Spokane River Regional Toxics Task Force
Data Synthesis Workshop Meeting Notes

Thursday and Friday, May 30 and 31, 2019
EWU Riverpoint Campus Building #2
310 N. Riverpoint Blvd., Spokane, WA

Day 1 – May 30, 2019

Attendees (46):

BiJay Adams - Liberty Lake Sewer & Water District
Tom Agnew – Liberty Lake Sewer & Water District
Mike Anderson – City of Coeur d'Alene
John Beacham – City of Post Falls
Adriane Borgias – WA Department of Ecology
Ben Brattebo – Spokane County
Joel Breems – Avista
Craig Borrenpohl – City of Post Falls
Roger Crawford – Kaiser Aluminum
Lisa Dally-Wilson – Dally Environmental
Dave Dilks - LimnoTech
Chris Donley – WA Department of Fish and Wildlife
Jeff Donovan – City of Spokane
Brent Downey – Kaiser Aluminum
Brandee Era-Miller – WA Department of Ecology
Bill Fees – WA Department of Ecology
Ben Floyd – White Bluffs Consulting
Lara Floyd – White Bluffs Consulting
Trey George – City of Spokane
Alyssa Gersdorf – City of Post Falls
Catherine Glick – WA Department of Ecology
Pat Hallinan – WA Department of Ecology
Harper Havko – City of Spokane
Thomas Herron – Idaho Department of Environmental Quality
Will Hobbs – WA Department of Ecology
Doug Krapas – Inland Empire Paper
Kim Kimball – Pullman
Bud Leber – Kaiser Aluminum
Rob Lindsay – Spokane County
Brian Nickel – EPA
Cadie Olsen – City of Spokane
Monica Ott - Avista
David Paul – Kaiser Aluminum
Nigel Pickering – WSU
Karl Rains – WA Department of Ecology
Lisa Rodenburg – Rutgers University
Jim Ross – WA Department of Ecology
Greg Sattler – Liberty Lake Sewer & Water District
Jeremy Schmidt – WA Department of Ecology
Edgar Scott – Kaiser Aluminum
Amy Sumner – Spokane County
Chelsea Updegrove – Lands Council
Diana Washington – WA Department of Ecology
Kara Whitman - WSU
Siana Wong – WA Department of Ecology
Mike Zagar – Kootenai Environmental Alliance

After introductions, Lisa Dally Wilson acknowledged those who helped organize the workshop. She went over the primary objectives and intended outcomes of the workshop:

Primary Objectives:

- Where the TF should focus control efforts to effectively identify and reduce PCBs in the Spokane River watershed.
- Where the TF should focus data collection and analysis to further identify sources and better understand how they contribute to PCBs in fish.
- Provide an overall summary of all data available.
- Provide results of new analyses done by LimnoTech.

Intended Outcomes:

- Recommendations regarding 2019 monitoring activities.
- Possible recommendations for specific source control actions.
- Determine what level of effort should be invested in monitoring in future years?
- Recommendations for assessing trends and progress.

Management Objectives and Management Questions – Dave Dilks, LimnoTech (see presentation)
Questions/Answers:

- Is Long Lake a PCB sink? The TF focused on the area upstream of Nine Mile. Should the TF extend the study area to include Long Lake? Long Lake may be a sink but the TF is not evaluating it as part of the TF study area.

Conceptual Model

- Maps of study area – Brandee Era-Miller explained the maps that will be used during the workshop. Synoptic survey, biofilm sampling, and fish tissue sampling areas are depicted on them. The biofilm work focused on a core area so they have also provided a zoomed in look at that area on one map. Homolog distributions from some of the sampling were done for different time periods.
- Dave Dilks characterized a conceptual model LimnoTech had prepared showing all pathways from sources, along with associated delivery mechanisms, concentrations in water column/sediments, and fish tissue concentrations (see diagram in presentation).

Questions/Answers:

- Where is the mass of PCBs in the system? *Quantification of those sources and their transport are important. More data is known about the delivery pathways and river quantities.*
- Besides Lake Coeur d'Alene (CDA), it would be good to include tributaries also. *Dave said tributaries should be in there and it was taken out because Hangman Creek was a small part of it.*
- The simplifications are important because it does not make sense to spend money tracking down 1-2% of the issue.
- There are only a few entities working on emerging treatment technologies and should the TF do more with this going forward?
- Will CSO contribution be discussed? *Dave said it will be described in the summary of what we know, presented later in the day.*

Summary of Available Data and Studies (Past Work): (see Past Studies presentations)

1. **Groundwater** - Dave Dilks, LimnoTech (Four different studies that were done over the past dozen years).
   Spokane County/ Ecology 2015-2016 study: Concentrations were low at all sampling sites. Mike Hermanson stated the study was reviewed by the TF and is on the TF website.
   Kaiser Groundwater study: Different areas were being categorized**.** Study showed high concentrations in the plume. Upgradient concentrations were higher than what Spokane County/Ecology found in other background wells and it indicated something going on upgradient of Kaiser. It was not consistently high and there were occasional spikes.
   Urban Waters groundwater seeps – 2013 study: Two stations downstream of Upriver Dam were studied.
   Question: Can you provide the Model Toxics Control Act (MTCA) level for PCB clean up? *Jeremy Schmidt stated that soil is 10 ppm, groundwater is approximately 1000 pg/liter.*
   GE Spokane Site Groundwater 2016: Eight wells were sampled
   Questions/Comments/Answers:
   - How does the groundwater flow at these sites change over the course of a year? *There are higher concentrations during higher groundwater elevations.*

