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Comprehensive Plan to Reduce Polychlorinated Biphenyls (PCBs) in the Spokane River

Prepared for:
Spokane River Regional Toxics Task Force

September 15, 2016 DRAFT

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Executive Summary

The Spokane River begins in northern Idaho at the outlet of Coeur d'Alene Lake and flows west 112 miles to the Columbia River. The Spokane River and Lake Spokane have been placed on the State of Washington's 303(d) list of impaired waters because of concentrations of polychlorinated biphenyls (PCBs) that exceed water quality standards. The Spokane River Regional Toxics Task Force, comprised of NPDES permittees, state and local agencies, environmental groups, tribal sovereigns, EPA and other stakeholders), was formed with the objective to work collaboratively to characterize the sources of toxics in the Spokane River and identify and implement appropriate actions needed to make measurable progress towards meeting applicable water quality standards. This objective is being accomplished through the development of a Comprehensive Plan (SRRTTF, 2012b). This document presents that Comprehensive Plan.

Comment [TC1]: The City's permit at S14 requires this Comp Plan to include "targets and milestones for achieving water quality standards." The other permits probably require something similar. Are the targets and milestones in here?

The permit also requires the City to prepare a "5-Year Strategic Plan with short-term goal[s] and strategies, needed financial and technical assistance, and adapt BMP Implementation Plans (based on former TMPs) towards achieving those goals." But timing on these is unclear - may be April 2017?

Ecy's "measurable progress determination" refers to including "outcomes" such as PCBs removed from the river or watershed or City systems, [PCB] in the river, [PCB] in fish.

Comment [TC2]: EPA submitted a "PCB plan" to Judge Rothstein that says this comp plan will include: a summary of available data re PCBs in water, fish and sediments; a list of sources with current PCB loadings; a range of BMPs expected to reduce or eliminate these loadings; recommendations for BMP implementation; and recommendations for future studies to address data gaps. EPA also has interim milestones, such as 200 pg/L in the river by 12/15/20.

An extensive amount of data exists to support development of this Plan, including numerous studies by the Washington State Department of Ecology and recent monitoring efforts by the Task Force itself. These data were analyzed to estimate the mass of PCBs currently present in various source areas throughout the watershed, as well as the loading rate of PCBs to the Spokane River from various delivery mechanisms. PCBs produced intentionally through 1979, termed legacy PCBs, in buildings (i.e. small capacitors, sealants) and legacy soil contamination are estimated to be the largest source areas of PCBs in the watershed. The primary delivery mechanisms of PCBs to the Spokane River were determined to be cumulative loading across all wastewater treatment plants, contaminated groundwater, and stormwater/combined sewer overflows. PCB loading from Lake Coeur d'Alene and Spokane River tributaries are of similar magnitude to the other primary delivery mechanisms, due to much higher flow rates but with lower much concentrations of PCBs.

Because PCBs are introduced to the Spokane River from a number of different source areas and delivery mechanisms, a range of Control Actions (defined as "any activity which prevents, controls, removes or reduces pollution") are required to reduce PCB levels and ultimately attain water quality standards. A total of 45 Control Actions considered potentially applicable to address PCBs in the Spokane River were identified, and assessed in terms of costs and effectiveness. The specific Control Actions to be included in the Comprehensive Plan were determined at a SRRTTF workshop help in Spokane on July 27, 2016. Discussion of Control Actions at that workshop was divided into tiers of: 1) Control Actions already being implemented, and 2) Potential new Control Actions. Existing Control Actions were placed by the group into one of two categories. The first category contained the following Control Actions, where the group decided to maintain current efforts, and document those efforts in the Plan:

- Wastewater Treatment
- Remediate Known Contaminated Sites
- Stormwater Controls
- Low Impact Development Ordinance
- Street Sweeping
- Purchasing Standards

The second category contained existing Control Actions where the group identified improvements that could be made to current efforts. These consisted of:

- Support of Green Chemistry
- PCB Product Testing Information
- Waste Disposal Assistance
- Regulatory Rulemaking
- Compliance with PCB Regulations
- Emerging End of Pipe Stormwater Technologies

Potential new Control Actions were reviewed next, with two actions identified for inclusion in the Comprehensive Plan and a commitment to implementation:

- Identification of New Sites of Concern for Contaminated Groundwater
- Building Demolition and Renovation Control

Finally, eleven other new Control Actions were identified as being worthy of consideration in the future.

The Implementation Plan portion of this document lists milestones, timelines, and metrics to assess effectiveness for each of the new or expanded Control Actions. The effectiveness of SRRTTF's implementation of Control Actions will be assessed, in part, via annual preparation of an Implementation Review report which will compare actions conducted over the prior year to the timelines and effectiveness metrics spelled out in the Implementation Plan. The implementation review will provide flexibility to adapt strategies, phase out actions that are not working, and phase in new Control Actions as appropriate. In addition to annual review of the implementation of individual Control Actions, the Comprehensive Plan includes a five year reviewed to assess overall PCB loading and system response in terms of observed PCB concentrations in the river.

The Comprehensive Plan concludes with a section on Future Studies, which describes additional Control Action worthy of future consideration, as well as potential studies to be conducted to fill known data gaps about continuing PCB sources, delivery mechanisms, and environmental response.

1 Introduction

The Spokane River Regional Toxics Task Force (SRRTTF) was formed with the objective to work collaboratively to characterize the sources of toxics in the Spokane River and identify and implement appropriate actions needed to make measurable progress towards meeting applicable water quality standards. This objective is being accomplished for PCBs through the development of a Comprehensive Plan (SRRTTF, 2012b). This document presents that Comprehensive Plan, and this introductory section provides background information on the SRRTTF and the content of the Plan.

Comment [TC3]: Should we say this Comp Plan is required in each NPDES Permit that includes Task Force participation, and is anticipated by EPA in its PCB Plan?

1.1 Creation and Membership of the SRRTTF

Washington NPDES wastewater discharge permits issued in 2011 by the Washington State Department of Ecology (Ecology) for facilities discharging into the Spokane River included the requirement for the creation of a Regional Toxics Task Force. These permits stated that the Task Force membership should include the NPDES permittees in the Spokane River Basin, conservation and environmental interests, the Spokane Tribe of Indians, Spokane Regional Health District, Ecology, and other appropriate interests. NPDES permittees who discharge to the Spokane River in Idaho subsequently agreed to participate in the Task Force, and their participation is now similarly required in their NPDES permits.

The organization and governance of the Spokane River Regional Toxics Task Force is documented in a Memorandum of Agreement (SRRTTF, 2012a). Although participation is required by the permitting agencies (Ecology and EPA), the Task Force exists independent of, and therefore is not legally required to account to, Ecology or EPA. The Task Force includes voting members (representing NPDES permittees, state and local agencies other than Ecology, environmental groups and other stakeholders) and advisory members (Ecology, tribal sovereigns, and EPA). The Task Force currently consists of the following parties:

- Spokane County
- Liberty Lake Sewer and Water District
- Inland Empire Paper Company
- Kaiser Aluminum
- City of Spokane
- Spokane Regional Health District
- Washington State Department of Health
- Lake Spokane Association
- The Lands Council
- Spokane Riverkeeper
- Kootenai Environmental Alliance
- City of Coeur d'Alene
- Avista
- City of Post Falls
- Washington Department of Fish and Wildlife
- State of Washington: Represented by the Department of Ecology
- United States: Represented by the Environmental Protection Agency
- Spokane Tribe of Indians
- State of Idaho: Represented by the Department of Environmental Quality
- Coeur d'Alene Tribe
- Hayden Area Regional Sewer Board

1.2 Comprehensive Plan

The Comprehensive Plan as defined by the Task Force Work Plan (SRRTTF, 2012b) is a report that describes the data, analytical process, and the outcome of the analytical process regarding sources of PCBs to the Spokane River. The Plan will identify potentially applicable PCB Control Actions, assess the effectiveness of those Control Actions to reduce PCBs, and recommend a plan for implementation of Control Actions that are suitable toward PCB reduction in the Spokane River watershed. The activities to be contained in the Task Force's Comprehensive Plan are consistent with those activities subsequently defined in EPA's Plan for Addressing PCBs in the Spokane River (EPA, 2015).

Comment [TC4]: As above - we should mention the Permits and the EPA plan as providing some guidance and expectations for the content of this comp plan.

This document provides that Comprehensive Plan. It is divided into sections describing:

- **Watershed Characterization:** Describes the environmental setting, available data, and impairment status of the Spokane River and its contributing watershed.
- **PCB Source Assessment:** Defines all known PCB sources and pathways and their respective magnitudes, the analyses used to determine these magnitudes, and key data gaps.
- **PCB Control Actions:** Defines the management practices under consideration to control PCBs, and the expected costs and removal efficiency of each option.
- **Implementation Plan:** Defines the specific PCB management practices recommended for implementation, the recommended schedule for their implementation and measurable milestones to assess implementation effectiveness.
- **Future Studies:** Describes future activities designed to assess implementation effectiveness, identify additional Control Actions worthy of future consideration, and fill identified data gaps.

2
Watershed Characterization

Development of a Comprehensive Plan requires an understanding of the environmental setting, available data, and impairment status. This section presents that information, divided into sub-sections of:

- Study Area
- Hydrology
- Land Use and Population
- Available data
- Impairment status

2.1 Study Area

The Spokane River begins in northern Idaho at the outlet of Coeur d'Alene Lake and flows west 112 miles to Franklin D. Roosevelt Lake in the Columbia River (Figure 1). The watershed covers more than 6,000 square miles (15,500 km^2) in Washington and Idaho. This Comprehensive Plan focuses on the portion of the watershed draining to the Spokane River upstream of Long Lake Dam. This segment of the watershed and river has been chosen to be the focus of the SRRTTF's initial efforts for several reasons:

- Discharges from all of the major municipal and industrial sources in the watershed are located in this section of the river;
- Virtually all urban area storm runoff in the watershed enters the river in this section;
- This section of the river contains numerous river flow gaging stations, which allow for the determination of in-stream loadings at multiple locations through semi-quantitative mass balance calculations;
- The vast majority of the aquifer/river interchange occurs In this section of the river, the impact of which has not been quantified by previous studies;
- The likelihood of making near term source contribution reductions is greatest in this section of the river given the concentration of point source and storm runoff locations and the significant level of unidentified source contribution; and
- The ability to monitor and assess the effectiveness of PCB reductions is enhanced by the ability to track in-stream loadings with the infrastructure present (gaging stations) in this section of the river.

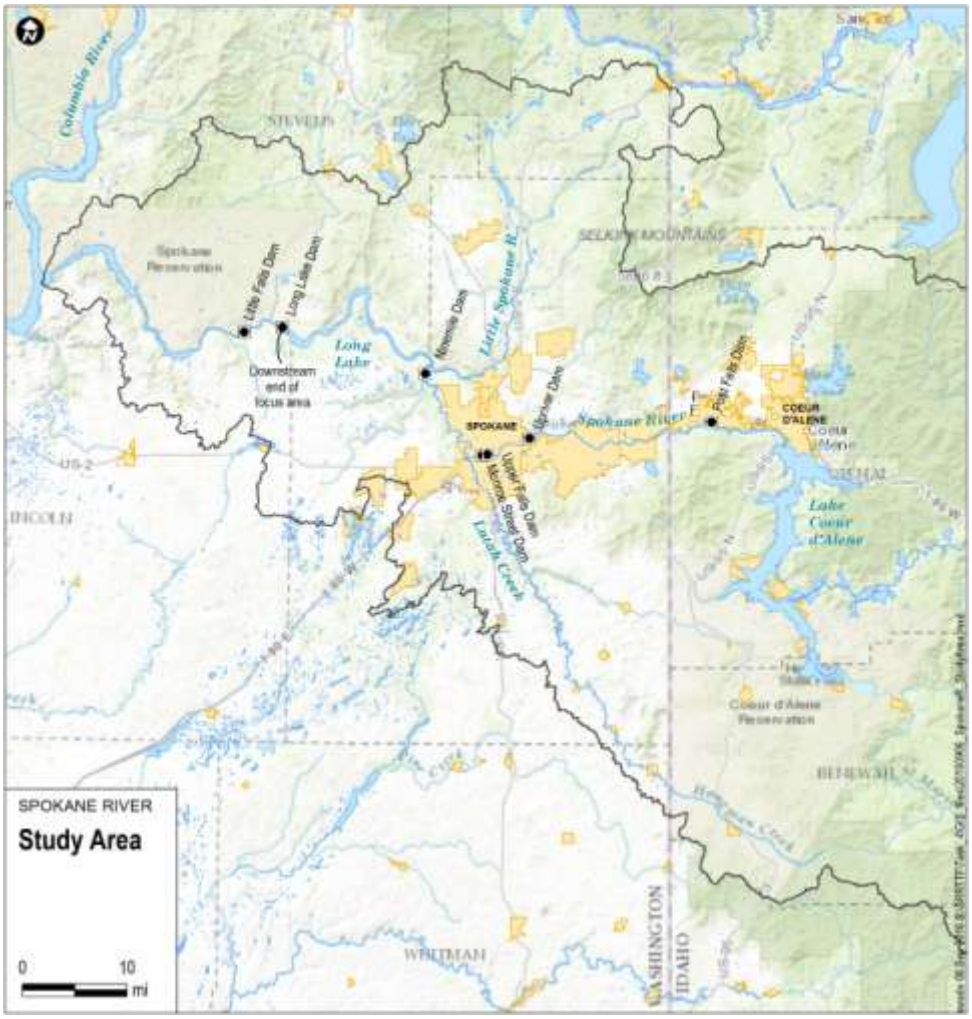

Figure 1. Spokane River Watershed

2.2 Hydrology

The hydrologic characteristics of the Spokane River watershed were described by Ecology (Serdar et al, 2011), which serves as the basis for the following description. The flow regime in the Spokane River is dictated largely by freezing temperatures in the winter followed by spring snowmelt. The annual mean flow for the years 1969-2016 was approximately 175,933 L/sec (6,213 cfs) at Post Falls. Average flows increased to 181,738 L/sec (6,418 cfs) at the Spokane Gage, reflecting the influx of groundwater and wastewater through this river reach. Prior to 1969 there were un-quantified agricultural diversions for irrigation from the Spokane River in the vicinity of Post Falls.

There are seven dams along the Spokane River:

1. Post Falls Dam (RM 100.8).
2. Upriver Dam (RM 80.2).
3. Upper Falls Dam (RM 74.5).
4. Monroe Street Dam (RM 74.0).
5. Ninemile Dam (RM 58.1).
6. Lake Spokane (Long Lake) Dam (RM 33.9).
7. Little Falls Dam (RM 29.3).

The dams create a series of pools which vary in length, the largest being 23-mile long Lake Spokane (also known as Long Lake, herein referred to as Lake Spokane). Downstream from Lake Spokane, the Spokane River forms the southern boundary of the Spokane Tribe of Indians reservation from Chamokane Creek (RM 32.5) to the Columbia River at RM 639.0.

2.3 Land Use and Population

The portion of the Spokane River watershed under focus for this Comprehensive Plan contains a diverse mixture of land uses (Figure 2). Approximately 11% of the focus area is in developed land use; 39% of the area is forested; and 23% of the area is in agricultural use. The river flows through the smaller cities of Post Falls and Coeur d'Alene in Idaho and large urban areas of the Spokane Valley and Spokane in Washington.

Comment [TC5]: What is the remaining 27%?

Total population in the Study Area watershed was estimated from 2011 census block group data obtained in GIS data format from the U.S. Census Bureau (https://www.census.gov/geo/maps-data/data/tiger-data.html). Population per acre was calculated for each census block group. The block groups were intersected with known watershed boundary delineations, with the area of each block group portion located inside a basin was multiplied by the population density. Those products were summed for each basin to obtain total population. The overall 2011 population for the Study Area watershed was estimated to be 571,045. Of this total, 401,976 people lived in watershed areas draining directly to the Spokane River; 57,669 people lived in watershed areas draining to Latah Creek; and 111,400 people lived in watershed areas draining to the Little Spokane River.

