

Long Term Monitoring Preliminary Discussion of First Round of Water Column SPMD Data

TTWG Meeting
February 16, 2021



Background

- SRRTTF has begun implementing a long-term PCB monitoring program
 - Fish: Year-old Redband Trout
 - Single event per monitoring year
 - Water column: Semi-Permeable Membrane Device
 - Three events per monitoring year: low, moderate and high flow
- Laboratory data from first SPMD event has been received
 - Preliminary discussion of initial data review

SPMD: Semi-Permeable Membrane Device

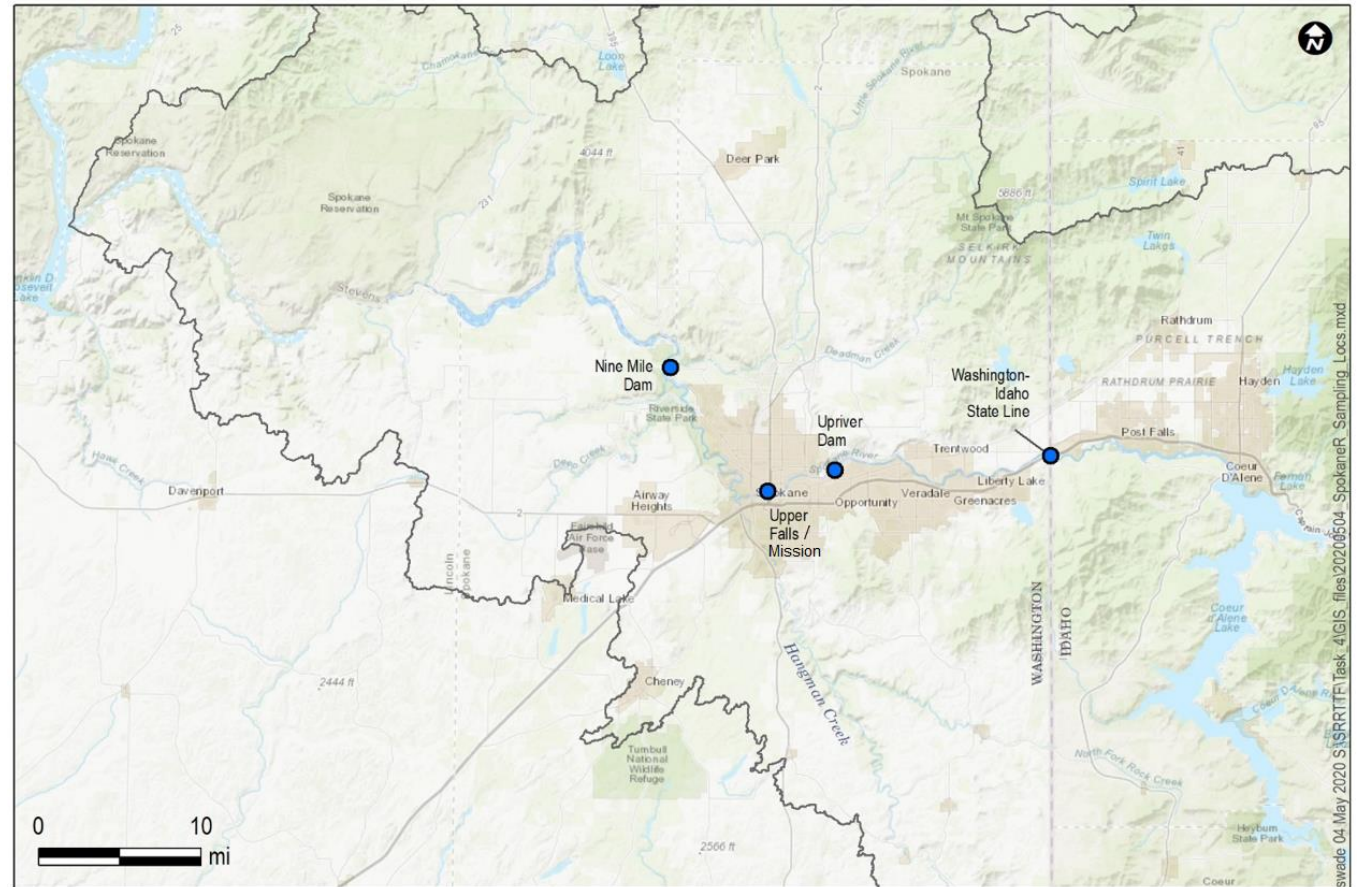
- Passive sampler
 - Low-density polyethylene tube filled with a highly purified lipid
 - PCBs from the water column diffuse through tube walls and concentrate in the lipid
- Deployed in field for ~28 days
 - Provides integrated estimate of water column PCB concentration