- How does Ecology determine whether a groundwater site is impacting surface water quality? *If there is a plume and a network and wells are closest to the surface water body, it is presumed it is impacting surface water. The PCB concentration increases as it approaches the river and clean up levels are set to protect the river and drinking water. Levels tend to be low enough not to trigger MTCA. We need to consider proximity to water and what level of evidence is needed to reopen a site.*
- How much slower do PCBs move in groundwater in this particular case? *Groundwater is moving fast and there is little organic material for PCBs to bind to. These both affect travel and absorption rates.*

2. **Atmospheric Deposition – Ecology 2016-2017:** Bulk sample results were collected and analyzed at three locations quarterly.
   Questions/Comments:
   - What is the congener shift between locations? *More of the higher congeners tend to exist in industrial sites. It showed a separation of three locations and as you move into more urban areas there were areas with higher congeners.*
   - With surface area the river does flow out of a large lake (CDA).
   - What is the source to atmosphere? *A lot of it is volatilization and PCBs escape into gas phase and see a correlation to population density. They volatilize from products and soils. Many studies have been done around the Great Lakes demonstrating that this relationship exists.*
   - What is the spatial scale for the TF? *The initial focus was to go down as far as Nine Mile Dam and upstream to Lake CDA outlet.*
   - What geographic areas is being evaluated? *The Spokane River from the outlet of Lake CDA down to Nine Mile.*
   - The TF should consider a larger spatial scale (e.g. Long Lake).

3. **Water Column and Discharges:** Dave Dilks, LimnoTech, and Lisa Rodenburg, Rutgers University
   Ecology, 2003-2007 study: Spokane River PCB source assessment - Five locations in the SRRTTF study area.
   Questions/Comments:
   - What was the lab method of analysis? *The PCBs were measured as congeners using Semi-permeable Membrane Devices (SPMDs) and method 1668.*
   - Does anyone know about an Upriver dam remediation that included PCBs? *The PCB samples were collected before the clean-up, but what they do not show is location frequency to detail that Upriver Dam is a large sink of PCBs. You could see higher concentrations in the bottom but that has not been done post clean up.*
   - Was the stormwater/CSO runoff estimate in the Source Assessment too high? *It overestimated what appeared to be happening. There was less running off than assumed in the original study and it should probably be less than 691 mg/day load.*
   - 691 mg/day is an estimated total? *It is taking annual load and dividing it into 365 days.*
   - Could you improve the estimate per day by using a stormwater model to characterize the stormwater flows throughout the year? *It is pretty clear that 691 mg/day be looked at with extreme scrutiny as this is old data.*

   - How much stormwater in a large rain event gets treated? *There is an allowance of one CSO per year on a twenty -year outfall. When the CSOs don't open up, 100% of water gets treated at the wastewater treatment plant, unless there is a very large overflow event. The stormwater system water goes to the river untreated. The city says that this is not the case as there is treatment through LID and other technologies.*

Ecology, 2012-2013 study - Surface water grabs and Continuous Low-Level Aqueous Monitoring (CLAM) devices – samples were at four stations in the study area.
Spokane County, 2016; SRRTTF, 2019: Dr. Rodenburg: Are sources Aroclors or inadvertent PCBs? How do we handle the blanks?
Questions/Comments:

- Do you spend time focusing source control on higher molecular weight PCBs and if they will get filtered out during treatment? *PCBs in the dissolved phase will not necessarily be removed by filtering effluent.*
- Where do the sources of the Aroclors come from? *1242 is from hydraulic fluids and electrical equipment and 1254 and 1260 may be construction and electrical equipment, such as transformers.*
- What is the blank solution used for the water column analysis? *They use high-performance liquid chromatography (HPLC) grade reagent water (ultra pure) and it gets processed like a sample would be and may use silicone rubber tubing, caulk, etc. Blank contamination numbers come from the whole analysis process.*
- When blank correction is done on water column samples the silicone-related factors disappear, but the PCB 11 does not, it appears real.
- Are the actual samples used with HPLC? *No, it is included as part of the process through the whole analysis. There are Aroclor PCBs in the atmosphere and they can get into the solvents being used.*
- Why is the blank correction situation different in the Spokane River? *The regulatory levels in the water column are so much lower here, I never had to deal with blanks associated with such low concentrations. The effluent from the water treatment plants here is cleaner than the regulatory clean-up levels from some of my east coast projects.*
- How many rivers in the US have this PCB problem? *Probably all of them if the water quality standard is what WA has.*

SRRTTF Synoptic survey, 2014: This was the first synoptic survey the TF did. In 2015 the TF did a similar study and repeated the mass balance assessment.
2016A study with monthly instream monitoring: Concentrations were generally low in Lake CDA at all times and there was some fluctuation in homolog distributions between months.
Questions/Comments/Answers:

- Where are the legacy industrial sites? *This study did not address location of TCP sites relative to sampling location. Given the size of the city there are areas that have the potential to be sources.*

Comprehensive Plan 2016B: PCB source areas, majority of the mass were distributed in three areas: non-fixed and fixed building sources and watershed soils.
2018, SRRTTF Synoptic Survey: The study addressed questions from the 2014 and 2015 studies and added up to Nine-Mile Dam plus added a station near downstream of Upriver Dam. The elevated spike was not seen at Mirabeau. There were repeatable results near Kaiser each time.
Ecology, 2016 study: An evaluation of fish hatcheries as sources of PCBs**.** The study indicated PCB concentrations were higher in fish tissue from fish released after four months than those fish tissues sampled from hatchery fish.
Water column summary: PCBs originate from Aroclors and PCB 11. There is a reasonable understanding of wastewater loads, coarser understanding of stormwater loads and some groundwater loads. We have snapshots of the river at selected times and know more about low flow conditions than high flow conditions.