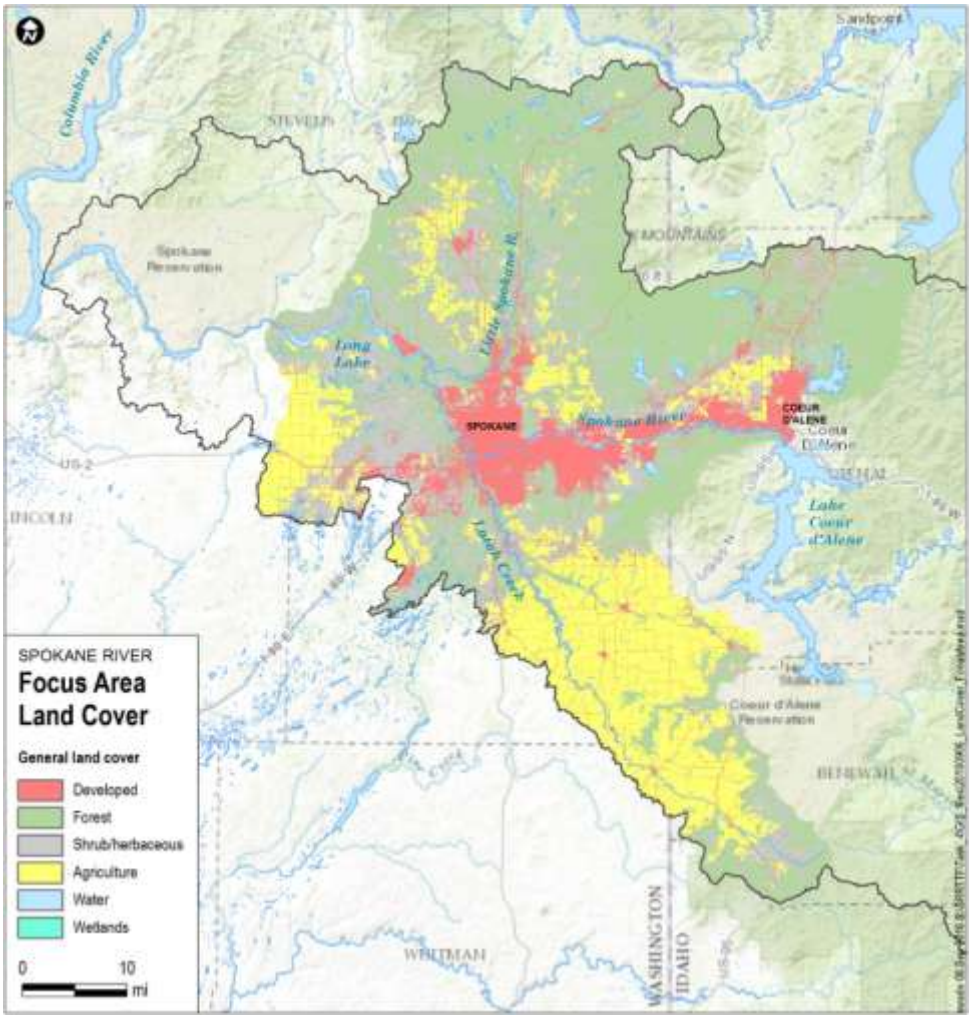

Figure 2. Land Use in the Area of Focus for the Comprehensive Plan

2.4 Available Data

A large amount of PCB-related data exists for development of the Comprehensive Plan. The available data are summarized here, in separate sections discussing a data compilation conducted in 2013 and data collected subsequent to that compilation.

2.4.1 2013 Data Compilation

Initial Task Force efforts included identification and collection of available data to define existing PCB sources and sinks. The intent of that work was to evaluate the quality and credibility of the available data

relative to satisfying identified data needs, and to store the resulting data in a database facilitating its use later in the project. Approximately 45 data sets were obtained. All data were reviewed to determine whether they met data quality objectives, as the data that were gathered were collected under a wide range of QA/QC procedures. A graded approach was taken with the data review, with data quality divided into categories ranging from "highest quality, fully acceptable for subsequent use" to "lesser quality, suitable only for supporting 'weight of evidence' approaches." Information was collected for the following categories:

- Climate
- Commercial buildings constructed between 1950 and 1980
- Identified contaminated sites
- Illegal dumping/spills
- Number and size of smelters and incinerators
- Number of Vehicle Registrations
- Numbers and sizes of auto dismantlers, computer and electronics recyclers, transfer stations, landfills, metal recyclers, and white goods recyclers
- PCB and PCDD/F emissions from incineration activities
- measurements of PCB and PCDD/F concentrations
- PCBs and PCDD/Fs in Combined Sewer Overflows
- PCBs in fish tissue
- PCBs in groundwater
- PCBs in sediment
- PCBs in soil
- PCBs and PCDD/Fs in stormwater
- Spokane River and tributary water column measurements (e.g., temperature)
- Stormwater loads
- Stream flow information for Spokane River and tributaries
- Wastewater treatment plant loads
- Water column

All relevant data collected during were evaluated and stored in a Microsoft Access data base, which was provided to the SRRTTF. A more complete description of the data collected and the evaluation process is provided in LimnoTech (2013).

2.4.2 Data Collected After 2013

Several additional studies providing data relevant to the Comprehensive Plan were conducted after the 2013 data compilation discussed above. These studies are:

- SRRTFF 2014 Monitoring (LimnoTech, 2015): This report documents SRRTTF Phase 2 technical activities, which focused on carrying out a synoptic survey to identify potential unmonitored dry weather sources of PCBs to the Spokane River. The survey was successfully conducted between August 12 and 24, 2014. Sampling locations included seven Spokane River stations between Lake Coeur d'Alene and Ninemile Dam, one station in Latah Creek, and seven point source discharges. Analysis of the data identified a likely large (i.e. as large as any other single dry weather source) incremental PCB load entering the Spokane River between Barker Road and the Trent Avenue Bridge. There is also the possibility of a large incremental PCB load entering the Spokane River between Greene Street and the Spokane USGS gage. This report also provides PCB data collected at two locations in the Spokane River in May, 2014.
- SRRTTF 2015 Monitoring (LimnoTech, 2016c): This report documents a follow-up survey designed to confirm the findings of the 2014 survey and provide greater detail on the location of the unmonitored PCB source. The follow-up survey was successfully conducted from August 18 to 22, 2015. Sampling locations included five Spokane River stations between Barker Rd. and the Spokane USGS Gage, and three point source discharges. The presence of a large incremental PCB load entering the Spokane River between Barker Road and the Trent Avenue Bridge was confirmed, with the location of where the majority of the load enters the river narrowed down to between Mirabeau Park and the Trent

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Avenue Bridge. Homolog-specific mass balance analyses indicated the potential presence of another groundwater loading source entering the river downstream of the Trent Avenue Bridge.

- Spokane River Toxics Sampling 2012-2013 – Surface Water, CLAM and Sediment Trap Results (Era-Miller, 2014): Ecology conducted a study to evaluate several types of sample collection methods and analytical methods for toxics monitoring in the Spokane River during fall 2012 through spring 2013. Surface water composite grabs samples was not a good monitoring tool for low level PCBs in the Spokane River, as the PCB congener sample data in general did not give a clear environmental signal above the analytical background noise. The CLAM collection method was judged to be a good surrogate for grab sampling for PCB congeners in the Spokane River. Sediment trap sampling was rated "good" for PCB analysis.
- PCBs in Municipal Products (City of Spokane, 2015a): Nearly 50 product samples were collected and analyzed for PCBs using EPA Method 1668C. The majority of samples were composed of roadway, pipe, and vehicle maintenance products. Because PCBs are also ubiquitously detected in sanitary wastewater samples, five personal care products were sampled as well.
- PCBs in General Consumer Products (Ecology, 2014b): Ecology evaluated the presence of PCBs in general consumer products, with particular emphasis placed on products likely to be contaminated with PCBs due to the inadvertent production of PCBs in the manufacturing process (e.g. paints, newspapers, glossy magazines, cereal boxes, and yellow plastic bags). 68 products were tested for PCBs.
- Hydroseed Pilot Project (SRRTTF, 2015): In response to high levels of PCBs in Hydroseed identified during initial product testing by the City of Spokane (2015a), SRRTTF undertook a Hydroseed Analysis and Reformulation PCB Removal Pilot Project. The purpose of this study was to confirm the elevated levels observed from the City's original analysis and to identify specific component(s) that may be contributing to these elevated levels. Results from this analysis are intended to be used to assist manufacturers of Hydroseed to develop specifications and/or reformulations with reduced levels of PCBs.
- PCB Characterization of Spokane Regional Vactor Waste Decant Facilities (City of Spokane, 2015b): Stormwater runoff has been identified as contributor of PCBs to the Spokane River. The Eastern Washington Phase II Municipal Permit requires that stormwater catch basins be periodically cleaned out to remove buildup of solids. Previous testing by the City of Spokane had shown that catch basin sediment can contain orders of magnitude greater PCB content than the stormwater itself. Stormwater sediment is removed from catch basins in the Spokane area by using vacuum eductor trucks (vactors). Environmental concerns were raised in recent years about how this material was being handled. The primary goal of this project was to characterize the PCB content of the material at regional decant facilities.
- Screening Survey of PCBs in Little Spokane River Water, Sediment, and Fish Tissue (Ecology, 2016): The lower section of the Little Spokane River has been listed as being water quality-impaired for PCBs in fish tissue. The objectives of this study were to verify the level of PCB contamination in fish tissue fillets in 2014-2015 and attempt to spatially characterize the extent of potential PCB contamination in the Little Spokane River. Three fish species – rainbow trout, mountain whitefish, and northern pikeminnow – were analyzed as fillet composites at three sites. Although PCB levels were lower than those measured in 1994 and 1996, most fish tissue samples still exceeded the National Toxics Rule human health criterion for PCBs.
- 2012 Freshwater Fish Contaminant Monitoring Program (Ecology, 2014a): This report summarizes results from Ecology's Freshwater Fish Contaminant Monitoring Program in 2012 for three areas in Washington: the Spokane River, Pend Oreille River, and North Cascades National Park. The sampling goals were to: (1) characterize contaminant levels in fish, and (2) determine spatial and temporal patterns in contaminant levels in Spokane River fish. Results showed that levels of PCBs in fish from the Spokane River remain elevated compared to most areas in Washington.

- Long Term Monitoring at the Spokane River Spokane Tribal Boundary (Ecology, 2016c): This report provides a summary of Preliminary Findings to Date surface water monitoring at the Spokane Tribal boundary (just upstream of Chamokane Creek) during three hydrologic periods in 2015 – 2016.

2.5 Impairment status

The Spokane River and Lake Spokane have been placed on [Category 5 of] the State of Washington's 303(d) list of impaired waters because of concentrations of polychlorinated biphenyls (PCBs) that exceed water quality standards. The Spokane River and Lake Spokane exceed the water quality standard (170 pg/l – based on a fish consumption rate of 6.5 g/day) for PCBs. Fifteen waterbody segments of the Spokane River and Lake Spokane and one segment of the Little Spokane River are on the 2008 303(d) list for exceeding human health water quality criteria for PCBs. It is noted that the PCB concentrations utilized to place these waters on the 303(d) list were derived from fish tissue concentrations and a bioconcentration factor rather than direct water column measurement. The Spokane Tribe of Indians have water quality standards for PCBs in the Spokane River below Lake Spokane that are more than 95% lower than State standards (1.3 pg/l), based on a higher fish consumption rate (865 g/day) than the general population (Spokane Tribe of Indians, 2010). Idaho has not listed the Spokane River as impaired because of PCBs.

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3
PCB Source Assessment

The intent of a PCB source assessment is to define PCB sources and pathways and their respective magnitudes, in order to identify key sources to be reduced via the implementation of Control Actions. The source assessment is also designed to identify key data gaps contributing to uncertainty in estimates of these sources and pathways, to help guide future monitoring efforts. The source assessment for PCBs in the Spokane River was conducted in two steps:

- Define the range of potentially important sources of PCBs in the Spokane River watershed and the pathways by which these PCBs are delivered to the river
- Define the magnitude of the sources and pathways identified above, along with key data gaps.

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Determination of the sources and pathways of PCBs in the Spokane River Watershed is described in detail in LimnoTech (2016a), which is included as Appendix A to this Comprehensive Plan. The calculation of the magnitude of these sources and pathways is described in detail in LimnoTech (2016b) and included as Appendix B to this Plan. The remainder or this section summarizes how these sources and pathways were determined, and how their magnitudes were estimated. It is divided into three sub-sections, corresponding to:

- PCBs Source Areas
- Delivery mechanisms of PCBs to the Spokane River
- Transport pathways between sources and delivery

3.1 PCBs Source Areas

There is the potential for confusion when discussing PCB sources, as the term "sources" commonly refers to the true origin of the contaminant. In the case of PCBs, the dominant source was intentional production by Monsanto through 1979. Although this source no longer exists, those legacy PCBs now exist throughout the environment. The Comprehensive Plan follows the nomenclature of SFEI (2010) and uses the term "source areas" to represent those environmental compartments containing PCBs. Source areas are defined as the places where PCBs were used, inadvertently released, systematically discarded or accumulated. Source areas of PCBs are divided into three broad categories in this Plan, based on refinement of earlier PCB source characterization done for San Francisco Bay (SFEI, 2010) and Spokane (LimnoTech, 2013). Source areas of PCBs are divided into three broad categories for purposes of discussion here:

- Legacy source areas of PCBs currently present in the Spokane watershed
- Ongoing source areas of PCBs continuing to be introduced to the watershed via inadvertent production in commercial products
- Environmental transport of non-local PCBs into the watershed study area, which may either be legacy or continuing source areas

Legacy source areas correspond to PCBs that were brought into the Spokane watershed in the past, but are not continuing to be produced. These were produced by Monsanto and marketed as Aroclors which were used in machine oils, transformers, etc. Legacy sources can be further divided into categories of

buildings, environmental, and industrial equipment. Building source areas can either be fixed to the building itself (e.g., paint, caulk) or non-fixed and removable (e.g., light ballasts). Legacy environmental source areas of PCBs correspond to contaminated surface soils, contaminated subsurface soils/groundwater, and in-place aquatic sediments in the Spokane River and Lake Spokane. Historically produced PCBs are also still contained in various forms of electrical equipment such as transformers and hydraulic equipment.

Despite the ban on the intentional production of PCBs instituted in 1979, PCBs still continue to be inadvertently produced in the chemical synthesis of many commercial products. Characterization of PCB loads from inadvertent sources have identified pigments in printed materials/fabrics (Guo et al, 2013) and paints (Hu and Hornbuckle, 2010) as two primary categories of inadvertent production. It is recognized that inadvertent PCB production occurs in other categories of products as well, although the magnitude of these other sources is largely unknown and/or considered to be much smaller than sources in the first two categories.

PCBs also enter the Spokane watershed study area via non-local source areas. Non-local source areas can either be delivered via the atmosphere or enter the river from Lake Coeur d'Alene. The term "non-local" is used to distinguish source areas that originate outside of the watershed from atmospheric sources that originate from the volatilization of PCBs in the Spokane watershed. It is recognized that these non-local environmental source areas can originate from either legacy PCB source areas or ongoing inadvertently produced sources.

The amount of mass contained in each PCB source area was estimated using available data and literature values, with specific calculations provided in Appendix B. The resulting estimates are provided in Table 1 and Figure 3 specified as ranges, sometimes covering an order (or orders) of magnitude, because of the extensive reliance on literature values. Although uncertain, these estimates are still worthwhile in distinguishing between source areas as likely significant or relatively unimportant in developing the Comprehensive Plan. Legacy PCBs in buildings (e.g. small capacitors, caulks) and legacy soil contamination are estimated to be the largest source areas of PCBs in the watershed.