Pictures from Ecology (2019) SOP

Sampling Locations

- State Line
- Upriver Dam
- Upper Falls/ Mission Reach
- Nine Mile Dam



Converting SPMD Results to Water Column Concentration

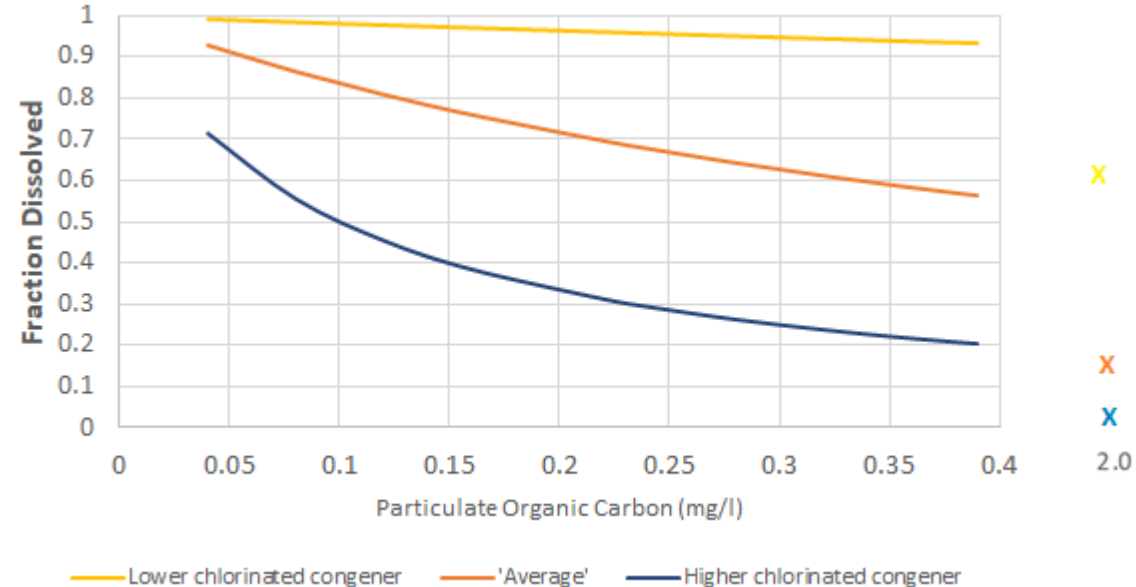
- Laboratory measures PCBs in the SPMD itself, results must undergo two conversions to obtain water column concentration
 - Relationship between PCB concentration in SPMD and dissolved PCB concentration in the water column
 - Relationship between dissolved PCB concentration in the water column and total PCB concentration
- First round of sampling has shown some complications with each step

Converting PCBs in SPMD to Dissolved PCBs in Water Column

- Conversion requires an estimate of the rate of PCB transfer through the SPMD membrane
- Calculated using Performance Reference Compounds (PRCs)
 - SPMDs are spiked with labeled congeners (PRCs) prior to deployment
 - PRC concentration measured in SPMDs both at deployment and after retrieval
 - Decrease in PRCs over deployment period is used to estimate the transfer rate
- PRC decrease for initial deployment was outside of the ideal range
 - David Alvarez (USGS) said that the issue wasn't serious enough to change protocol for upcoming deployment
 - Monitor next round of results, adjust future PRCs if necessary