4. **Sediments:** Dave Dilks, LimnoTech

Ecology 2003-2007: Low in absolute concentration.
Ecology, 2013: Eight locations in late August 2013. Concentrations were generally low and well below clean-up standards. Sediment clean-up standards may not be protective of the current water quality standard.

5. **Sediment/biofilm/macroinvertebrate:** Siana Wong, Brandee Era-Miller, Ecology
Ecology, 2018: Measured PCBs in biofilm (19 sites), sediment (3 sites) and in macroinvertebrates (2 sites). Biofilm was a broad representation of the river. The highest concentrations were at Gonzaga sites. They will have the SR3A site resampled in the summer of 2019 due to high concentrations found. They will also focus on the Mission Bridge and Spokane Gage sites.
Questions/Answers:
   - Did you take triplicate samples or have error bars? *They took a field duplicate at the Gonzaga site and it showed a lot of variability. They also did a duplicate at Upriver Dam and it was similar to the sample. They are planning to do duplicate or triplicate samples going forward.*
   - How is biofilm sampling done? *They scrape off the top surface of slime on rocks and send it to the lab for analysis using 1668 congeners.*
   - Can you compare biofilm samples with lab analysis and can they be called quantitative? *There is variability among samples. Biofilm accumulates over three weeks and are better for certainty due to higher concentrations.*

6. **Fish:** Dave Dilks, LimnoTech
Early Ecology Studies, 2005: Elevated concentrations at Mission Park and Long Lake.
2012 Ecology study: Used four fish species from four locations in the TF study. They did not see the elevated levels at Mission Park as was demonstrated in the 2005 study. Generally, the Spokane River has higher concentrations in fish tissues than many other water bodies in the state. Even though the water column concentrations are lower, the fish concentrations are higher.
Comments:
   - There was also a Carp study in Long Lake around 2015 and they looked at both Aroclors and congeners and found little difference in PCB concentrations. The same conclusion was also made in the 2012 study.
   - We have all of these studies and all use a different designation for location, etc. Perhaps a chart may be better that shows the river mile (RM); Can we settle on some standard designation for sites and also depict the RM location?
   - Maybe a work group could break this up by river mile as it gets confusing.
   - The Data Management work group has the database and they can add a comment about where the different labels are and are working on developing an online GIS map.
   - The Department of Health does fish advisories for this same area and you could overlay it onto the Spokane River to help depict priority areas.
   - We could add that layer to the online GIS map being created.

Introduction – Current work and management questions: Dave Dilks, LimnoTech

Summary of Results of Recent Analyses Addressing Management Questions: Dave Dilks, LimnoTech & Dr. Lisa Rodenberg, Rutgers University (see Current/New Work presentation)

Characterize Sources: Looked at data from past studies over the last 6 weeks (see Existing Pathways presentations)

1. **Summarize existing knowledge of PCB delivery pathways**: Reconciling the Serdar loading assessment with more recent studies.

Questions/Comments:

- Were the flows theoretical that Ecology used? Were the flows 10x higher? *Yes, and the load was 25x higher. It is a holistic view of flows throughout the year.*
- Ecology data was collected three times. It is worth looking at the October sample because the Semi-Permeable Membrane Device (SPMD) may have aggregated. Blank censoring could be a factor that could explain the differences.
- Kaiser compared SPMD with composite samples and the report was submitted to Ecology. The concentration of the model is a calculated concentration and not direct.
- Things have changed since 2003 and 2004 with Upriver Dam, Donkey Island clean up, Kaiser work and City of Spokane wastewater treatment improvements.
- The synoptic survey focused on low flow and Serdar was a more holistic look of the entire year. How does stormwater fit in? Assuming the Serdar overestimated stormwater, then there is even a greater unknown load.
- With the unknown being more in Long Lake and it being thought of as a sink, do you think the load is from the lake itself if there are high concentrations? *Brandee said she is not sure and there may be some loading contribution, but she thinks it is a net sink instead of a source.*
- Can you talk about loads at Nine Mile for monthly monitoring vs the Serdar report? *Most of the monthly concentrations at Nine Mile were higher than directly upstream.*

Summary of existing loading pathways: One of the biggest loads is what is coming out of Lake CDA but do not feel it is as significant as other areas, because concentrations are low (flows are high). The groundwater load near Kaiser was the highest.