Table 1. Mass of PCB Estimated in each Source Area Category

Source Area Category	PCB Mass (kg)
Legacy	
Building sources	
Non-fixed[1]	50 – 40,000
Fixed[2]	60 - 130,000
Environmental	
Watershed soils	550 - 55,000
Sub-surface soils – cleanup sites	Unknown
Spokane R. deep sediments	4 -100
L. Spokane deep sediments	8 - 200
L. Spokane shallow sediments	0.4 - 10
Spokane R. shallow sediments	0.06 – 0.15
Industrial equipment	6.4 - 25
Ongoing	
Inadvertent production	0.2 – 450

[1] PCBs in small capacitors in items such as appliances and lamp ballasts.
[2] Building materials such as paints and sealants (e.g. caulks).

Source Area Category	PCB Mass (kg)
Non-Local Environmental	
Lake Coeur d'Alene	~0 – 0.047
Atmospheric	Unknown

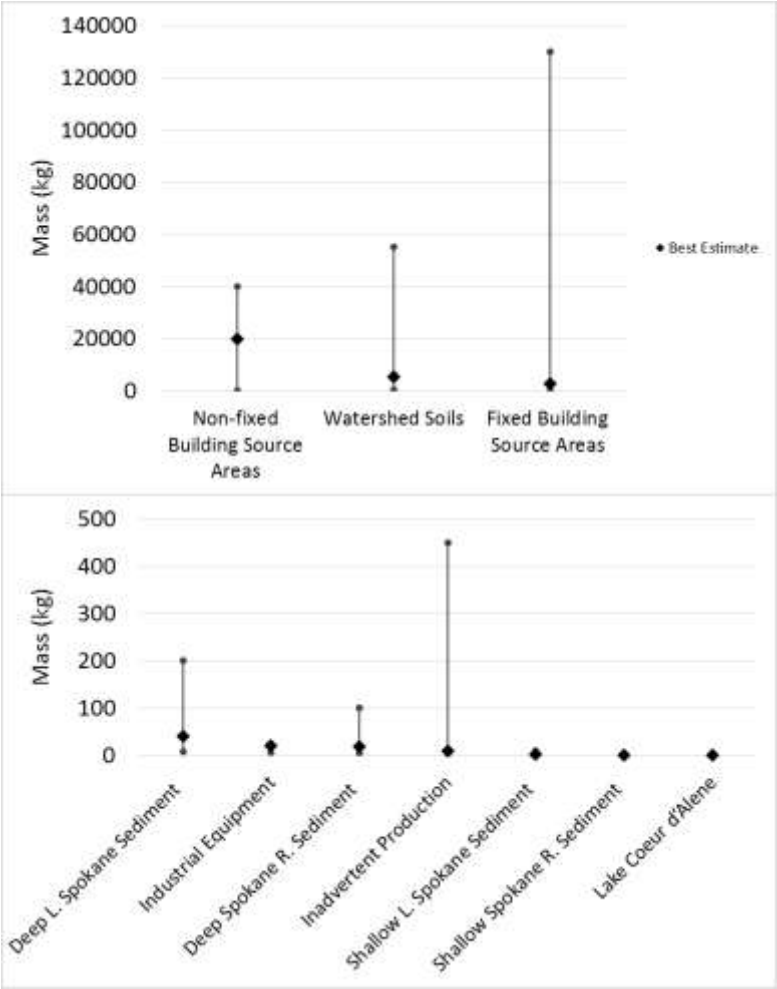

Figure 3. Estimated Range of Mass of PCB in each Source Area Category (Note the large difference in scale between the two embedded graphs)

3.2 Delivery Mechanisms of PCBs to the Spokane River

PCBs were determined by LimnoTech (2016a) to be delivered to the Spokane River study area via a number of mechanisms, consisting of:

- Transport of PCBs from upstream sources through Lake Coeur d'Alene
- Atmospheric deposition
- Groundwater loading
- Stormwater runoff, either as part of an MS4 stormwater system or via direct drainage
- Combined sewer overflows (CSOs)
- Tributaries
- Discharge from municipal and industrial wastewater treatment plants
- Discharge of waste water and stocking of fish from fish hatcheries
- Diffusion or resuspension of PCBs from bedded sediments in the Spokane River and Lake Spokane

The mass loading rate for PCBs estimated in each source category was estimated using available data and literature values, with the specific calculations provided in Appendix B and results provided below in Table 2 and Figure 4. The primary delivery mechanisms of PCBs to the Spokane River were determined to be cumulative loading across all wastewater treatment plants, contaminated groundwater, and stormwater/combined sewer overflows. PCB loading from Lake Coeur d'Alene and Spokane River tributaries are of similar magnitude to the other primary delivery mechanisms, due to much higher flow rates but with lower much concentrations of PCBs.

Table 2. PCB Loading Rates Estimated for each Delivery Mechanism

Delivery Mechanism	PCB Loading Rate (mg/day)
WWTPs	
Total Municipal	6 - 2652
Total Industrial	48 - 271
Groundwater loading	60 - 300
Upstream sources	~0 - 260
Tributaries	
Latah Creek	~0 - 215
Little Spokane River	15-200
MS4 stormwater/CSOs	15 - 94
Bottom sediments	0.2 - 20
Fish hatcheries	Unknown
Atmospheric deposition to surface water	<0

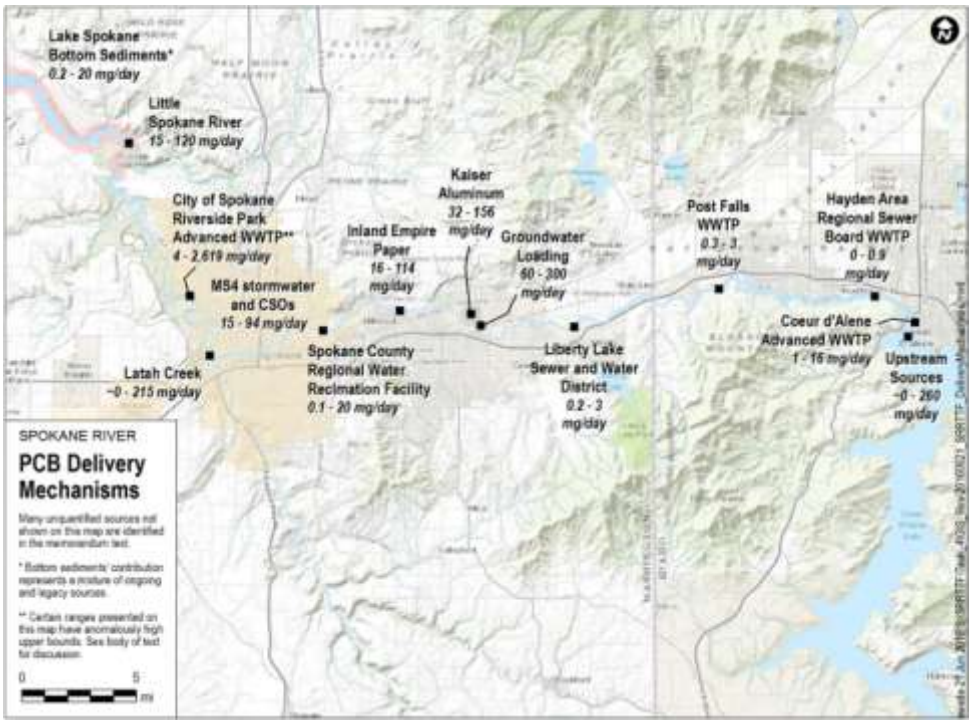

Figure 4. Estimated Range of PCB Loading Rates (mg/day) for each Delivery Mechanism

3.3 Transport Pathways between Source Areas and Delivery

Although quantitative estimates were generated for the PCB mass currently residing in the watershed and for the magnitude of different delivery mechanisms to the Spokane River, much less information was available to quantify the transport pathways between these source areas and delivery mechanisms. The primary categories transport pathways linking PCB source areas to delivery mechanisms are defined as:

- Mobilization in the watershed
- Volatilization to the atmosphere
- Delivery to sewer infrastructure
- Contribution to groundwater

Many of the watershed source areas of PCBs are not immediately available for transport to the river, and must first undergo a mobilization step. Mobilization in the watershed occurs via several mechanisms. For example, fixed building sources can be released to surface soil during building demolition and PCBs contained in industrial sources can be mobilized via spills to surrounding soils. The magnitudes of these individual mobilization pathways were estimated to the extent possible, with results shown in Figure 5. Mobilization from fixed building sources appears to be a significant transport pathway, and mobilization from non-fixed building sources, consumer product, and land application also identified as potentially important pathways. Insufficient data exist to define the magnitude of pathways between this initial mobilization step and delivery to the Spokane River.

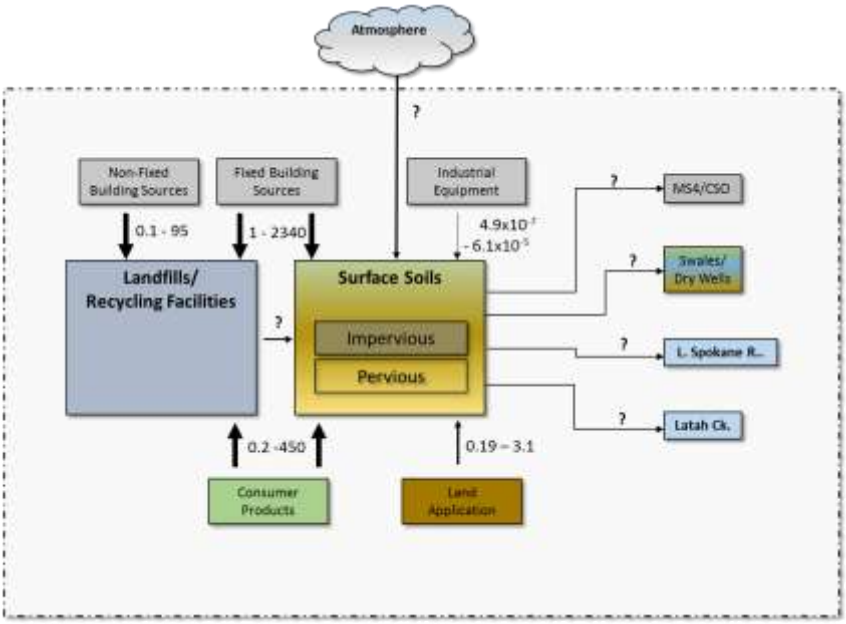

Figure 5. Estimated Magnitudes (kg/yr) for Watershed Mobilization Pathways

Numerous sources contribute to local atmospheric concentrations of PCBs via volatilization, i.e. conversion into a gas phase. Most of these pathways consist of volatilization directly from one of the previously listed source categories (i.e., buildings, surface soils). Volatilization from contaminated surface soils was determine to be the dominant pathway of PCBs to the atmosphere, with an estimated volatilization load of 16-1600 kg/yr. Potential combustion sources (e.g., incinerators, residential burning) were estimated to contribute an atmospheric load of 17 kg/yr. Volatilization of land-applied wastewater treatment sludge was determined to be negligible. Little definitive information exists on the specific amount of PCBs delivered to the Spokane area from atmospheric source areas. Ecology's Environmental Assessment Program (Ecology, 2016b) is currently undertaking a study that will provide information on this transport pathway.

The Spokane watershed contains a range of sewer infrastructure capable of delivering PCBs, either directly or indirectly, to the river. This infrastructure can be broadly divided into categories of stormwater and wastewater. Stormwater infrastructure can be further divided into categories of systems that directly discharge to the river and those that do not directly discharge (e.g., dry wells). No quantitative estimate exists defining the quantity of PCBs being delivered to the stormwater system, although a lower bound estimate of loading to the City of Spokane's MS4 system can be obtained from the stormwater loading estimate provided above of 0.01 kg/year. No information exists to estimate PCB loading to non-discharging stormwater systems. An estimate of PCBs delivered to municipal wastewater systems was derived from observed influent PCB concentrations, and calculated at 0.77 kg/yr.

Deleted: directly

The final intermediate transport pathway is contribution to groundwater. Subsurface soils can contribute to groundwater either via legacy contamination, landfill disposal of PCB-containing products, leaking submersible well pumps, or private septic systems. The Magnitude of Source Areas section above concluded that insufficient data exist to estimate the total mass of legacy subsurface PCB contamination; correspondingly, insufficient data are available to estimate the rate at which this legacy subsurface

Comment [TC6]: Not dry wells? Ecy's database suggests about 900 registered UICs in the county (not all over the aquifer, of course)

contamination contributes to groundwater. A lower bound estimate can be gained from the groundwater loading calculation presented above in the Magnitude of Delivery Mechanisms section, which estimated the groundwater loading in the river section directly below Mirabeau Park at 0.054 kg/year. This is considered a lower bound estimate because it only considers legacy contamination loading from a portion of the aquifer. No data were found describing groundwater PCB loading from landfills, although modern landfills are designed and operated to prevent any adverse effects to groundwater. No quantitative information was available describing the rate of leakage from submersible well pumps or the rate at which private septic systems are delivering PCBs to the groundwater.

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4
PCB Control Actions

As discussed above, PCBs are introduced to the Spokane River from a number of different source areas, transport pathways, and delivery mechanisms. This diversity of sources and pathways requires the application of a diverse range of Control Actions to reduce PCB levels and ultimately attain water quality standards. In addition, there are a wide range of PCB Control Actions that have been applied elsewhere for various source areas and pathways, that may or may not be applicable for Spokane. Evaluation of PCB Control Actions for inclusion in the Comprehensive Plan was conducted in three steps:

- Definition of the inventory of Control Actions to be evaluated for the Spokane River
- Evaluation of the cost and effectiveness of each PCB Control Action under consideration
- Definition of the specific Control Actions to be included in the Comprehensive Plan

The inventory of Control Actions to be evaluated in the Spokane River watershed is described in detail in LimnoTech (2016b), which is included as Appendix C to this Comprehensive Plan. The evaluation of the cost and effectiveness of each of PCB Control Actions under consideration is described in detail in LimnoTech (2016e), which is included as is included as Appendix D. The specific Control Actions to be included in the Comprehensive Plan were determined at a SRRTTF workshop help in Spokane on July 27, 2016. This section describes how these Control Actions were identified, evaluated, and selected for inclusion in the Comprehensive Plan. It is divided into three sub-sections, corresponding to:

- Inventory of Control Actions to be evaluated
- Evaluation of Control Action cost and effectiveness
- Selection of Control Actions for inclusion in the Comprehensive Plan

4.1 Inventory of Control Actions to Be Evaluated

Identification of the universe of Control Actions that have the potential to reduce PCB loading to the Spokane River is a necessary first step in the development of the Comprehensive Plan. These Control Actions have commonly been referred to as Best Management Practices (BMPs) in other studies. The term Best Management Practice is not being used in the Comprehensive Plan, because it has a specific legal meaning that varies between Washington and Idaho. In the context of the Spokane River Comprehensive Plan, Control Actions are defined consistent with SFEI (2010) as "any activity, technology, process, operational method or measure, or engineered system, which when implemented prevents, controls, removes or reduces pollution." The Control Actions identified for consideration in the Comprehensive Plan were obtained from several sources:

- BMP Toolbox for the San Francisco Bay Area (SFEI, 2010)
- Stormwater Management Manual for Eastern Washington (Washington Department of Ecology, 2004)
- Spokane Regional Stormwater Manual (Spokane County, City of Spokane, and City of Spokane Valley, 2008)

- Spokane River Regional Toxics Task Force February 6-8, 2016 Workshop
- PCB Chemical Action Plan (Washington Department of Ecology, 2015)
- Discussions within the SRRTTF BMP subgroup

For purposes of initial assessment, Control Actions were divided into the following four categories based upon discussions of the SRRTTF BMP planning group.

