
1.8
0.7
0.8
4.8
23.0
51.0
9.8
4.9
4.0
1.6
0.6
9.7
36.4
46.4
5.5
0.9
3.8
34.1
48.4
8.8
1.6
1.6
0.2
5.6
31.0
47.1
10.1
2.8
2.0
1.0
Decachlorobiphenyl
Nonachlorobiphenyls
Octachlorobiphenyls
Heptachlorobiphenyls
Hexachlorobiphenyls
Pentachlorobiphenyls
Tetrachlorobiphenyls
Trichlorobiphenyls
Dichlorobiphenyls
Monochlorobiphenyls


2011 Group 13 Individual Retests
Percent of Total PCB
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Retest 12
Retest 14
Retest 15
Retest 19
Retest 20
Retest 20 DUPLICATE
Retest 22
Retest 23
0.8
1.9
17.7
58.9
14.0
4.3
1.6
1.3
7.2
41.6
40.9
8.2
0.4
0.7
1.6
7.4
45.3
34.1
8.6
1.3
0.8
7.7
24.5
24.5
33.5
5.0
3.3
1.6
11.1
51.2
29.1
5.4
0.7
2.0
10.0
54.7
26.7
5.0
1.2
2.4
4.8
21.4
45.2
19.0
4.8
2.4
1.0
8.0
18.3
45.9
15.4
7.0
2.7
1.5
Decachlorobiphenyl
Nonachlorobiphenyls
Octachlorobiphenyls
Heptachlorobiphenyls
Hexachlorobiphenyls
Pentachlorobiphenyls
Tetrachlorobiphenyls
Trichlorobiphenyls
Dichlorobiphenyls
Monochlorobiphenyls


2011 Group 24, 25 Individual Retests
Percent of Total PCB
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2.4
7.4
21.2
27.0
23.4
13.3
4.4
2.6
8.7
28.7
17.7
21.0
15.5
5.0
3.7
9.9
21.0
31.9
15.4
15.1
2.5
Retest 26
Retest 27
Retest 28
Decachlorobiphenyl
Nonachlorobiphenyls
Octachlorobiphenyls
Heptachlorobiphenyls
Hexachlorobiphenyls
Pentachlorobiphenyls
Tetrachlorobiphenyls
Trichlorobiphenyls
Dichlorobiphenyls
Monochlorobiphenyls


Oils and Fluids - Percent Homologue Pattern (2011 Samples)
Percent of Total PCB
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Valvoline Full Synthetic 5W-30
Pennzoil 5W-30
Quaker State 5W-30
Valvoline Mercon V
Red Line D4 ATF
Decachlorobiphenyl
Nonachlorobiphenyls
Octachlorobiphenyls
Heptachlorobiphenyls
Hexachlorobiphenyls
Pentachlorobiphenyls
Tetrachlorobiphenyls
Trichlorobiphenyls
Dichlorobiphenyls
Monochlorobiphenyls


Weight Percent of Homologues in Standard Aroclor Mixes
Weight Percent of Homologue in Aroclor
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Aroclor 1016
Aroclor 1221
Aroclor 1232
Aroclor 1242
Aroclor 1248
Aroclor 1254f
Aroclor 1254g
Aroclor 1260
Aroclor 1262
Nonachlorobiphenyls
Octachlorobiphenyls
Heptachlorobiphenyls
Hexachlorobiphenyls
Pentachlorobiphenyls
Tetrachlorobiphenyls
Trichlorobiphenyls
Dichlorobiphenyls
Monochlorobiphenyls