Questions/Answers:

- Could PCBs preferentially be leaving the water column into the sediment via settling? *The higher chlorinated ones would but this is not what we are seeing.*
- Is it possible that the lower congener PCBs are more soluble? *Yes, and they do volatilize more but preferentially it is not that great or does not differ that much across homologs. These are not the PCBs showing up in the fish.*

2. **SRRTTF fingerprint analyses:** Dr. Lisa Rodenburg (see Suitability of Data for Fingerprinting presentation)

Questions/Answers:

- If the Aroclors appear unweathered, what is the most likely source? *You have to look at all evidence and weathering is one part of it. Development here is relatively new compared to other places, and that is why you do not see as much weathering here.*
- What do you mean by P450 metabolism? *The original fingerprint in fish, comparing it to Aroclor and looking at the pathway. The PCBs that do not metabolize stay big and strong, but others disappear.*
- Can you apply traditional decay rates to this? *Perhaps if you know the age of the fish, but every species is different, and the exposure is also different.*
- Is the metabolism dechlorinating? *No, it is oxygenating and stripping away some congeners that are more degradable.*
- Is metabolism a good thing? *The hydroxylated PCBs resulting from metabolism are, in general, more toxic.*
- Fish data include multiple data and ages -are you going to clump this data? *The congener fingerprints are the same anywhere in fish and it does not matter what part you use, but the gut contents could have a different fingerprint.*

3. **Similarity of homolog patterns**: Dave Dilks (see Pattern Similarity-Analysis of Homolog Distributions to Better Understand Nature of Loads presentations)

   Lake CDA seasonality: It is not possible to determine if there are different loading patterns by season because concentrations are so low relative to blanks.

   Atmospheric Deposition conclusions with Lake C'DA, Upgradient groundwater and stormwater: Can say that stormwater is not driven by what is happening at Monroe and Turnbull. Advise that the TF should not focus on Atmospheric Deposition studies, better to remain an Ecology task.

   In River seasonality conclusions: There was high similarity between spring and summer at Plante's Ferry and USGS Gage and low similarity between winter and other seasons. Little confidence should be placed in the winter correlations, due to them being based upon a single data point.

   Biofilm and Water Column Data: Two sites stand out, USGS Gage and Mirabeau with biofilm bioconcentration results.
   - What were the date differences in sampling? *Biofilm sampling was conducted in late August and water column data were collected in early August.*

   Variability in Biofilm PCB concentration: There is a lot of variability and there are too few data to draw strong conclusions. Additional monitoring will help.
   Comments:
   - We are talking about doing more studies, why would we not put our money towards evaluating the high concentration areas and then go in later and re-evaluate? *This will be discussed more tomorrow.*
   - Additional monitoring of biofilm will help if the TF wants to come to any strong conclusions. Water column sampling helps in calculating the bioaccumulation, which may not be a top priority.

4. **Spatial assessment of PCBs in fish, biofilm and sediments:** Done at four locations and with four different fish species. Seeing similar patterns across the different kinds of fish. (see Spatial Fish presentation)
   Questions/Comments:
   - Dr. Rodenburg. pointed out the "Twin Towers" in the results at all stations and in the species in the presentation table regarding certain PCBs. With metabolism, PCBs 147 and 149 start going away. In water and in the fish we see the metabolism happening.
   - The overall PCB magnitude changes as fish get older but the PCB signature will not change much.
   - What is the takeaway? *The congeners bioaccumulate to different degrees. We may be looking at PCBs in the water column that are not necessarily bioaccumulating in fish.*
   - Mike Hermanson has looked at these data and has seen a change from station to station.
   - When it comes to fish tissue concentration what is meaningful as to what people consume? What is the logic of species that we choose? *Generally, our data are used for human health assessment but usually the focus is water quality, and we tend to choose a lower trophic level and higher trophic level species. Most of the species are longer lived because it is exploratory, but it also depends on what is in the water body and collecting enough fish to*

put in the composite samples. Edible fish information is sent to the Department of Health and the listing is based on a very prescribed procedure (Ecology Policy 1-11).

- In another assumption used in the water quality standard they all used the same bioconcentration factor, which dates back to 1980.
- The TF Fish work group is working on developing a proposed approach with associated studies to measure and track PCB concentrations in fish tissue over time.
- Brandee explained that Keith Seiders (Ecology) is doing a lot of work on this topic and put a lot of effort into determining what species are to be sampled. His team will be out again in 2022 doing fish analysis.
- Is monitoring the responsibility of the TF or others?
- With seasonal accumulation of PCBs, is there a potential for credit for seasonal discharge with dam operations impacts on concentrations?
- Is there a means of being able to work with the TF to help inform EPA what they address from a regulatory standpoint? Maybe it could inform us on where to focus efforts.
- What are we targeting? *Making measurable progress towards a water quality standard. If we are looking at human health, this is a different focus given that different PCBs bioaccumulate in fish.*

Identify Controls/Cause-Effect Mechanisms

1. **Partitioning model between water column and sediments:** Dave Dilks (see presentation) Brandee Era-Miller and Siana Wong (Ecology) found with sediment and biofilm sampling there were high concentrations and a lot of variability near Gonzaga. Ecology plans on doing more biofilm sampling at this location in August 2019.

   Questions/Comments/Answers:

   - Is the model applied site specific? *It is an average condition, and these are specific sites.*
   - Do you have information on organic carbon at the Gonzaga site? *No*
   - Could stormwater sources contribute preferentially to sediment contamination? *It depends on the flow condition and type of solids and associated organic content. Total Suspended solids will vary during different seasons (more deposition, less sediment) and they did not consider this but just looked at the fraction of any given storm/flow event.*

2. **Bioaccumulation model (sediment and biofilm based):** Dave Dilks (see Screening Level Bioaccumulation Modeling presentation)

   The results of the model were inconclusive and are too uncertain to directly address management related questions. The TF needs more information to use this model.