- Institutional
- Stormwater Treatment
- Wastewater Treatment
- Site Remediation

Institutional Control Actions include information sharing (educational campaigns) and governmental practices to help businesses and the general public identify, avoid, clean up and/or properly dispose of products containing PCBs. These control actions require the least amount of infrastructure, engineering work, maintenance, and disturbance of existing land because their intent is to avoid the continued use, inadvertent production, or release of PCBs. Institutional control actions can be further broken down into two categories, government practices and educational control actions. Governmental practices can include regulatory actions that restrict the use or disposal of PCB-containing items, as well as providing incentives for voluntary programs such as hazardous waste take-back programs. Educational control actions consists of activities that will indirectly reduce loading of PCBs, by altering public behavior and/or providing information to help direct future PCB reduction efforts. Stormwater Treatment Control Actions are engineered options to be installed or built with the existing storm sewer infrastructure to capture soil and water containing PCBs and prevent it from being discharged to the Spokane River. Wastewater treatment Control Actions are those intended to reduce the loading of PCB from municipal and industrial wastewater treatment plants (WWTPs), either by actions to reduce the amount of PCBs being delivered via influent to the WWTP or increasing the rate of PCB removal with the WWTP itself. Site remediation Control Actions involve: 1) identifying, and 2) cleaning up soil/groundwater that have been contaminated from past use of PCBs, before they can be mobilized and transported to the river.

A total of 45 Control Actions considered potentially applicable to address PCBs in the Spokane River were identified. Each Control Action ultimately considered is listed by category in Table 3. Summary descriptions of each of these Control Actions are provided in Appendix D of this Plan.

Table 3. Menu of Control Actions Identified as Potentially Applicable for Reducing PCB Loads to the Spokane River and Lake Spokane

Category	Sub-Category	Control Action
Institutional	Government Practices (Regulatory Actions and/or Incentivized Voluntary Programs)	Disposal assistance for PCB-containing items
		Land use/development ordinance that encourages LID
		Leaf removal
		Street sweeping
		Catch basin/pipe cleanout
		Purchasing standards
		Survey of local utilities for electrical equipment
		Regulation of waste disposal
		Removal of carp from Lake Spokane
		Building demolition control actions
		PCB-product labeling law
		Leak prevention/detection in electrical equipment
		Accelerated sewer construction
		PCB identification during inspections
		Regulatory rulemaking
		Compliance with PCB regulations
		Support green chemistry alternatives
	Educational	Survey of PCB-containing materials in schools/public buildings
		Education/outreach about PCB sources
		Education about discharge through septic systems in aquifer recharge area
		Education about filtering of post-consumer paper products
		PCB product information

Table 3 (continued). Menu of Control Actions Identified as Potentially Applicable for Reducing PCB Loads to the Spokane River and Lake Spokane

Category	Sub-Category	Control Action
Stormwater Treatment	**Pipe Entrance**	Infiltration control actions
		Retention and reuse control actions
		Bioretention control actions
		Isolation of contaminated source areas from the MS4
		Filters
		Screens
		Wet vault
		Hydrodynamic separator
	End of Pipe	Constructed wetlands
		Sedimentation basin
		Discharge to ground/dry well
		Diversion to treatment plant
		Fungi (mycoremedation) or biochar incorporated into stormwater treatment
Wastewater Treatment		Development of a Toxics Management Action Plan
		Implementation of a source tracking program
		Chemical fingerprinting or pattern analysis
		Remediation and/or mitigation of individual sources
		Elimination of PCB-containing equipment
		Public outreach and communications
		Review of procurement ordinances
		Pretreatment regulations
Site Remediation		Identification of contaminated sites
		Clean up of contaminated sites

4.2 Evaluation of Control Action Cost and Effectiveness

The second step in identifying those Control Action that may be most appropriate for inclusion in the Comprehensive Plan consisted of a detailed review of the inventory of Control Actions listed above. This section summarizes that review, and is divided into sections of Review Factors and Findings. A more detailed description of this assessment is provided in Appendix D.

4.3 Review Factors

Each Control Action was reviewed with respect to the following factors:

- Magnitude of pathway
- Reduction efficiency
- Cost
- Implementing entity

- Pollution prevention hierarchy
- Potential overlap with existing efforts
- Ancillary benefit
- Timeframes for implementation and results

The information gathered for this review indicated that many of the reviewed Control Actions have no quantitative information available on costs or effectiveness. In addition, the magnitude of the transport pathways between many source areas and delivery mechanisms as discussed above were determined to be either highly uncertain, or unknown. Because quantitative information was lacking for many aspects of this review, a qualitative scoring system was used. The definition of each aspect of the review, as well as the qualitative ranking system used, is described below.

"Magnitude of Pathway" describes the importance of the pathway in terms of delivering PCBs to the river or lake from the source area or pathway being targeted by the Control Action. Control Actions that interrupt significant pathways may be very effective in preventing PCB sources from contributing PCBs to the system. Even though many intermediate transport pathways are uncertain or not quantified, sufficient information exists to allow at least a qualitative understanding of the importance of many pathways. As such, Control Actions were rated as follows:

- Highly suitable: Pathway provides >1% of the total PCB load delivered to the system
- Moderately suitable: Pathway provides 0.1- 1% of the total PCB load delivered to the system
- Less suitable: Pathway provides <0.1% of the total PCB load delivered to the system

"Reduction Efficiency" is a primary consideration in terms of prioritizing Control Actions, as it describes the extent to which a given action is expected to reduce PCB movement from its targeted source area or pathway. Although quantitative information defining reduction efficiency was not available for many Control Actions, sufficient information exists to allow the majority of Control Action to be rated as follows:

- Highly suitable: >50% reduction in targeted source area or pathway
- Moderately suitable: 10-50% reduction in targeted source area or pathway
- Less suitable: <10% reduction in targeted source area or pathway

"Cost" describes the expected long-term cost of implementing the Control Action, considering both capital and operating costs. Control Actions that remove PCBs at lower costs will be preferred over Control Actions that remove similar amounts of PCBs at greater costs. Even in the absence of quantitative data, a qualitative understanding exists regarding the costs of many Control Actions, and they are rated as follows:

- Highly suitable: <$100,000
- Moderately suitable: $100,000-$1,000,000
- Less suitable: >1,000,000

"Implementing Entity" describes the extent to which there is a clearly identified responsible party for implementing the control action due to their enrollment in a regulatory or voluntary program, along with an assessment of their willingness to do so. It is rated as follows:

- Highly suitable Entity identified and willing to implement
- Moderately suitable: Entity identified, willingness uncertain
- Less suitable: No willing entity identified

Experience with a wide range of pollutants has shown that preventing the creation or release of a pollutant is far more effective than controlling it once released. "Pollution Prevention Hierarchy"

describes where the Control Action is located on the spectrum from limiting production and use of PCBs to treating PCBs prior to their release to the river or lake. It is rated as follows:

- Highly suitable: Controls production or use of PCBs
- Moderately suitable: Manages the mobility of PCBs in the environment
- Less suitable: Performs "end-of-pipe" treatment of PCBs prior to discharge

"Existing Efforts" describes the extent to which a given Control Action relates with existing PCB control efforts that are required by state or federal law or currently being conducted under voluntary programs. It is rated as follows:

- Highly suitable: Addresses a source area or pathway that is not currently being addressed
- Moderately suitable: Expands upon existing controls of a source area or pathway
- Less suitable: Redundant with existing efforts

"Ancillary Benefit" describes the extent to which a given Control Action provides benefits beyond removal of PCBs from the system. It is rated as follows:

- Highly suitable: Provides significant additional benefits beyond reduction of PCB loads
- Moderately suitable: Provides some additional benefits beyond reduction of PCB loads
- Less suitable: Provides minimal additional benefit beyond reduction of PCB loads

"Timeframe" assesses the amount of time it will take for a given Control Action to be implemented and a system response observed. It is rated as follows:

- Highly suitable: Expected response within two year timeframe
- Moderately suitable: Expected response within five year timeframe
- Less suitable: Expected response within twenty year timeframe

4.4 Review Findings

Table 4 summarizes the findings of the above review, using a simple shading scheme to identify whether each aspect of each Control Action is:

- Highly suitable
- Moderately suitable
- Less suitable
- Unable to be evaluated, due to a lack of information

Table 4. Initial Summarization of Control Actions

Control Action	Significance of Pathway	Removal Efficiency	Cost	Implementing Entity	PP Hierarchy	Ancillary Benefit	Existing Efforts	Implementation Time	System Respone Time
Disposal assistance									
LID ordinance									
Leaf removal									
Street sweeping									
Catch basin/pipe cleanout									
Purchasing standards									
Survey of electrical equipment									
Regulation of waste disposal									
Remove Carp from L. Spokane									
Building demolition control									
PCB-product labeling law									
Leak prevention/detection									
Accelerated sewer construction									
PCB I.D. during inspections									
Regulatory rulemaking									
Compliance with PCB regulations									
Support green chemistry									
Survey schools/public buildings									
Education on PCB sources									
Education on septic discharge									
Education on consumer filtering									
PCB product information									
Stormwater - pipe entrance									
Stormwater - pipe system									
Stormwater - end of pipe									
Wastewater treatment									
I.D. of contaminated sites									
Clean up of contaminated sites									

Key	
Unknown	
Magnitude of Pathway	
>1% of total load	
0.1 - 1% of total load	
<0.1% of total load	
Removal Efficiency	
>50% reduction	
10-50% reduction	
<10% reduction	
Cost	
<$100k	
$100k-$1M	
>$1M	
Implementing Entity	
Identified and willing	
identified	
None identified	
Hierarchy	
Controls production or use	
Manages mobility	
End of pipe control	
Ancillary Benefit	
Significant	
Some	
Minimal	
Existing Controls	
Not currently being addressed	
Expands upon existing controls	
Redundant	
Time Frame	
W/in two years	
W/in five years	
W/in twenty years	

One key observation made from this review was that the most significant delivery mechanisms of PCBs all have existing Control Actions in various phases of development. Specific PCB-related Control Actions underway in Spokane are:

- Wastewater treatment plants discharging to the Spokane River are all required to develop and install treatment systems to reduce nutrient loading that will concurrently result in reductions of PCB loading. In addition, each wastewater facility has developed a Toxics Management Action Plan that includes a PCB source identification study and associated control actions. These treatment plants are operated by:
    - City of Coeur d'Alene
    - City of Spokane
    - Kaiser Aluminum
    - Spokane County
    - City of Post Falls
    - Liberty Lake Sewer and Water District
    - Inland Empire Paper
    - Hayden Area Regional Sewer Board
- Remediation activities for known contaminated sites in Washington are being implemented and managed under the jurisdiction of the Model Toxics Control Act (MTCA). Marti and Maggi (2015) searched for sites in Spokane that could be contributing PCB contamination to groundwater in the area of the Spokane River. They identified 31 clean-up sites, three of which have confirmed release of PCBs and subject to MTCA remediation. They are:
    - Spokane River Upriver Dam and Donkey Island
    - Kaiser Aluminum
    - General Electric Company, E. Mission Ave.
- The City of Spokane is actively addressing stormwater and CSO loading of PCBs as part of their Integrated Clean Water Plan. Other entities are also controlling their stormwater loads under NPDES permits, including:
    - Idaho Transportation Department
    - City of Post Falls
    - Spokane County
    - Washington Department of Transportation
    - City of Coeur d'Alene
    - Post Falls Highway Department
    - City of Spokane Valley
- The large majority of stormwater in the remainder of the watershed (including Spokane County and the City of Spokane Valley) is being diverted to groundwater, as opposed to direct surface discharge to the River. This activity is consistent with many of the PCB Control Actions discussed previously under the category of "Stormwater Treatment--Pipe Entrance," and is regulated under the State of Washington's Underground Injection Control Program.
- Local electric utilities have replaced their transformer oils with essentially PCB-free oils, and eliminated the use of large capacitors.

4.5 Selection of Control Actions for Inclusion in the Comprehensive Plan

The results of the evaluation of Control Actions presented above were discussed at a SRRTTF workshop held in Spokane on July 27, 2016. The objective of this workshop was to define, in a consensus-based manner among SRRTTF members, the specific Control Actions to be included in the Comprehensive Plan. A summary of the Control Actions under consideration were presented in spreadsheet format as shown in Table 5. The 45 Control Actions originally identified were condensed into 27 categories, primarily by grouping individual stormwater controls into categories corresponding their location (i.e. pipe entrance, in the pipe system, or end of pipe). Discussion of Control Actions at the workshop was divided into tiers of:

- Control Actions already being implemented
- Potential new Control Actions

Table 5. Summary of Control Options Presented at July 27, 2016 Workshop

PCB Control Action	Magnitude of Source Area	Magnitude of Delivery Mechanism	Magnitude of Pathway Being Controlled	Ongoing? Action?	by Whom?	Actionable Recommendation	by Whom?	Time to Implement	Time to Noticeable System Response	Outcome	Cost, Possible $ Sources	Ancillary Benefit
Already Being Implemented												
Wastewater Treatment	Unknown	54 - 2923 mg/day	54 - 2923 mg/day	Toxics Mgt Plans, source tracking, public outreach, pretreatment regs, etc.	Permits (EPA/ Ecology); dischargers	-	-	-	-	-	-	-
Remediate Known Contaminated Sites	Unknown	60 - 300 mg/day	60 - 300 mg/day	Ongoing	Ecology, w/responsible parties	-	-	-	-	-	-	-
LID Ordinance	Unknown	15 - 94 mg/day	Unknown	Create & implement land use/ development standards encouraging low impact development	City of Spokane	-	-	-	-	-	-	-
Stormwater Pipe Entrance	Unknown	15-94 mg/day	15-94 mg/day	Infiltration controls (trenches, basins, dry-wells), bio-retention	City of Spokane	-	-	-	-	-	-	-
Stormwater Pipe System	Unknown	15-94 mg/day	15-94 mg/day	Screens, filters, wet vaults, hydrodynamic separators	City of Spokane	-	-	-	-	-	-	-
Catch Basin/Pipe Cleanout	Unknown	15 - 94 mg/day	Unknown	Partial; removal of sediments from catch basins, pipes	City of Spokane	-	-	-	-	-	-	-
Support green chemistry	0.2 to 450 mg/day	Unknown	Unknown	Ongoing	Ecology	Outreach/education	SRRTTF members	Within 5 years	20 years or more	Reduced import of PCBs to watershed	$100K-$1M	Marginal
Street sweeping	Unknown	15-94 mg/day	Unknown	Ongoing	Many communities	Increased frequency	Municipal public works	Within 2 years	20 years or more	Fewer particulates contributing to stormwater	$100K-$1M	Significant
Leaf Removal	Unknown	15 - 94 mg/day	Unknown	Ongoing	City of Spokane, Spokane County, Coeur d'Alene	Enhance current municipal leaf removal programs	Municipal public works	Within 2 years	20 years or more	Less leaf litter contributing to stormwater	$100K-$1M	Marginal
ID New Contaminated Sites	Unknown	Unknown	Unknown	Ongoing	Ecology	Mining of existing data, targeted monitoring	Ecology, SRRTTF	Within 5 years	20 years or more	Identify sites for remediation	$100K-$1M	Marginal
Purchasing Standards	0.2 to 450 mg/day	Unknown	Unknown	In place in Washington	Ecology, City of Spokane, Spokane County	Expansion to Idaho?	State of Idaho, DEQ, municipalities	Within 5 years	20 years or more	Reduced import of PCBs to watershed	$100K-$1M	Marginal

PCB Control Action	Magnitude of Source Area	Magnitude of Delivery Mechanism	Magnitude of Pathway Being Controlled	Ongoing? Action?	by Whom?	Actionable Recommendation	by Whom?	Time to Implement	Time to Noticeable System Response	Outcome	Cost, Possible $ Sources	Ancillary Benefit
Potential New Actions												
PCB Product-Labeling Law	0.2 to 450 mg/day	Unknown	Unknown	-	-	Lobby for development of ordinance	All SRRTTF members (potentially)	Within 5 years	20 years or more	Reduced import of PCBs to watershed	<$100K	Marginal
PCB Product Info	0.2 to 450 mg/day	Unknown	Unknown	-	-	Lobby for development of ordinance	All SRRTTF members (potentially)	Within 5 years	20 years or more	Reduced import of PCBs to watershed	<$100K	Marginal
Survey Electrical Equipment	5.5 to 22 kg	0.001 – 0.02 mg/day	0.001 – 0.02 mg/day	-	-	Regulatory requirement or voluntary action	States, utilities, industries	Within 5 years	20 years or more	Better source area identification	<$100K	Marginal
Leak Prevention/ Detection	5.5 to 22 kg	0.001 – 0.02 mg/day	0.001 – 0.02 mg/day	-	-	Regulatory requirement or voluntary action	States, utilities, industries	Within 5 years	20 years or more	Reduced leaks/spills	<$100K	Marginal
PCB ID During Inspections	50 – 40,000 kg	Unknown	Unknown	-	-	Training inspectors to identify materials and what to do next	Munici-palities	Within 5 years	20 years or more	Better source area identification	<$100K	Marginal
Survey Schools & Public Buildings	Unknown	Unknown	Unknown	-	-	Survey PCB-containing materials in schools/public buildings	Ecology; Regional Health Districts	Within 5 years	20 years or more	Better source area identification	<$100K	Marginal
Building Demolition Control	60 - 130,000 kg	Unknown	Unknown	-	-	Regulations/ ordinances requiring mgmt. of PCB-containing materials during demolition and renovation	EPA, States, local governments	Within 5 years	20 years or more	Under investigation	<$100K	Marginal
Waste Disposal Assistance	Unknown	Unknown	Unknown	-	-	Develop programs to accept and dispose of PCB-containing items	Numerous organizations	Within 5 years	20 years or more	Reduced illegal disposal	<$100K	Marginal
Carp Removal	Unknown	N/A	1.5 – 4.1 g PCBs per 1000 carp removed	Pilot study	Avista/Ecology	Remove carp from Lake Spokane	Avista/ Ecology	Within 2 years	20 years or more	Reduced human exposure	?	Significant
Educational on Septic Disposal	Unknown	Unknown	Unknown	-	-	Educate on-site septic system owners located over aquifer recharge area on proper waste disposal	Local governments	Within 2 years	20 years or more	Less disposal of PCB containing material into septics	<$100K	Marginal
Educational on Filtering Post-consumer Paper	Unknown	Unknown	Unknown	-	-	Educate on separating paper recycling materials w/yellow inks/ pigments into the garbage stream	Local governments	Within 2 years	20 years or more	Less PCB-containing trash sent to recycling	<$100K	Marginal
Accelerated Sewer Construction	Unknown	Unknown	Unknown	-	-	Accelerate sewer construction to replace septic systems	Local munici-palities	Within 5 years	20 years or more	Reduced load to aquifer	>$1M	Marginal
Regulatory Rulemaking	0.2 to 450 mg/day	Unknown	Unknown	-	-	Engage with federal agencies to reform TSCA and FDA packaging regs	SRRTTF members	5 - 20 years	20 years or more	Reduced import of PCBs to watershed	$100K-$1M	Marginal
Compliance with PCB Regulations	0.2 to 450 mg/day	Unknown	Unknown	-	-	Engage with agencies to require stricter accountability for compliance with existing rules	SRRTTF members	5 - 20 years	20 years or more	Reduced import of PCBs to watershed	$100K-$1M	Marginal
Regulation of Waste Disposal	Unknown	Unknown	Unknown	-	-	Review laws regulating waste disposal and revise as necessary	Local governments	5 - 20 years	20 years or more	Reduction in improper disposal	<$100K	Marginal
Emerging End of Stormwater Pipe Technologies	Unknown	15-94 mg/day	15-94 mg/day	Research fungi, bio-char, activated carbon	City of Spokane	Support additional research	Municipal public works	5 - 20 years	20 years or more	Reduced import of PCBs to watershed	?	Marginal

Existing Control Actions were discussed first, and placed by the group into one of two categories. The first category (called Category A) contained Control Actions where the group decided to maintain current efforts, and document those efforts in the Plan. The following Control Actions were identified as Category A:

- Wastewater Treatment
- Remediate Known Contaminated Sites
- Stormwater Controls
- Low Impact Development Ordinance
- Street Sweeping
- Purchasing Standards

The second category (called Category B) contained Control Actions where the group identified improvements that could be made to existing efforts. The following Control Actions were identified as Category B:

- Support of Green Chemistry
- PCB Product Testing Information
- Waste Disposal Assistance
- Regulatory Rulemaking
- Compliance with PCB Regulations
- Emerging End of Pipe Stormwater Technologies

Potential new Control Actions were reviewed next, and placed into one of three categories by the group:

C. Include in Comprehensive Plan and commit to implementation
D. Include in Comprehensive Plan as an activity worth exploring in the future
E. Do not include in Comprehensive Plan

Two Control Actions were identified as Category C for inclusion in the Comprehensive Plan with a commitment to implementation: Identification of New Sites of Concern for Contaminated Groundwater and Building Demolition and Renovation Control. The following nine Control Actions were identified as Category D, to be included in the Comprehensive Plan as an activity worth exploring in the future:

- Survey Schools and Public Buildings
- Accelerated Sewer Construction
- Emerging Wastewater Technology
- Survey Electrical Equipment
- Leak Prevention/ Detection
- Regulation of Waste Disposal
- Removal of Carp from Lake Spokane
- PCB Identification during Inspections
- Compliance with PCB Regulations for Imported Products
- Education on Septic Disposal
- Stormwater Source Tracing

Three Control Actions were identified as Category E, and not considered for future implementation:

- Expanded Leaf Removal
- PCB Product Labeling Law
- Education on Filtering Postconsumer Paper

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5 Implementation Plan

This section discusses the specific Control Actions selected to be undertaken to reduce PCBs in the Spokane River, the recommended schedule for their implementation, and measurable milestones to assess their implementation effectiveness. It contains sections corresponding to each of the Category A, B, and C Control Actions identified in the previous section. Category D Control Actions (i.e. ones intended for future consideration) are discussed later in this document. Long-term effectiveness in reducing PCBs in the river and fish tissue is addressed in Section 6.

The effectiveness of SRRTTF's implementation of Control Actions will be assessed annually through the preparation of an Implementation Review report. The report will determine the extent to which each individual milestone listed in this section was attained, and will provide flexibility to adapt strategies, phase out actions that are not working, and phase in new Control Actions as appropriate.

5.1 Category A: Wastewater Treatment

NPDES permits regulate discharges from wastewater and industrial facilities in Washington and Idaho, as well as fish hatcheries (under a general permit). The Washington and Idaho (EPA) NPDES permits require each wastewater facility discharging to the Spokane River to develop and install treatment systems to reduce nutrient loading that will concurrently result in reductions of PCB loading. Additional permit requirements that relate to the monitoring and reduction of PCB loads are described for the following categories of permits: Idaho Municipal Permits, Washington Municipal Permits, Washington Industrial Permits, and Fish Hatchery General Permit. The information that follows is based on the most current permits as of September 2016, and does not include information in draft permits that have not yet been approved.

5.1.1 Idaho Municipal Permits

The City of Coeur d'Alene (ID0022853), City of Post Falls (ID0025852), and Hayden Area Regional Sewer Board (ID0026590) all have NPDES permits with numerous PCB-related requirements. These permits have very similar, if not identical requirements to monitor PCB congeners at influent, effluent and instream locations and participate in the SRRTTF. Other requirements that are common to these three permits and which will reduce PCB loads to the Spokane River are:

- Submit a Toxics Management Plan to EPA and IDEQ, with the goal of reducing loadings of PCBs to the Spokane River to the maximum extent practicable. The Toxics Management Plan must address source control and elimination as follows:
  - From contaminated soils, sediments, storm water and groundwater entering the POTW collection system via inflow and infiltration
  - From industrial and commercial sources, including compliance with pre-treatment regulations for industrial users indirect discharges of PCBs that cause pass through or interference

- From any person discharging PCBs to the POTW water in excess of applicable pre-treatment local limit established by the POTW, or 3 ug/L, whichever is less.
- By means of eliminating existing sources that are within direct control of the permittee.
- By means of changing the permittee's procurement practices, control and minimize the future generation and release of PCBs that are within the direct control of the permittee, including preferential use of PCB free substitutes for those products containing PCBs below the regulated level of 50 ppm
- Develop and implement a public education program to educate the public about: the difference between products free of PCBs and those labeled non-PCB but which contain PCBs below the TSCA regulatory threshold of 50 ppm; and proper disposal of waste products that may contain PCBs including those containing PCBs below the TSCA regulatory threshold of 50 ppm and the hazards associated with improper disposal.
- Distribute appropriate educational materials to target audiences at least once per year.
- At least once a year, prepare and distribute information relevant to the TMP to a newspaper, and make all relevant TMP documents available to the public.

- Submit an annual report to EPA and IDEQ that contains: PCB monitoring results, copies of educational materials, ordinances, inventories, guidance materials or other products produced as part of the TMP.
  - Description and schedule for implementation of additional actions that may be necessary, based on monitoring results, to ensure compliance with applicable water quality standards
  - Summary of actions taken to reduce discharges of PCBs during the previous 12-month period, and a separate summary of actions planned for the next reporting cycle

5.1.2 Washington Municipal Permits

There are three Washington municipal permits. These are permit WA-002447-3, which covers the City of Spokane Riverside Park WRF and CSOs, and Spokane County Pretreatment Program, and permit WA-0045144 which covers the Liberty Lake Sewer and Water District. The third permit (WA-0093317) covers the Spokane County Regional WRF. These permits are similar to each other with regards to PCBs, and are also similar to the Idaho municipal permits. Requirements common to the three Washington municipal permits are listed below with a few differences noted.

Each permit includes requirements to monitor PCB congeners at minimum specified frequencies in raw sewage and final effluent and participate in the SRRTTF. PCBs sampling and analysis must be in accordance with the quality assurance plan and scope of work submitted to the Department of Ecology. The quality assurance plan will be reviewed annually and revised if needed. (The QAPP language is slightly different for the County permit). The effluent monitoring results will be compiled and analyzed by Ecology for the purpose of establishing a performance-based PCB effluent limitation for the following permit cycle. The Spokane County permit additionally requires biosolids PCB monitoring.

A report[3] must be submitted to Ecology annually, containing a report of the sampling results. Annually, the permittee and Ecology will review the data, including pattern analysis of homologs, detection limits, QA/QC procedures and a draft action plan (The Toxics Management Plan) listing identified sources, potential sources suggested by data analysis and future source identification activities. Annually the permittee and Ecology will confer and revise locations and frequency of raw sewage PCB sampling in the collection system.

[3] The Spokane City and Liberty Lake Sewer and Water District permits refer to this report as a "Receiving Water and Effluent Study," whereas the Spokane County permit refers to it as a "Toxics Management Report."

Similar to the Idaho municipal permits, the goals of the Toxics Management Plan are to reduce loadings of PCBs to the Spokane River to the maximum extent practicable realizing statistically significant reductions in the influent concentration of toxicants to the treatment plants over the next 10 years, and reduce PCBs in the effluent to the maximum extent practicable to bring the Spokane River into compliance with WQS for PCBs. The Toxics Management Plan must address source control and elimination of PCBs from:

- Contaminated soils and sediments,
- Storm water entering the wastewater collection system,
- Industrial and commercial sources. As an element of the Spokane City and Spokane County permitted pretreatment programs (not Liberty Lake), the scope of their inspections and monitoring will be expanded to include PCBs. The PCB monitoring must follow a QAPP.
- By means of eliminating active sources such as: older machinery, older electrical equipment and components, construction material content, commercial materials
- By means of changing procurement practices and ordinances control and minimize toxics, including preferential use of PCB free substitutes for those products containing PCBs below the regulated level of 5 ppm, in sources such as: construction material content, commercial materials, soaps and cleaners.
- The Permittee must also prepare public media educating the public about the difference between products free of PCBs and those labeled non-PCB but which contain PCBs below the TSCA regulatory threshold of 5 ppm.

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Washington Industrial Permits

There are two Washington industrial permits, the Inland Empire Paper Company permit (WA-000082-5) and the Kaiser Aluminum permit (WA0000892).

The Inland Empire Paper Company permit contains monitoring requirements for PCB congeners, but does not contain PCB effluent limits. After Inland Empire Paper Company collects total PCB data according to the initial testing frequency, Ecology intends to modify the permit to set an interim numeric effluent limit for total PCBs.

This permit also includes requirements to submit a scope of work for a PCB Source Identification Study, and completion of that study after approval by the Department. The scope of work for the PCB Source Identification Study should include raw materials used at the facility that may contain PCBs, a site review where PCB containing equipment was/may have been used, a sampling plan with proposed sampling locations, quality control protocols, sampling protocols and PCB text methods.

Following approval of the scope of work, Inland Empire Paper Company shall submit a report of the results and incorporate findings into the PCB BMP Plan. The PCB BMP plan shall include:

- A list of members of a cross-functional team responsible for developing the BMP plan, including the name of a designated team leader.
- A description of current and past source identification, source control, pollution prevention, and wastewater reduction efforts and their effectiveness.
- Identification of technical/economical evaluation of new BMPs. BMPs should include, but are not limited to: modification of equipment, facilities, technology, processes, and procedures; source control; remediation of any contaminated areas, etc.
- A schedule for implementation of economically feasible BMPs.
- Methods used for measuring progress towards the BMP goal and updating the BMP plan.
- Results from testing of any waste streams for PCBs taken in support of the PCB BMP plan and PCB Source Identification Study.

Following initial submission of the PCB BMP plan, an annual report is due to the Department and shall include: a) all BMP plan monitoring results for the year; b) a summary of effectiveness of all BMPs implemented to meet the BMP plan goal; and c) any updates to the BMP plan.

The Kaiser Aluminum permit assumes use of a black walnut shell (BWS) filtration system to aid in removing PCBs from the process wastewater. This system was constructed in response to an Agreed Order issued by Ecology, which was subsequently amended in October, 2005, to require influent sampling to the BWS to verify that the design PCB loadings to the filters were being maintained (among other requirements). The permit specifies PCB influent sampling and loading limits for the black walnut shell filtration system inlet, to verify that the design PCB loadings to the filters are being maintained. This permit also requires continued PCB source identification and cleanup actions that were initiated under Amended Order No. 2868, to reduce PCBs in the effluent to the maximum extent practicable to bring the Spokane River into compliance with applicable water quality standards for PCBs. Among other things, the Amended Order required Kaiser Aluminum investigate the high levels of PCBs discharged in 2002 and identify and remove PCBs still remaining in the wastewater treatment and collection systems. In addition, Kaiser Aluminum is required to prepare a scope of work for additional source identification efforts that utilizes information from a 2012 report, and which includes a sampling plan with proposed sampling locations, sampling protocols, PCB test methods and a work schedule. A report summarizing the status of the PCB source identification and cleanup must be provided semiannually to Ecology.

Comment [TC7]: I think Kaiser uses a variety of walnut shells, not just black walnut

5.1.3 Fish Hatchery General Permit

The general NPDES permit (WAG130000) for Federal Aquaculture Facilities and Aquaculture Facilities located in Indian Country has permit requirements related to PCBs. Some requirements apply to all permittees and a subset applies only to permittees that discharge to waters in WRIA 54 (Lower Spokane) and WRIA 57 (Middle Spokane). These are generally described below.

All facilities that discharge to waters in the Lower Spokane and Middle Spokane watersheds must:

- Monitor their effluent for PCB congeners. This currently applies to the Ford State Fish Hatchery and Spokane Tribal Hatchery. Total concentration of dioxin-like PCB congeners and a complete congener analysis must be reported.
- Use any available product testing data to preferentially purchase paint and caulk with the lowest practicable total PCB concentrations
- Facilities in the Spokane River area must also request PCB content information from fish food suppliers and include documentation of that request in their files.

All facilities must develop and implement a BMP plan (and annually review the plan) that meets specific requirements, including the following that apply to PCBs:

- Implement procedures to eliminate the release of PCBs from any known sources in the facility.
- Implement purchasing procedures that give preference for fish food that contains the lowest amount of PCBs that is economically and practically feasible.