   Questions/Answers:

   - Why would you use the Wenatchee study instead of the Serdar study? *It was run with both Wenatchee and Serdar assumptions. There is a lot of uncertainty depending on inputs (what and how much fish are eating, etc.). It showed that PCB 153 bioaccumulates much more than PCB 11. We need a lot more targeted data (food web, lipid, water, sediment, biofilm, etc.) to determine if there are sediment hot spots. There is some sediment signal and the model shows that sediments play a role, but not how much of a role.*
   - How would a more rigorous model assist the Task Force? *It could help identify hot spots (areas of interest/concern).*

Make Progress/Status and Trends

1. **Statistical summary of current water column PCB concentration:** What is our current understanding and what is needed to get to a statistically significant trend assessment?

2. **Trend analysis for water column –** Data analyzed at four sites: Barker, Trent Avenue/Plantes Ferry, USGS, and Nine Mile. There is a need for more years of data to determine if a trend exists and the number of years for data collection depends on the sampling frequency. (see Trend presentation)

   Questions/Comments:

   - Would fish tissue be better for this? *Dave would have to look at fish tissue data and see how variable it is. Brandee added that with the proposed fish tissue concentrations tracking approach, they hope to have enough fish tissue data by 2022 to see a trend.*
   - Fish may be better than water due to low variability.
   - Given that there are some areas with legacy PCBs and there was significant clean up during that time, these areas should be included in the evaluation. There may be a temporary increase after land cleanup, then a steady decrease.
   - In the Upper Hudson this is a big problem and it is very difficult to see these trends. Spokane has much less sediment. It is difficult to see trends but if you are able to decrease PCB loading here in Spokane then you may see a quicker response than in other systems because the system has little organic matter for PCBs to bind to. The challenge in Spokane is when you do not know what to expect in a drop.
   - I did not see a pie chart with reassessment and do not know what percentage dischargers are of the total PCBs. Thirty to forty percent of the load may be from treatment plants. We should see a significant drop from dischargers in 2021 when most of them will have advanced tertiary treatment. What is the sampling strategy to detect this? We need to plan ahead.
   - As loadings are reduced, you are rapidly approaching a point in which you will not be able to sample the water column to assess trends because rivers concentrations will be at the level of blank concentration.
   - Flow weighted sampling may be better as PCBs have long hold times and you can get rid of variability.
   - Low density polyethylene strips are being used to say something about water column concentrations and it could be something to consider.

   Action item: Brian Nickel to send link to the facilitation team to share with the TF on studies on this sampling method.

   - This is basically what SPMDs are and with both techniques you are estimating concentration.
   - Another methodology could be sediment traps and they sit in the water column for several months and you get an integrated average. You could build a trend program around it.
   - In the sediment partitioning with the Gonzaga/Post term 2 site, if the standard model does not explain these sites, what possibly could and what do we do about it? *The water column is generally well mixed but the sediment is not so you could be hitting the one point that is higher. Sediment is tougher with sampling.*
   - What is the regulatory framework for looking at groundwater? *The TF may be able to do this if they want to although when it comes to land use or private property the TF has limits.*
   - We can get lost in the details of places we do not have control over or dig in on other things we do control. As dischargers let's solve our issues then highlight other issues and work within the community to get those done.
   - If you do reduce discharge loads, it will not likely get the river to the right water quality standard. Every river in the country likely exceeds the current WA standard.

Day 2 – May 31, 2019

Recap Day 1

Management Objectives, Questions and Results: Lisa Dally Wilson started the day by providing an overview of the ideas and questions that were posed by the attendees via the notes from the previous day. The Tech Track work group will discuss these suggestions, along with the rest of the findings from the workshop, and then provide recommendations to the TF. (see the presentation)

Comments:

- Lisa Rodenburg suggested that the TF consider using Enzyme-linked Immunosorbent Assay (ELISA) kits to sample some hot spots.
- The fish experience all the PCBs but only bioaccumulate some of them.
- Small mouth bass are newer to the system but are now an apex predator. This species should be looked at. In previous Ecology studies they were not sampled.

Action items/Parking lot To Dos:

- Dave Dilks will put together a low flow pie chart of sources (reflecting the information in the bar chart he presented at the workshop) by the next TF meeting.
- Develop a worksheet and sample location naming protocol that standardizes the name of each sample location and identifies river mile. Data management workgroup and Ecology EAP can help with this task. Include names used at the time of the study for the site and sync with online GIS database that the County is currently developing. (Note – County and Ecology to coordinate on GIS database and Google Earth database).
- Add layer showing DOH advisories to the Ecology generated Google Earth Map.
- Other dischargers besides Kaiser and Spokane County have been monitoring routinely for PCBs and may have enough samples to also include in Dr. Rodenburg's Phase 2 PMF (fingerprint) analysis. Provider Lisa Rodenburg and Mike Hermanson this information right away, as scoping for this work is underway.
- Brian Nickel to check on the PCB 11 risk assessment and note the importance of looking at the hydroxylated forms.

Next Steps summary of yesterday's presentations: Dave Dilks (see Knowns/Unknowns presentation)

- Likely next steps: Biofilm/sediment sampling and monitoring to establish if progress is being made which may help assess significance of unknown loads during higher flows.
- Unlikely next steps: Refining the estimate of magnitude of stormwater/CSO loads and determining significance of atmospheric deposition.
- Potential next steps:
    - Provide additional resources to EAP for biofilm/sediment hotspots (areas of interest/concern)
    - Improved assessment of dry weather groundwater loads from Greene street to Nine mile
    - Significance of loads upgradient of Kaiser
    - Targeted assessment of high flow loading
    - Investigate cause of apparent loss of PCBs near Upriver dam
    - Develop linkage between PCB loads and resulting fish tissue
    - Develop a method/study of tracking fish tissue concentration over time in similarly aged species.