5.1.4 Schedule and Monitoring Program

Each of the above permits is renewed periodically, typically on a five-year basis. Because this is a Category A Control Action (maintain existing activities), this Comprehensive Plan is not specifying additional scheduling or monitoring requirements beyond the long-term implementation effectiveness monitoring discussed in Section 6 of this Plan.

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5.2 Category A: Remediate Known Contaminated Sites

Ecology's Toxics Cleanup Program (TCP) is responsible for remediating known contaminated sites, working under regulatory authority from Washington's Model Toxics Control Act (MTCA). Four contaminated sites with potential to contribute PCBs to the Spokane River are in various stages of remediation:

- Spokane River Upriver Dam and Donkey Island
- General Electric Co.
- City Parcel
- Kaiser Aluminum

The status of each site is discussed below.

5.2.1 Spokane River Upriver Dam and Donkey Island

Historical discharges PCBs to Spokane River upstream of the Upriver Dam and Donkey Island led to contamination of river sediments. Two PCB deposits in river-bottom sediments were investigated and cleaned up from 2003 to 2007 in accordance with a consent decree Ecology entered into with Avista and Kaiser Aluminum & Chemical Corporation. The remedy involved the removal and containment of PCB-contaminated sediments. Due to the design of the selected remedy to cap contaminated sediments in place, PCBs remain in sediments at concentrations exceeding the selected cleanup level for the site. Post-remediation surface and subsurface sediment sampling were required to be performed as part of the Cleanup Action Plan. Surface grab samples were collected from material on top of the cap and subsurface sediment profile cores were collected from the cap extending into the material below the cap. In addition, a bathymetric survey was conducted prior to each sampling event to evaluate cap thickness and help select locations for the surface and subsurface sediment samples. Ecology has determined, based upon review of the collected data, that: 1) the cleanup remedy implemented at the Site is currently protective of human health and the environment; and 2) monitoring of the effectiveness of the remedial action and the integrity of the cap should continue in the future at a rate of once every five years to ensure long-term protectiveness (Ecology, 2015).

5.2.2 General Electric Co.

The General Electric Co. site is approximately 1200 feet south of the Spokane River in Spokane, and less than two acres in size. The site was used by General Electric to operate a transformer service shop from 1961 to 1980. Oils containing PCBs were released to soils during service operations. Investigations in the mid to late 1980s confirmed the presence of PCBs in soils and groundwater. Cleanup actions began in 1991. Remedies were accepted as complete in 1999 included vitrification, removal, containment, groundwater monitoring, and institutional controls. Institutional controls include fencing the General Electric property, inspecting and maintaining an asphalt cap, and recording of restrictive covenants. Cleanup is now considered complete and monitoring continues to ensure protection of human health and the environment. Periodic reviews have been conducted in 2003, 2008, and 2013 and have included the evaluation of groundwater data, inspection of the reports on the asphalt cap, and existing institutional controls. The most recent review concludes that the site cleanup continues to be protective of human health and the environment. Groundwater monitoring in seven of eight monitoring wells are in compliance with specified clean-up levels (Ecology, 2013).

5.2.3 City Parcel

The City Parcel site covers just over half an acre. Spokane Transformer, Inc. repaired and recycled transformers at the site from 1961 through 1979. In 1979, the site was sold to City Parcel, Inc., a package

delivery service. Soil samples collected between 1976 and 1997 consistently contained PCB contamination at concentrations exceeding both residential and industrial standards. Groundwater has been sampled multiple times, and no contamination was detected. Ecology conducted a state-funded feasibility study and developed a cleanup action plan in 2004 that included removing the building, contaminated soil, all drain lines and dry wells and an underground storage tank. In 2009, the building was demolished, and contaminated debris were removed. Contaminated soil was also excavated and disposed off-site at this time. Soil samples taken following this revealed PCB contamination along the northern and western fence lines surrounding the property. Ecology will conduct periodic reviews at least every five years to ensure site uses continue to protect human health and the environment (Ecology web site).

5.2.4 Kaiser Aluminum

The Kaiser Aluminum Fabricated Products facility had in the past used hydraulic oils containing high concentrations of PCBs for aluminum casting operations. Kaiser's long term use and storage of PCB-contaminated soils contaminated the soil and underlying groundwater with PCBs. Since 2005, Kaiser has conducted a series of investigation and cleanup activities for soil and groundwater under the authority and requirements of Ecology's cleanup regulations, the state's MTCA. In 2012, Ecology issued an Amended Agreed Order requiring soil excavation and capping of deeper soil to address PCB contamination; these actions have been completed, resulting in the removal of 540 tons of soil that contained elevated levels of PCBs. The 2012 order also required Kaiser to initiate a PCB groundwater treatment pilot study by October 30, 2015. The contamination of groundwater underlying the Kaiser facility is widespread, with PCB levels exceeding 500,000 pg/L (Hart Crowser, 2012). After completion of this pilot study, Ecology will issue a cleanup action plan that will specify the actions that Kaiser must take to remediate the PCB-contaminated groundwater. Ecology estimates that this groundwater treatment system will be operational by 2020 (EPA, 2015).

5.2.5 Schedule and Monitoring Program

Each of the above sites has stipulated cleanup and/or period review schedules and monitoring requirements as discussed above. Because this is a Category A Control Action (maintain existing activities), this Comprehensive Plan is not specifying additional scheduling or monitoring requirements beyond the long-term implementation effectiveness monitoring discussed in Section 6 of this Plan.

5.3 Category A: Stormwater Controls

Many of the communities in the Spokane River watershed are regulated by Municipal Separate Sewer System (MS4) permits that will restrict discharges of PCBs to the river. While most of these regulations are not PCB-specific, the practices they require will indirectly reduce PCB loads via reduction in stormwater volume and/or reduction in suspended solids (a known carrier of PCBs) concentrations in stormwater. In addition to MS4 permits, the City of Spokane has committed to an Integrated Clean Water Plan. These existing stormwater control actions are described below.

5.3.1 NPDES permits for MS4s

The Washington communities of City of Spokane, City of Spokane Valley and Spokane County are covered under the Eastern Washington general MS4 Phase 2 permit. This permit has an effective date of August 1, 2014, and expires July 31, 2019. Washington State Department of Transportation (DOT) has a separate MS4 permit that was effective as of August 1, 2013. The Idaho communities and highway districts (City of Post Falls, City of Coeur d'Alene, Post Falls Highway District, and Idaho DOT, District 1) will all be covered under the forthcoming general permit for all regulated MS4s in Idaho. The preliminary draft permit and fact sheet were issued in April 2016.

The Eastern Washington general permit requires permittees to allow Low Impact Development (LID) stormwater management techniques in new development and redevelopment projects, where feasible. Second, the permit features new requirements for permittees to cooperatively develop and conduct Ecology-approved studies to assess effectiveness of permit-required stormwater management program activities and best management practices" (City of Spokane's Clean Water Plan 2014). Other components of existing MS4 permits that will lead to reduction of PCBs in stormwater include (from Ecology, 2012):

Comment [TC8]: Where does this quote begin?

- All new development and redevelopment projects meeting a specified threshold must preserve natural drainage systems to the extent possible at the site.
- Stormwater collection and conveyance system, including catch basins, stormwater sewer pipes, open channels, culverts, structural stormwater controls, and structural runoff treatment and/or flow control facilities. The Operation and Maintenance (O&M) Plan shall address, but is not limited to: regular inspections, cleaning, proper disposal of waste removed from the system in accordance with street waste disposal requirements, and record keeping. No later than 180 days prior to the expiration date of this permit, Permittees shall implement catch basin cleaning, stormwater system maintenance, scheduled structural BMP inspections and maintenance, and pollution prevention/good housekeeping practices. Decant water shall be disposed of in accordance with street waste disposal requirements.
- The O&M Plan shall address for roads, highways, and parking lots: deicing, anti-icing, and snow removal practices; snow disposal areas and runoff from snow storage areas; material (e.g. salt, sand, or other chemical) storage areas; and all-season BMPs to reduce road and parking lot debris and other pollutants from entering the MS4. No later than 180 days prior to the expiration date of this permit, Permittees shall implement all pollution prevention/good housekeeping practices established in the O&M Plan for all roads, highways, and parking lots with more than 5,000 square feet of pollutant generating impervious surface that are owned, operated, or maintained by the Permittee.
- A minimum of 95% of all known stormwater treatment and flow control facilities (except catch basins) owned, operated or maintained by the Permittee shall be inspected at least once every two years before the expiration date of this permit, with problem facilities identified during inspections to be inspected more frequently.
- All catch basins and inlets owned or operated by the Permittee shall be inspected at least once by December 31, 2018 and every two years thereafter. Catch basins must be cleaned if the inspection indicates cleaning is needed to comply with maintenance standards.

The Idaho general MS4 permit (EPA, 2016) lists low impact development as a topic to consider when permittees are developing their education and outreach programs. More specific to PCBs, there is required monitoring of stormwater discharges and catch basin sediments for PCBs at least twice per year for the Idaho permittees in the Spokane River watershed listed above. Permittees must report the total concentration of dioxin-like PCB congeners and use EPA method 1668C for analysis. Two or more permittees may cooperate to conduct any of the required monitoring.

5.3.2 City of Spokane's Integrated Clean Water Plan

The City of Spokane (2014) Clean Water Plan included the following measures that will reduce PCB loads to the Spokane River:

- The Cochran basin project "focuses on reducing the discharge of stormwater through infiltration, potentially using centralized bioinfiltration facilities located either near the TJ Meenach Bridge and/or near the existing Downriver Disc Golf Course. Estimated to cost $34 million, it will include an infiltration pond, piping, disc golf infiltration, near river biofiltration, 1.25 MG storage tank. Estimated average load of PCBs removed in the treatment layer of the facility is 4.688 g/yr and

estimated PCB load diverted (pollutants that aren't removed in the facility and enter the vadose zone) is 0.29 g/yr. (City of Spokane, 2014)

- Section 6.2 of the plan describes the City's "Long-Term Approach to Reduce Stormwater Pollution" and focuses on the implementation of green infrastructure (GI) to intercept stormwater before reaching the combined sewer system. "Because of the multiple benefits provided by GI, the City of Spokane has adopted a long-term approach to implementing GI by coupling these improvements with other public infrastructure projects, and by encouraging use of its LID ordinance on private projects" (City of Spokane 2014).
- The City is also working to reduce or eliminate CSOs for their 20 NPDES-permitted outfalls. Of those, six have been addressed through implementation of CSO storage facilities. Additional efforts to control CSOs include elimination of one outfall 20 and construction of storage tanks at three other outfalls. Additional CSO construction activities are scheduled for 2017 (City of Spokane 2014).

5.3.3 Schedule and Monitoring Program

Because this is a Category A Control Action (maintain existing activities), this Comprehensive Plan is not specifying additional scheduling or monitoring requirements beyond the long-term implementation effectiveness monitoring discussed in Section 6 of this Plan.

5.4 Category A: Low Impact Development Ordinance

Low-impact development (LID) describes a land planning and engineering design approach to manage stormwater runoff. LID uses on-site natural features to replicate the pre-development hydrologic regime of watersheds through infiltrating, filtering, storing, evaporating, and detaining runoff close to its source. By reducing runoff volume, implementation of LID will ultimately lead to reduction in stormwater PCB load. The City of Spokane enacted a low impact development ordinance in 2013 as part of the requirements of a consent decree entered into with the Spokane Riverkeeper as part of commitments made to improve water quality. It does not have any firm requirements, but simply encourages the use of these stormwater practices: "Low impact development is encouraged for site development and redevelopment" (ORD C35021 Section 11). The ordinance also officially adopts the Eastern Washington Low Impact Development Guidance Manual as a technical reference for developers. There is a financial incentive for developers as they will be granted a 10% discount on their stormwater fee for implementing LID practices into new or re-developed projects.

Comment [TC9]: No one else is doing LID? Not the County or Spokane Valley?

5.4.1 Schedule and Monitoring Program

Because this is a Category A Control Action (maintain existing activities), this Comprehensive Plan is not specifying additional scheduling or monitoring requirements beyond the long-term implementation effectiveness monitoring discussed in Section 6 of this Plan.

5.5 Category A: Street Sweeping

Street sweeping is designed to remove debris and particulate matter from street surfaces for subsequent disposal, thus preventing these materials from being washed into the stormwater system during wet weather and delivered to the river. Because PCBs are strongly associated with particulate material, street sweeping can reduce PCB loading from stormwater. Several communities in the Spokane River watershed conduct regular street sweeping.

The City of Spokane primarily conducts street sweeping during summer through fall with a priority on arterial roads, followed by residential areas. The downtown business district is swept every other Thursday morning. To pick up the heavy and fine debris and dust, each crew has a mechanical broom,

regenerative air broom, a street flusher and a hauling truck. Street sweeping in Spokane Valley is done by a contractor with frequency determined by specified priority areas. Highest priority areas are authorized to be swept twice a month. Priority two areas are authorized to be swept once during the month. All other areas will be authorized by the City as determined necessary. The Contractor uses regenerative air type sweepers for arterial sweeping. Sweeping along curbs is done using a high-efficiency vacuum sweeper. Residential streets in Coeur d'Alene are swept an average of four times yearly and all arterials are swept twice monthly. Two sweepers are employed at a time and they work from spring to fall. Street sweeping in Post Falls is accomplished by rotating the sections of city four days a week from May through September.

Comment [TC10]: How are the street sweepings handled for disposal? City and County have decant facilities.

Does Liberty Lake sweep the streets?

Anyone collecting any data from the street sweepings to try and estimate the impact this is having?

5.5.1 Schedule and Monitoring Program

Because this is a Category A Control Action (maintain existing activities), this Comprehensive Plan is not specifying additional scheduling or monitoring requirements beyond the long-term implementation effectiveness monitoring discussed in Section 6 of this Plan.

5.6 Category A: Purchasing Standards

The State of Washington enacted legislation in 2014 that directed the Washington Department of Enterprise Services to "establish purchasing and procurement policies that provide a preference for products and products in packaging that does not contain polychlorinated biphenyls." RCW 39.26.280. The legislation also precluded other State agencies from knowingly purchasing "products or products in packaging containing polychlorinated biphenyls above the practical quantification limit except when it is not cost-effective or technically feasible to do so." Id. This legislation was adopted, in part, as a result of Task Force efforts to discourage use of products containing PCBs. In June of 2014, the City of Spokane enacted a similar municipal ordinance providing a preference in City purchases for products and products in packaging that do not contain PCBs. Spokane County passed an almost identical resolution (#2014-1022) in December 2014. Implementation of the municipal ordinances should not only reduce the introduction materials containing PCBs, but also facilitate the development of an economic market with reduced amounts of PCBs (EPA, 2015).

5.6.1 Schedule and Monitoring Program

Because this is a Category A Control Action (maintain existing activities), this Comprehensive Plan is not specifying additional scheduling or monitoring requirements beyond the long-term implementation effectiveness monitoring discussed in Section 6 of this Plan.

5.7 Category B: Support of Green Chemistry

The Control Action Green Chemistry is designed to reduce inadvertent PCB production through the development of alternative (non-chlorinated) products or products with reduced levels of PCBs.

5.7.1 Existing Actions

Washington State Department of Ecology provides a range of technical support and expertise to educators (http://www.ecy.wa.gov/greenchemistry/edumain.html) looking to incorporate green chemistry into teaching materials, manufacturers looking to understand the potential impacts of the ingredients (http://www.ecy.wa.gov/greenchemistry/chazassess.html) in their products, and to the general public who want to know which are safer choices (http://www.ecy.wa.gov/greenchemistry/saferchoice.html) for products such as the "Safer Choice" label. Ecology also provides training and other educational resources about safer chemical alternatives and green chemistry (http://www.ecy.wa.gov/programs/hwtr/shoptalkonline/current_issue/story_three.html).

Ecology has partnered with Northwest Green Chemistry (http://www.northwestgreenchemistry.org/) on some of these information resources and tools, including organization of a session called "Green Chemistry Design for a Rainbow of Colorants," at the Green Chemistry and Engineering Conference held in Portland (OR) in June, 2016.

5.7.2 New Actions

The Task Force will provide additional support to existing Green Chemistry efforts as follows:

- Provide guidance and feedback to Ecology related to current and potential ongoing Green Chemistry efforts
- Contact other parties, including EPA and universities, to provide feedback on existing efforts and/or solicit participation in future Green Chemistry efforts.

5.7.3 Schedule and Monitoring Program

The effectiveness of SRRTTF's implementation of Category B and C Control Actions will be assessed, in part, via annual preparation of an Implementation Review report. This report will compare actions conducted over the prior year to the timelines spelled out in the implementation plan. Specific milestones, timelines and effectiveness metrics are listed in Table 6 for the Green Chemistry Control Action. The first milestone consists of demonstrated tangible outreach to Ecology, EPA, and/or universities. Initial outreach will be conducted within one year of issuance of Comprehensive Plan, and future schedules assessed as part of the Implementation Review report. The second milestone consists of tangible improvement in Green Chemistry efforts due to SRRTTF actions, to be attained with two years of issuance of the Comprehensive Plan.

Table 6. Milestones, Timelines and Effectiveness Metrics for Green Chemistry

Milestone	Timeline	Effectiveness Metric
Demonstrated outreach efforts to Ecology, EPA, and/or universities	Within one year of issuance of Comprehensive Plan	Outreach conducted
Accelerated Green Chemistry efforts	Within two years of issuance of Comprehensive Plan	Tangible improvement in Green Chemistry efforts due to SRRTTF actions

5.8 Category B: PCB Product Testing Information

This Control Action consists of further study of the extent to which commercial products contain inadvertently produced PCBs, as well as creation of a database to store the collected information. This Control Action also includes public education on products containing PCBs, providing consumers the opportunity to select products with lower PCB content.

5.8.1 Existing Actions

As discussed above in the section on Available Data, many project have been conducted and/or are ongoing related to testing of PCBs in commercial or consumer products. The City of Spokane (2015a) collected and analyzed nearly 50 product samples to determine PCB content in various municipal products. The SRRTTF (2015) Hydroseed Pilot Project analyzed specific component(s) of hydroseed that may be contributing to elevated PCB levels. Ecology (2014b) evaluated the presence of PCBs in 68 general consumer products and is preparing a forthcoming PCB product testing report analyzing 201 consumer products.

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5.8.2 New Actions

The Task Force will provide additional support to existing Green Chemistry efforts as follows:

- Provide guidance and feedback to Ecology, including comments on the forthcoming PCB product testing report
- Support development of a centralized clearinghouse containing PCB product testing information.
- Conduct public education on products containing PCBs

5.8.3 Schedule and Monitoring Program

Specific milestones, timelines and effectiveness metrics are listed in Table 7 for the Control Action PCB Product Testing Information. The first milestone consists of the provision of comments on Ecology's PCB product testing report within three months of issuance of the draft report. The second milestone consists of demonstrated tangible outreach to Ecology, regarding development of a PCB product testing clearinghouse. Initial outreach will be conducted within one year of issuance of Comprehensive Plan, and future schedules assessed as part of the Implementation Review report. The third milestone is development of a clearinghouse within two years of issuance of the Comprehensive Plan. Public education will be evaluated annually, with an expectation of a measurable change in public behavior within five years of issuance of the Comprehensive Plan.

Table 7. Milestones, Timelines and Effectiveness Metrics for PCB Product Testing Information

Milestone	Timeline	Effectiveness Metric
Provide comments on the PCB product testing report	Within three months of issuance of draft report	Comments provided
Support Ecology efforts towards development of a clearinghouse	Within one year of issuance of Comprehensive Plan	Demonstrated support, reassessed annually
Development of clearinghouse	Within two years of issuance of Comprehensive Plan	Has clearinghouse been developed?
Public education	Ongoing annual assessment	Has outreach been conducted?
Public education	Within five years of issuance of Comprehensive Plan	Measurable change in public behavior

5.9 Category B: Waste Disposal Assistance

This Control Action consists of programs (targeted at household consumers and businesses that generate small quantities of PCBs) designed to accept and properly dispose of PCB-containing items, thus preventing legacy non-fixed building sources such as small appliances and lamp ballasts from potentially being disposed of improperly.

5.9.1 Existing Actions

Several voluntary programs currently exist to assist consumers and businesses in properly disposing waste materials. The Spokane River Forum sponsors a Waste Directory (http://spokaneriver.net/wastedirectory/) that provides information describing which waste products may contain PCBs, as well providing information on proper methods for disposing these materials. Spokane EnviroStars (http://spokaneenvirostars.org/) is a voluntary program that certifies local small businesses having practices and policies in place demonstrating proper management and reduction of hazardous and other waste.

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In addition, the State of Washington has established a Mercury-Containing Lights Product Stewardship Program (Chapter 173-910 WAC) to collect and properly dispose of mercury-containing lights. While this program is currently targeted towards control of mercury, it could be adapted to also consider PCB-containing wastes.

5.9.2 New Actions

The Task Force will provide additional support to existing Waste Disposal Assistance efforts as follows:

- Provide recommendation to implementing organizations as to how they can better control PCB-containing wastes
- Raise public awareness on how to identify and dispose of PCB-containing items

5.9.3 Schedule and Monitoring Program

Specific milestones, timelines and effectiveness metrics are listed in Table 8 for the Control Action Waste Disposal Assistance. The first milestone consists of providing specific recommendations to implementing organizations. Initial recommendations will be provided within one year of issuance of the Comprehensive Plan, and the effectiveness of these recommendations and need for continued support will be evaluated annually. The final milestones consist of raised public awareness on how to identify and dispose of PCB-containing items. Initial outreach in this regard will be conducted within one year of issuance of the Comprehensive Plan, and one effectiveness metric will be whether outreach has been conducted. Future schedules for outreach will be assessed as part of the Implementation Review report. The final effectiveness metric will be a measurable change in public behavior in terms of disposal of PCB-containing wastes, to be achieved within five years of issuance of the Comprehensive Plan.

Comment [TC11]: Will this increase in awareness be measured?

Table 8. Milestones, Timelines and Effectiveness Metrics for Waste Disposal Assistance

Milestone	Timeline	Effectiveness Metric
Recommendations to implementing organizations	Within one year of issuance of Comprehensive Plan	Recommendations provided, reassessed annually
Raised public awareness on how to identify and dispose of PCB-containing items	Ongoing annual assessment	Has outreach been conducted?
Raised awareness on how to identify and dispose of PCB-containing items	Within five years of issuance of Comprehensive Plan	Measurable change in public behavior

5.10 Category B: Regulatory Rulemaking

This Control Action consists of regulatory reform of Federal TSCA and FDA's food packaging regulations to: 1) re-visit currently allowed concentration of PCBs in chemical processes; 2) eliminate or reduce the creation of inadvertently generated PCB; and 3) reassess the current use authorizations for PCBs.

5.10.1 Existing Actions

The SRRTTF and individual members have had continuing engagement with State and federal agencies to lobby for reform of existing regulations, including providing evaluation and comment on rulemaking activities.

5.10.2 New Actions

Paint manufacturers providing road paint to transportation agencies are currently required to use pigments compliant with a strictly-controlled "color box". These color box requirements can only be met

through the use of PCB-containing diarylide pigments. The Task Force will seek to attain State/federal level changes to color box requirements for road paints, allowing the use of PCB-free (or essentially PCB-free) pigments in these paints.

5.10.3 Schedule and Monitoring Program

Specific milestones, timelines and effectiveness metrics are listed in Table 9 for the Control Action Regulatory Rulemaking. The first milestone consists of continuing the existing ongoing dialogue with EPA and legislators regarding reform of TSCA and FDA's food packaging regulations. The effectiveness of this dialog and need for continued dialogue will be evaluated annually in the Implementation Review report. The remaining milestones relate to State/Federal-level changes to color box requirements for road paints. The first milestone consists of outreach to governmental agencies and paint manufactures, and will be conducted within one year of issuance of the Comprehensive Plan. The effectiveness of this outreach recommendations and feasibility of getting changes enacted will be evaluated annually. The long-term goal, with a timeline of ten years, is to have the color box requirement changed to allow the use of PCB-free pigments.

Table 9. Milestones, Timelines and Effectiveness Metrics for Regulatory Rulemaking

Milestone	Timeline	Effectiveness Metric
Dialogue/letters with EPA and legislators on TSCA reform	Ongoing annual assessment	Dialogue continuing to be conducted
State/Federal-level changes to color box requirements for road paints	Within one year of issuance of Comprehensive Plan	Has outreach been conducted?
State/Federal-level changes to color box requirements for road paints	Within ten years of issuance of Comprehensive Plan	Evidence of changed regulations

5.11 Category B: Compliance with PCB Regulations

This Control Action consists of requiring stricter accountability for compliance with existing rules. Potential activities include enforcement of existing TSCA rules to ensure imported and manufactured products are complying with allowable PCB levels, and enforcement of rules related to oil burning.

5.11.1 Existing Actions

The SRRTTF and individual members have had continuing engagement with State and federal agencies providing comments related to draft NPDES permits (e.g. the recent general hatchery permit), Clean Water Act compliance activities, and waterbody assessments such as 303(d) lists.

5.11.2 New Actions

Ecology's Environmental Assessment Program (Ecology, 2016b) is currently undertaking a study that will provide information on atmospheric transport of PCBs. The Task Force will review results of this study when it becomes available to assess the need for regulatory control of oil burning.

5.11.3 Schedule and Monitoring Program

Specific milestones, timelines and effectiveness metrics are listed in Table 10 for the Control Action Compliance with PCB Regulations. The first milestone consists of maintaining existing activity in terms of providing comments on recurring regulatory issues. Comments will be provided on an ongoing as-needed

basis, and assessed as part of the Implementation Review report. The second milestone consists of review of the Ecology atmospheric transport study, and a determination made regarding the need for more regulatory control of oil burning. Should oil burning be identified as a significant contributor of PCBs, the final milestone consists of a measurable change in regulatory control over this practice.

Table 10. Milestones, Timelines and Effectiveness Metrics for Compliance with PCB Regulations

Milestone	Timeline	Effectiveness Metric
Comments on recurring regulatory issues	Ongoing annual assessment	Recommendations provided, reassessed annually
Review of Ecology atmospheric transport study	Within one year of issuance of study	Determination of need for more regulatory control of oil burning
Changes in oil burning control (if appropriate)	Within five years of issuance of Comprehensive Plan	Measurable change in regulatory control

5.12 Category B: Emerging End of Pipe Stormwater Technologies

While many options currently exist for controlling stormwater PCB loads, they typically focus on activities to capture PCBs, but not destroy them. Newer technologies, such as mycoremediation, are being investigated that could lead to actual PCB destruction.

5.12.1 Existing Actions:

The Lands Council has begun an innovative mycology project which uses a native species of fungi, called white rot fungi, to break down persistent PCBs from stormwater. Because PCBs are chemically similar to the wood that these fungi naturally eat, the fungi can break down these chemicals without experiencing toxic effects. White rot fungi have been shown to break down PCBs under laboratory conditions, and The Lands Council is seeking to test this utility on a much larger scale in the field in order to identify the potential for WRF to be used to prevent PCBs from entering the Spokane River. If successful, this novel method could have broad implications for cost-effective cleanup at contaminated sites. The Lands Council currently has a contract with the City of Spokane for an initial mycoremediation experiment, which is looking at 'fungal treatment' of vactor waste on a small scale. This experiment is ongoing, with results expected in early spring of 2017.

5.12.2 New Actions:

The existing experiment could be considered Phase 1 of a larger study. Specific activities to be conducted in upcoming phases will depend upon results of Phase 1. The Task Force will review Phase 1 findings and identify and/or support additional phases of research projects that meet Task Force goals. The specific nature of this support will be determined after Phase 1, and could include identification of grant opportunities, support to the Lands Council of pursuit of these grant opportunities, and/or direct funding.

5.12.3 Schedule and Monitoring Program

Specific milestones, timelines and effectiveness metrics are listed in Table 11 for the Control Action Emerging End of Pipe Stormwater Technologies. The first milestone consists of the SRTTF reviewing the Phase 1 results of the Lands Council works and providing feedback on next steps. The second milestone consists of identification of the appropriate level of Phase 2 support, and provision of that support. Both of these milestones will be accomplished within one year of completion of the Phase 1 report.

Table 11. Milestones, Timelines and Effectiveness Metrics for Emerging End of Pipe Stormwater Technologies

Milestone	Timeline	Effectiveness Metric
Assessment of Phase 1 results	Within one year of completion of Phase 1 report	Feedback provided
Phase 2 support	Within one year of completion of Phase 1 report	Level of support defined and provided

5.13 Category C: Building Demolition and Renovation Control

Fixed building sources have been identified as one of the largest source areas of PCBs in the Spokane watershed. Building demolition and renovation activities provide the potential to mobilize these fixed PCBs, making them more amenable to transport to the Spokane River. This Control Action consists of providing educational materials that inform contractors of proper methods of management of PCB-containing materials and waste during building demolition and renovation.

The San Francisco Estuary Institute (SFEI) conducted a study to estimate the total content of PCBs in caulk in buildings throughout the Bay Area and the potential load of PCBs from demolition and remodeling sources to San Francisco Bay (Klosterhaus et al., 2011). A companion project was led by the San Francisco Estuary Project (SFEP) and focused on how to reduce this load of PCBs (SFEP, 2011). They developed descriptions of several different management practices for managing PCBs in caulk during building demolition or remodeling, related to:

- Building Occupant Notification: communication of health and safety goals prior to beginning a project
- Worker Training: proper identification, handling and disposal of PCB-contaminated materials
- Personal Protective Equipment (PPE): protection of human health and limit the spread of contaminated materials
- Work Area Containment: prevention of the spread of contaminated dust
- Tools and Equipment: selection of appropriate tools that minimize dust generation
- Demolition: includes dust management, discharge of wastewater, and removal of other hazardous materials
- Site Erosion and Sediment Controls
- Work Area Housekeeping and End of Project
- Transport and Disposal

5.13.1 Actions

The specific actions to be implemented by the SRRTTF relative to Building Demolition and Renovation Control are:

1. Adapt the SFEP document to make it suitable for use as a guidance document for Spokane-area building contractors
2. Work with relevant local government agencies responsible for permitting to ensure that the guidance document be distributed as part of all building permits related to building demolition and renovation

5.13.2 Schedule and Monitoring Program

Specific milestones, timelines and effectiveness metrics are listed in Table 12 for the Control Action Building Demolition and Renovation Control. The first milestone consists of adaptation of the SFEP

report, which will be completed within one year of issuance of the Comprehensive Plan. The second milestone consists of coordination with local governments to have the guidance document routinely distributed with relevant permits, to be completed within two years of issuance of the Comprehensive Plan. The final milestone is a demonstrated change in contractor behavior in response to the guidance provided, to be attained within five years of issuance of the Comprehensive Plan.

Table 12. Milestones, Timelines and Effectiveness Metrics for Building Demolition and Renovation Control

Milestone	Timeline	Effectiveness Metric
Adaptation of SFEP report	Within one year of issuance of Comprehensive Plan	Guidance document produced
Distribution of guidance document	Within two years of issuance of Comprehensive Plan	Guidance document routinely distributed with permits
Utilization of guidance document	Within five years of issuance of Comprehensive Plan	Measurable change in contractor behavior

5.14 Category C: Identification of Sites of Concern for Contaminated Groundwater

As discussed above in the section Remediate Known Contaminated Sites, Ecology has identified and initiated remediation activities on several sites believed to be contributing PCBs to the Spokane River. Activities conducted on behalf of the Task Force have identified the potential for additional sites of potential concern; specifically:

- Assessment of groundwater PCB data collected up-gradient of the known Kaiser groundwater contamination indicates the potential for a significant groundwater loading source independent of the Kaiser remediation (LimnoTech, 2016f)
- Homolog-specific mass balance analyses conducted with the 2015 and 2016 synoptic river survey data indicate the potential presence of a significant groundwater PCB loading source entering the river downstream of the Trent Avenue Bridge (LimnoTech, 2016d).
- Cleanup targets for many TCP sites are based on levels necessary to protect groundwater as a drinking water supply (adjusted for the Practical Quantitation Limit), and are not necessarily protective of river water quality standards. For example, the groundwater cleanup target concentration at the City Parcel site (0.1 ug/l) is approximately 600 times higher than the river water quality standard of 170 pg/l. Given that sites that have received No Further Action (NFA) designation may still contain groundwater PCB concentrations orders of magnitude higher than safe river concentrations, these sites have the potential to contribute to water quality standard violations in the Spokane River. Marti and Maggi (2015) identified 23 TCP sites with confirmed releases of PCBs to soil and/or groundwater that may merit further investigation in terms of potential to contribute problematic levels of PCBs to the Spokane River.