Comments by Lisa Rodenburg:

Your system is different, and it needs to be studied. We do not know that sediment and water are anywhere close to equilibrium. The standard linkages between sediment, water and fish may not apply

here. The food web is changing so what you thought ten years ago may not be what is happening today. I would move toward developing a linkage between PCB loads and resulting higher fish tissue concentrations. You are trying to measure trends everywhere, but any trends you have seen may not necessarily continue in the future.

Questions/Comments:

- Putting the science on the shoulders of municipalities is too much. The cost is too high for each household. We have compelling science questions and local capacity at universities. We could put together a team to address these questions.
- With the comment about the food web changing, should the fish tissue concentrations be driving our control actions*? Even though the food web is changing, the bioaccumulation will not likely be different.* How would changes in the food web impact what the TF is working on? What is the linkage between water and fish versus between sediment and fish? *The hot spots may be driving the fish problem. A good way to find out if this is the case is to use an ELISA kit since it is less expensive to do multiple samplings.*
- There is also the option of doing PCB Aroclor analysis and see if the concentrations are high enough in biofilm to see detections.
- As we meet our permit conditions a lot of the goals for the TF should align and be met. A lot of the PCB driven questions will be answered as entities meet their permit conditions.
- Should anything be done about inadvertent PCBs? *Dr. Rodenburg said that inadvertent PCBs are not the problem, but rather, what is in the fish. The TF should go after high molecular weight PCBs over inadvertent ones and Dave Dilks agreed. In the water column money is better spent trying to control Aroclor type sources. However, inadvertent PCBs such as PCB-11 are dominant in the water column and from a regulatory standpoint we need to meet water quality standards.*

Breakout Sessions to Address Future Work Questions

Data synthesis workshop attendees were organized into three groups. Each group addressed the same three questions. After attendees reconvened, reports from each group were shared, and common ideas were identified along with other suggestions provided by each group. The questions, responses, common ideas, and additional discussion topics are summarized below.

Question 1 – Data Gaps and Questions: Based on what you learned at the workshop, which data gaps/questions do you feel are most important to address and why (and which can we put aside)? Generally, describe the action(s) needed to address the data gap/question.

Group 1 – **Responses to Question 1**

- It is possible we may not need to fill any more data gaps. Instead, identify and focus on things we can control.
- Address three general data gaps:
    - Biofilm/sediment work to identify/confirm problematic PCB locations. Start with this activity as a first step as it is likely a more cost-effective approach (food web assessment is expensive and may not help remove PCBs).
    - Collect additional information on known contaminated sites, targeting Aroclors 1254 and 1260.
    - Measure PCB concentrations at high flows using synoptic sampling - Start with data collection on one reach with some known sources, and if we do get helpful information (PCBs detected/not overwhelmed by dilution factor) then a second phase could include additional high flow synoptic sampling on the rest of the river area being evaluated by the Task Force.

Group 2 – **Responses to Question 1**

- Better understand spatial extent and magnitude of PCB contributions upgradient of Kaiser, from the GE site, and Kaiser and its associated plume (Aroclor 1248)
- Collect and evaluate additional sediment samples to better understand spatial extent and magnitude of PCB contributions for Gonzaga reach
- Collect additional biofilm and macroinvertebrates samples near GE site, SR3A and at Spokane Gage.
- Consider additional water quality data collection at Division Street.
- Evaluate ways to better understand the reach from Plantes Ferry to Greene Street to see if groundwater loss is masking a source.
- Potentially look at change analysis instead of trend analysis.
- Conduct synoptic sampling at high flows at same locations listed above to better understand what is causing an influx of PCBs downstream in Lake Spokane (Long Lake). Recognize water quality sampling may not be as effective moving forward to establish trends due to noise in the data and analysis methods.
- Compare PCB concentrations in fish at different locations, which will help focus scopes of future studies. Focus on hots spots in biofilm study and provide input and funding to Ecology. Do ELISA analysis and add in this method in conjunction with water sampling.
- Develop research questions, publish to TF website, partner with Universities in future studies.

Group 3 – **Responses to Question 1**

- Target analyses on areas with unknown PCB sources such as SR3A, Gonzaga and the Mission Reach.
- Improve our understanding of the food web - we have heard at the workshop that the Spokane River is a unique system (compared to other river systems with PCB concerns). Also better understand metabolism changes that may be occurring in the food web.
- Look at areas where we know there is a source and combine with groundwater work using pit tracers (injecting tracers into groundwater and tracking to look at characteristics) such as at the GE site both in wet and dry conditions, and use this information to sort out the magnitude of contributions, and fluctuations in river contributions from potential sources, and whether there is value in pursuing additional actions in these areas.
- Look at industrial park dry wells – understand their impacts to groundwater, and whether there is value to pursue further.
- Look at concentrations of PCBs below Long Lake Dam to know how close we are to meeting the tribal standard.
- Evaluate Hangman Creek for future wet weather sampling as a potential PCB stormwater source. There was a high PCB concentration in 2016.
- Develop a high flow mass balance by conducting synoptic sampling at high flow conditions, recognizing we may need to adjust our data collection methods (e.g., use a passive sampling method).
- What does the model look like if Mirabeau and Spokane Gage are not outliers?
- Data collection efforts need to help narrow Task Force (or others) focus and lead to an opportunity to do something about a source, and to better understand source contributions throughout the year (not just during low flows).