Because these additional sites have the potential to cause or contribute to PCB impairment of the Spokane River, it is important to: 1) Determine whether they have the potential to be significant contributors of PCBs, and 2) Develop a plan for remediation for any source determined to be a potential contributor.

5.14.1 Actions

The Task Force will implement the following three-step process to identify sites of concern for contaminated groundwater:

1. Mine existing data

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2. Consult with TCP
3. Determine next action (e.g. targeted monitoring)

Mine existing data

Initial activities will consist of compiling and reviewing available data to assess the potential significance of new groundwater sites to contributing PCBs to the Spokane River. Separate activities will be conducted for each of the three categories of sites described immediately above.

With respect to the potential source up-gradient of Kaiser, existing data have largely been mined to the extent necessary to define that a source exists and that its magnitude is potentially of concern. Recent evaluations of hydrogeological and groundwater quality information collected by Kaiser show that there likely is an up-gradient source of PCBs via venting groundwater within the gaining portion of the river from approximately the Pentzer WWTP to Kaiser monitoring well MW-15 (approximately 1.1. miles). This conclusion is based on available PCB homolog data collected from Kaiser monitoring wells, which show a difference between the PCB homolog patterns between the Kaiser plume monitoring well data and up-gradient and cross-gradient monitoring well data collected outside these areas (LimnoTech, 2016f). The Kaiser plume data are dominated by the tri- and tetra- homolog groups, while the up-gradient/cross-gradient PCB data are dominated by the tetra-, penta- and hexa- homolog groups (Figure 6).

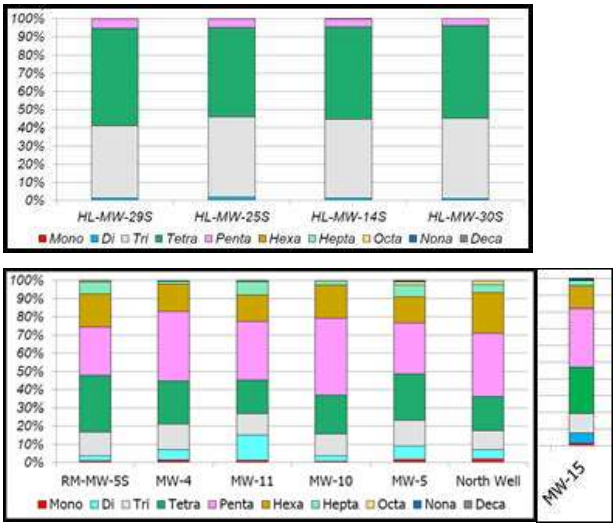

Figure 6. Homolog Distribution of Groundwater Monitoring Data Collected form Kaiser Plume (top) and Up-Gradient/Cross-Gradient Wells (bottom)

For this stretch of the river, an initial up-gradient PCB loading estimate of 14 to 55 mg/day was calculated, assuming a representative seepage rate of 0.01 cfs per linear foot of river (Kahle and Bartolina, 2007), and representative average up-gradient PCB concentrations ranging from 0.1 to 0.384 ng/l. Although this analysis is not rigorous enough to prove that a significant up-gradient source exists, it is rigorous enough to show that up-gradient sources merit additional consideration.

The source of the up-gradient PCB groundwater loads is unknown, but the Spokane Industrial Park area may be one contributor. This observation is based on:

- The up-gradient location of the Industrial Park relative to the Kaiser boundary monitoring wells. These wells historically have shown detectable concentrations of PCBs up to 6 ng/l (median = 0.1 ng/l).
- Ecology's Urban Waters Initiative has identified the Industrial Park as a likely source of PCBs prior to 1994 (http://www.ecy.wa.gov/urbanwaters/spokaneriver.html)
- Past use of the area as a Naval Supply Depot
- The presence of approximately 500 Underground Injection Control (UIC) wells which are registered in the UIC database as non-municipal stormwater wells that generally are 7 to 10 feet deep (EAP, September 16, 2015).

With respect to the suspected source downstream of the Trent Avenue Bridge, data mining activities will consist of more detailed homolog-specific mass balance assessments to estimate the magnitude of the load. The mass balance assessments conducted to date at this site have only considered river concentration data and stream flow to determine that a net loading of penta- through hepta- chloro PCB homologs occurs. The specific magnitude of this potential loading source was not assessed further due to the confounding effects of groundwater exchange mechanisms which are more complex than assumed in the original mass balance assessment. Data mining activities conducted under the Comprehensive Plan will consist of:

- Estimating groundwater gains and losses for the stream reach from available hydrogeologic data
- Conducting a mass balance analysis for 2014 and 2015 synoptic survey data, using the gross gaining and losing flow estimates, to update the prior analyses which only considered net groundwater flow.
- Calculate estimated loading rate and congener distribution of the potential source.
- Review existing TCP site information to identify potential contributing sites.

With respect to other TCP sites, data mining activities will consist of estimating the potential magnitude of loading from the 23 TCP sites with confirmed releases of PCBs identified by Marti and Maggi (2015). This will be done by:

- Calculating the amount of area potentially containing PCB concentrations at cleanup target concentration.
- Reviewing existing hydrogeologic information to estimate groundwater seepage rates for each site.
- Merging areal extent, seepage rate and concentration estimates to calculate a potential loading contribution for each site

Package information for and consult with TCP

The results of the above data mining activities will be documented in a technical report, and shared with Ecology TCP staff. The Task Force will schedule a meeting (or meetings) with TCP to present and discuss results. Findings will be compared to those obtained by TCP (e.g. TCP will be conducting a separate assessment of the magnitude of the loading up-gradient of the Kaiser site). Result of the meeting(s) will feed directly in to the next step, determining subsequent actions.

Determine next action

Based on the above findings and discussions, the Task Force will work with TCP to determine appropriate next steps, and the party (or parties) responsible for conducting them. Depending on findings from the data mining, next steps could include:

- Determining that certain sites are contributing to the impairment of the river, and identifying potential remediation actions
- Targeted monitoring to better define the contribution of sites determined to be potentially important

- Exclusion of certain sites that are determined to be insignificant contributors to the impairment of the river

5.14.2 Schedule and Monitoring Program

Specific milestones, timelines and effectiveness metrics are listed in Table 13 for the Control Action Identification of Sites of Concern for Contaminated Groundwater. The first milestone consists of data mining activities, which will generate an assessment document within one year of issuance of the Comprehensive Plan. The second milestone consists of coordination with TCP, which will result in a consensus plan for future action within two years of issuance of the Comprehensive Plan. The final milestone will be a determination of whether each site under consideration is a sufficient enough contributor of PCBs to the Spokane River to merit remediation activities, and initiation of remedial activities on sites determined to be significant. This final milestone will be accomplished within five years of issuance of the Comprehensive Plan.

Table 13. Milestones, Timelines and Effectiveness Metrics for Identification of Sites of Concern for Contaminated Groundwater

Milestone	Timeline	Effectiveness Metric
Initial data mining	Within one year of issuance of Comprehensive Plan	Assessment document produced
TCP coordination	Within two years of issuance of Comprehensive Plan	Study plan adopted
Identification, remediation (as appropriate)	Within five years of issuance of Comprehensive Plan	Conclusive identification of significance of sites. Initiation of remedial activities on sites determined to be significant.

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Future Activities

In addition to the Implementation Activities described above, the SRRTTF intends to conduct additional activities in the future to assess implementation effectiveness, and to consider additional Control Actions and studies to fill identified data gaps.

6.1 Implementation Effectiveness Assessment

The Implementation Plan section above contains effectiveness metrics specific to each Control Action, designed to assess whether each action is being implemented and performing as planned. The Task Force will also conduct a broader implementation effectiveness assessment within five years, designed to review all available data to assess:

- PCB loading to the Spokane River from the primary delivery mechanisms, and changes in loading over the evaluation period
- Spokane River PCB concentrations, and changes in concentration over the evaluation period

PCB loading will be assessed for the primary delivery mechanisms described previously, as follows. PCB loading from wastewater treatment plants will be assessed via review of all effluent monitoring data collected by each plant as part of their NPDES permit requirements. Groundwater loading near Kaiser will be assessed via review of data collected by Kaiser as part of their ongoing remediation efforts. Stormwater/CSO loading will be assessed via review of post-implementation performance data to be collected by the City of Spokane as part of their Integrated Clean Water Plan. Changes in loading from Lake Coeur d'Alene will be assessed via review of observed Spokane River PCB concentrations in Idaho being collected as a requirement of NPDES permits in Idaho.

In-river concentrations will be assessed via review of long-term river monitoring data to be collected by the Task Force and/or Ecology. Statistical tests will be applied as appropriate to determine if statistically significant reductions have occurred in loads and in-river concentrations. In addition to assessment of the change in River concentrations, river concentrations will also be compared to existing water quality standards.

The above assessment will be conducted five years after the issuance of this Comprehensive Plan. If PCB loads and/or concentrations are not decreasing, the Task Force will identify, evaluate, and select new Control Actions (or modify existing Control Actions) in an adaptive manner to ensure that reductions occur in the future. It is expected that the implementation effectiveness assessment will be repeated on a five year basis.

6.2 Consideration of Additional Control Actions

As discussed above, numerous Control Actions were placed in Category D, defined as "Include in Comprehensive Plan as an activity worth exploring in the future." The commitment to these actions is to

give them future consideration, but with no specific commitment towards implementation at this time. This section describes the following Control Actions identified as Category D:

- Survey Schools and Public Buildings
- Accelerated Sewer Construction
- Emerging Wastewater Technology
- Survey Electrical Equipment
- Leak Prevention/ Detection
- Regulation of Waste Disposal
- Removal of Carp from Lake Spokane
- PCB Identification during Inspections
- Compliance with PCB Regulations for Imported Products

Each is described below. The Task Force will consider the need to implement any of these Control Actions as part of their annual implementation effectiveness assessment.

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6.2.1 Education on Septic Disposal

This Control Action is designed to educate on-site septic system owners located over the aquifer recharge area on proper disposal of wastes (e.g., not "down the drain") and on the environmental and functional benefits of regular tank pumping.

6.2.2 Survey Schools and Public Buildings

This action consists of programs designed to survey PCB-containing materials in schools/public buildings and enact a program to dispose of them properly or implement encapsulation.

6.2.3 Accelerated Sewer Construction

This action consists of acceleration of sewer construction to replace septic systems. Spokane County has completed its mandatory septic tank elimination program for septic tanks within the Urban Growth Area (UGA) in areas that have sewer available, requiring connection within a year of notification and enforcement through the Prosecutor's office. There is some overlap between the UGA and the Critical Aquifer Recharge Area (CARA), but still a large amount of area where sewer construction could help eliminate discharge to the CARA. There is currently no planned effort to eliminate every septic system within the UGA, due to reasons such as:

- Installation of sewers in low density areas is not cost effective
- Certain land uses are exempt by state law from the requirement to connect to sewer, even when available (e.g. manufactured home parks)

6.2.4 Emerging Wastewater Technology

This action consists of regular outreach to researchers/contractors in the field of wastewater treatment in order to stay abreast of potential new technologies for PCB removal.

6.2.5 Survey Electrical Equipment

This action would conduct a survey of local utilities and other owners of electrical equipment to document the presence/amount of PCBs in transformers. Identify PCB-containing equipment (nominal 1 ppm concentration) that has a reasonable pathway to the river, if spilled, and target for removal.

6.2.6 Leak Prevention/ Detection

This action consists of implementation of state and/or local ordinance to require a leak prevention/detection system in any PCB-containing transformer or capacitor.

6.2.7 Regulation of Waste Disposal

This action consists of programs designed to review local/regional laws regulating waste disposal (including oil burning) and illegal dumping, and revise as necessary (e.g. enforcing fines/other penalties for improperly disposing of PCBs.)

6.2.8 Stormwater Source Tracing

Through Ecology's Urban Waters Initiative, a team of Ecology staff and specialists from the Spokane Regional Health District have sampled water and visited businesses along the river to identify sources of toxic chemicals, including PCBs. These studies are designed to identify potential hot spots (i.e. areas contributing an inordinately high amount of PCBs) that could be controlled in the future. This action consists of considering these source tracing activities to identify significant sources of PCBs to the Spokane stormwater system.

6.2.9 Removal of Carp from Lake Spokane

This action involves removing carp from Lake Spokane. Carp in the lake are known to be contaminated with PCBs, and removing them would prevent further cycling in the watershed. This Control Action was suggested as a complement to existing studies conducted by Avista regarding removal of carp from Lake Spokane for the purposes of phosphorus removal.

6.2.10 PCB Identification during Inspections

This action consists of identifying PCB-containing materials as part of other regular inspections (e.g., building permits, IDDE, facility inspections). It involves training inspectors to identify materials and what to do next (safe disposal, encapsulation, etc.).

6.2.11 Compliance with PCB Regulations for Imported Products

This control action consists requiring stricter accountability for compliance with existing rules, specifically enforcement of existing TSCA rules to ensure imported and manufactured products are complying with allowable PCB levels.

6.3 Studies to Address Data Gaps

Due to the diffuse nature of PCB source area, poorly defined pathways between source areas and delivery mechanisms, and uncertain environmental response, the Task Force will contemplate addition studies to address some key data gaps. The Task Force will consider the need to conduct any of these studies as part of their routine implementation effectiveness assessment. It is noted that some of these studies may be conducted by Ecology's Environmental Assessment Program, in which case the Task Force will provide review and comment. Two potential studies are provided below, related to bioaccumulation of PCBs in fish and assessment of sediment PCB concentrations.

6.3.1 Bioaccumulation of PCBs in Fish

Measured water column PCB concentrations in the Spokane River are currently at levels similar to, and typically below, the listed water quality standard. Fish tissue concentrations, however, remain well above

target levels. This study would collect the necessary data and perform the associated analyses to better understand the site-specific factors that drive fish tissue concentrations in the Spokane River. This work could also review past fish studies to see if historically observed PCB concentrations are unduly influenced by specific age of the fish collected.

6.3.2 Sediment PCB Concentrations

There is a commonly-held assumption that legacy bottom sediments are not a significant contributor to PCB impairment of the Spokane River, because: 1) The River is viewed as sediment-poor, with many non-depositional zones, and 2) Remediation activities have been conducted at areas of known legacy sediment contamination. This assumption may not be accurate, however, as there are known areas of sediment deposition in impounded sections of the river that have not been sufficiently sampled to provide a clear understanding of sediment PCB contributions. Available recent data currently consist of sediment trap measurements conducted near Ninemile and Upriver Dam in 2013 (Era-Miller, 2014), and sediment data collected as part of reassessment of the Upriver Dam and Donkey Island PCB sediment sites. Some additional sediment PCB concentration data exist (Johnson. and Norton, 2001), but are much older.

This study, if undertaken, would be designed to:

- conduct sediment PCB measurements in known depositional areas (such as behind Ninemile Dam and Upriver Dam);
- provide an assessment of the extent to which existing sediment concentrations reflect existing loads versus legacy sources; and
- provide a better-informed understanding of the contribution of sediments to PCB impairment of the Spokane River.

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