Common Responses to Question 1 Among All Groups:

1. Additional biofilm/sediment sampling as a first step in identifying problematic areas and the spatial extent of those areas. Consider SRRTTF augmentation of Washington State Department of Ecology's Environmental Assessment Program (EAP) sampling this August to further verify unknown sources.
2. Generally, all groups focused on drilling deeper into known contaminated areas or areas suspected to be a source of PCB based on recent sample results or historic land use using biofilm/sediment sampling and parallel water column sampling rather than approaching the River from a big picture synoptic survey/mass balance approach as the SRRTTF has in the past.
3. High flows – Are we mobilizing PCBs in the water column at high water levels? Conduct water column sampling at high water level(s): Consider a two-phased study process:
    - Phase 1 - Reach specific study (consider reach located somewhere between Plantes Ferry and Spokane Gage -possible sites to target include Gonzaga site, SR3, Mission, or GE) – Further target sites from August Biofilm monitoring results
    - Phase 2 - If Phase 1 indicates ability to detect PCBs at high flow (e.g., dilution does not render concentrations below detection), Consider a full synoptic high flow study leading to a better understanding of concentrations at high flow (use to establish high flow pie chart similar to the low flow sources chart)
4. Research/Literature objective – Search historical information to identify contaminated sites (potential hot spots) focusing on prevalent and problematic Aroclors used in past production processes (1254 and 1260). Understand industrial site dry wells. Use this information to help guide location of further sampling efforts.
5. Long-term monitoring program (see question 3, Common Response #1)

Other Comments and Questions Related to Addressing Question 1

- Better understand spatial extent of Kaiser plume, upgradient of Kaiser and GE. Why is the evaluation and improved characterization of groundwater contributions not higher on the list? There are high numbers at Kaiser, upgradient of Kaiser and at the GE site. How can we better identify what it is coming from these sites and getting into the river? What about the wells? *We are seeing it at the wells, but it is not coming up in synoptic surveys at GE.*
- When sampling fish the inside of the fish can be looked at to see contents, which could help with the food web study.
- Conduct additional low flow monitoring in the reach between the USGS Gage and Nine Mile dam, so understanding is more refined.

Question 2 – Given what we've learned about relative sources of PCBs impacting the Spokane River, are there new actions or adjustments to current actions that we can implement that could further reduce the PCB load entering the Spokane River system?

Group 1 – Responses to Question 2

- Expand public outreach focusing on unknown sources and make sure the public is informed.
    - Develop a catalog of various BMPs and conduct cost/benefit analysis for implementing them.
    - Align TF efforts and goals with individual regulators and requirements (e.g. MS4 permit requirements) and use in outreach and to measure progress.
    - Bolster current household hazardous waste program and estimate PCBs removed as a result of the program.
    - TF develop a template to give all agencies for providing consistency on mass of PCBs removed.

- Focus on what more collectively the TF can do that individual entities are not doing, such as focusing on emerging technologies.

Group 2 – **Responses to Question 2**

- Look at sewer collection systems in older developments that are more likely to have legacy PCBs in paints and caulks. What is the composition of the flow? This could help point to product sources.
- Focus on one specific area and characterize all we know for this area.
- Standardize a program to track environmental improvement and cost effectiveness.
- Tell the story of the TF and the dischargers, and what the benefits are to society from our work in public outreach. Also acknowledge challenges. Look for alternative sources of funding. Host an annual workshop like the Dissolved Oxygen TMDL group does. Hold an annual meeting to tell the story, along with associated communication strategies.

Group 3 – **Responses to Question 2**

- Conduct additional research and development on emerging technologies.
- Evaluate effectiveness of current stormwater treatment methods and apply those methods most effective at removing PCBs throughout the basin.
- Work with Ecology and EPA to determine if the GE site should be reopened.
- Target education and outreach efforts on reducing use of consumer products with inadvertent PCBs.
- Get biosolids out of the watershed.
- Pursue compliance actions for known open sources that might contribute to stormwater.

Common Responses to Question 2 Among All Groups:

1. Education and Outreach:
    - Tell the story about the progress being made. Do a better job at measuring PCBs removed as a result of different E&O programs and tell that as part of the story. Conduct annual meeting as part of sharing story. Also provide template to regulated agencies that provides consistent information regarding mass of PCBs removed each year and summarize in a form that can be shared with the public as part of annual comprehensive plan progress reporting.
    - Align TF activities with and support individual member MS4 requirements and use in outreach and to measure progress
    - Conduct outreach that helps to reduce inadvertent PCBs
    - Bolster and quantify household waste collection
    - Share technology (e.g., most effective stormwater treatment technologies)
    - Focus on hazard products reduction

2. Conduct additional research and development on emerging technologies – how to dispose of PCBs once they are removed.
3. Focus on identifying and removing unknown sources.

Other Comments and Questions Related to Addressing Question 2:

- Evaluate biosolids – Look at past studies to better understand. Pursue compliance actions for other sources once known, which needs more discussion. There is not consensus of this action moving forward. What kind of actions can we take to better understand this to see if it is an issue? King county has biosolid issues with PCBs the TF could follow up on. Cadie Olsen has done some research

on this topic. The TF may want to look at areas that are unclear on how to clean up. What are the different pathways that clean up could help with reducing a source and what would the TF need to know to initiate the action? What if a past cleanup action cannot be reopened and there is no way to clean it up? What is the TF role in that? Is it to move on or look at a regulatory agency that can help? *(Potential topic for future TF meeting agenda)*

- The concept of telling the story is important to gain public support. The TF should go through the Comprehensive Plan and determine what has been done, what has not been done, and what is even possible.
- When telling the story, the TF needs to make sure to tell the stories of collaboration and taking advantages of opportunities that arise (i.e. Apple/HP ink standards, TSCA work, road paint)
- There are heavier congeners such as TiO_2 and not just PCB 11 that can be inadvertently produced.

Question 3 – Are there other studies or actions that have not been mentioned above that could allow us to better measure reductions in PCBs in the Spokane River Watershed over time (i.e., assess trends in PCB concentrations and TF progress)?

Group 1 – **Responses to Question 3**

- Metrics:
    - Identify the number of identified contaminated sites the TF identifies from their monitoring that are subsequently included in a clean-up program.
    - Calculate the amount of PCBs removed via treatment technology (e.g., point source sediment removal from stormwater catch basins and street sweeping).
    - Track the number of outreach events the TF and individual members conduct.
- Implement a thoughtful, long-term monitoring program – a network that can track concentrations in fish and water (and establish consistency over time). Supplement Ecology ten-year fish tissue sampling with a short-term method that analyzes rainbow trout tissue sampling (two-four year olds) to determine trends in fish-tissue concentrations. Consider cost-effective sampling methodologies and coordinate with additional sediment and water column sampling. Helps set a baseline for fish tissue concentrations before discharger wastewater treatment technologies are in place.

Group 2 – **Responses to Question 3**

- Collect samples every three months – look at magnitude corrected for flow over a season. Consider sediment traps and SPMDs. Take longer period samples and not try to quantify but identify change over time.
- Reconnect with Urban Waters Program with Jim Ross, Ecology, and associated sampling and local source controls.
- Do a small-scale study (e.g., for a house) characterizing sources and associated BMPs and what impacts and reductions there are over a year.

Group 3 – **Responses to Question 3**

- Develop a monitoring system that identifies long term monitoring sites, monitoring procedures and consistent time frames.
- Keep track of trends over time and have some measurement sources such as Plantes Ferry, Long Lake and Nine Mile and having more frequent fish tissue monitoring than every ten years. Consider SPMD sampling tools to get total PCBs and congeners.
- Have a long-term program that reduces blank contamination and use sediment traps as a way to gather data.

- We have a good pie chart that identifies PCB areas at low flow, but we also need to develop one of these for higher flow conditions.

Common Responses to Question 3 Among All groups:

1. Establish a long-term monitoring program/network to set baseline and track concentrations in fish and water (sediment and biofilm) with the intent to establish consistency and coordinated sampling between media. Conduct fish tissue sampling for rainbow trout to determine baseline and trends. The TF, WDFW and Ecology can combine their efforts. NSF grant to get scientists involved at front end of project scoping. As part of this, consider cost-effective sampling methodologies such as sediment traps and SPMDs to collect longer period PCB data to identify change over time. [Thoughtful, sampling program that lays out long term water quality and fish monitoring (for purposes of establishing baseline and tracking concentrations in fish – to supplement Ecology 10-year monitoring intervals.)] Developing a long-term monitoring plan needs to be really thought through. What will it look like and how will it complement the Ecology-conducted measurable progress review?
2. Metrics:
    - Identify the number of identified contaminated sites the TF identifies from their monitoring that are subsequently included in a clean-up program.
    - Calculate the amount of PCBs removed via treatment technology (e.g., point source sediment removal from stormwater catch basins and street sweeping).
    - Track the number of outreach events the TF and individual members conduct.

Other Comments and Questions Related to Addressing Question 3:

- Outreach needs to be shared at a more public level, which also helps the TF create its story of progress. What have individual entities done to move forward, what are the challenges and what might the future look like? The findings can be used outside of this area since we are not alone in addressing PCBs. Getting it out to the public is also important.
- Most of the information is based on concentrations and there are some hot spots, but how big are they? It is hard to prioritize not knowing how significant they are.
- Dave Dilks and Dr. Rodenburg were asked what they thought about the findings from the breakout groups? They were encouraged by the commonality. Dr. Rodenburg mentioned thinking about what needs to be done first, and that it is hard to measure trends. The TF needs to use common sampling methodology in place now and keep using so the data is useful ten years from now. The TF has gone as far as it can with sampling and needs to have a passive sampling method to start measuring trends. The TF already has an SPMD data set, this could be time zero in a longer-term monitoring program. Another option worth exploring is using high volume samples to avoid the blank contamination issues that have been experienced in prior analyses. Dave suggested more biofilm, high flow synoptic monitoring, and integrated monitoring to assess trends.
- Consider including Long Lake in the measuring discussion for the Tech Track work group as it is not currently in the TF study area.

Other (parking lot) questions asked during workshop:

1. Long Lake as a sink? Should we evaluate this given the location of the Spokane Indian Tribe PCB standard and where it is measured?
2. Treatment technologies - should the TF address this? Evaluate emerging technologies, next steps after removal and how we dispose.
3. Stormwater treatment – Educate the TF on stormwater MS4 permit requirements and CSOs.
4. Add tributaries to delivery pathway slide?

Prioritization: The Tech Track work group will work on identifying how to advance the findings and recommendations from the workshop. It was suggested to expand the work group to include the Fish work group. Ben suggested that technical work planned for this summer should be approved at the June or August TF meeting. A scope of work will be developed and then shared. Funding begins July 1. Field work is scheduled for early August so the TF may need to have a conference call or another meeting, possibly in July to approve. Ecology said it will take a couple of months for the QAPP to be approved.