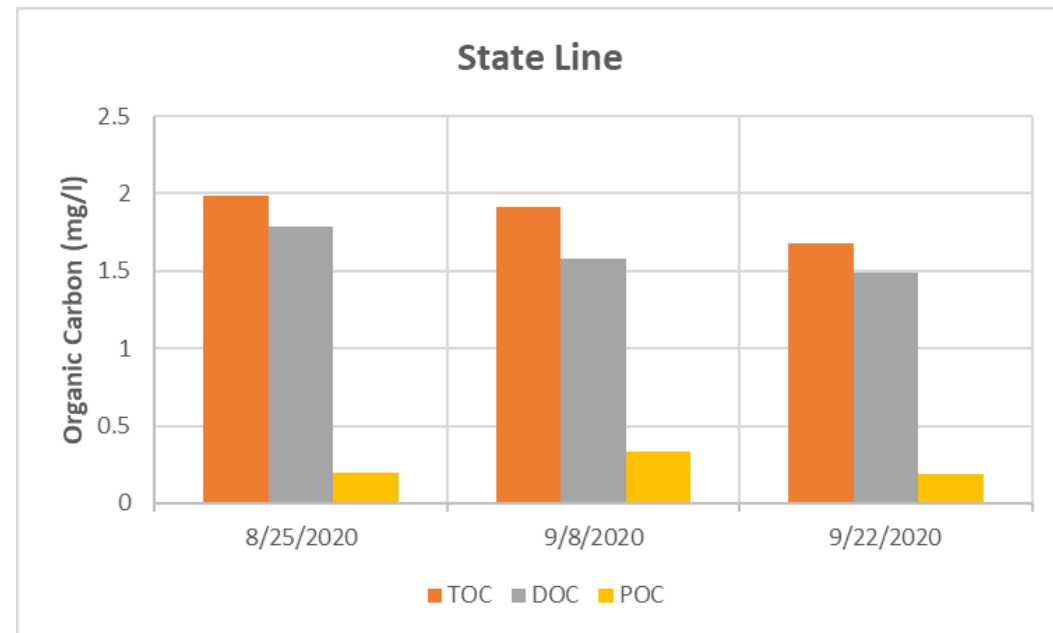
Converting Dissolved PCB to Total PCB Concentration

- Total PCB concentration = dissolved PCB concentration/fraction dissolved
 - e.g., if fraction dissolved = 0.5, total concentration = 2x dissolved concentration
 - if fraction dissolved = 0.1, total concentration = 10x dissolved concentration
- Fraction of total PCB concentration in dissolved form depends on the water column organic carbon concentration and the chemical properties of each congener



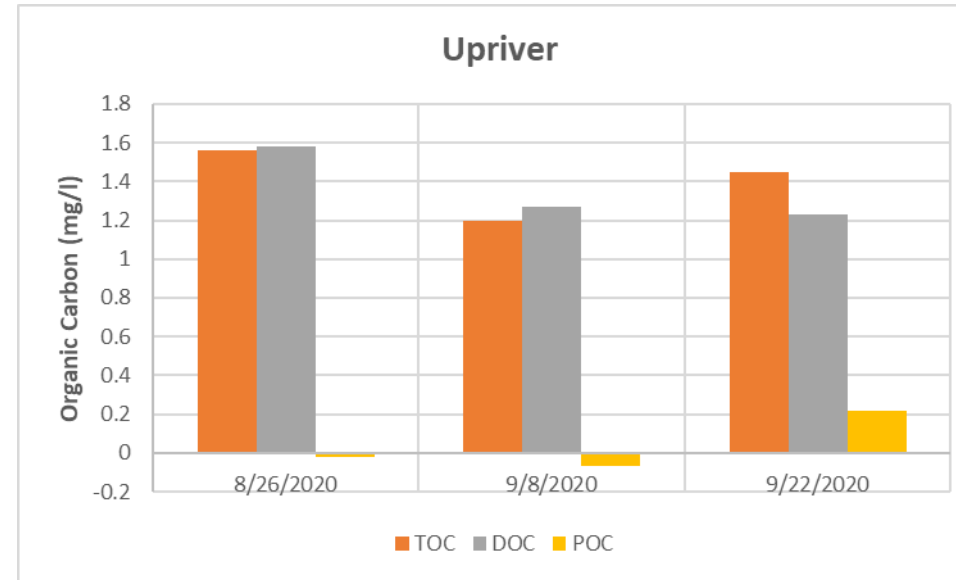
Converting Dissolved PCB to Total

- Particulate organic carbon (POC) estimated as the difference between total organic carbon (TOC) and dissolved organic carbon (DOC)
- TOC and DOC measured at time of deployment, mid-point of deployment, and time of retrieval
- POC concentrations are well-behaved at some sites



Converting Dissolved PCB to Total

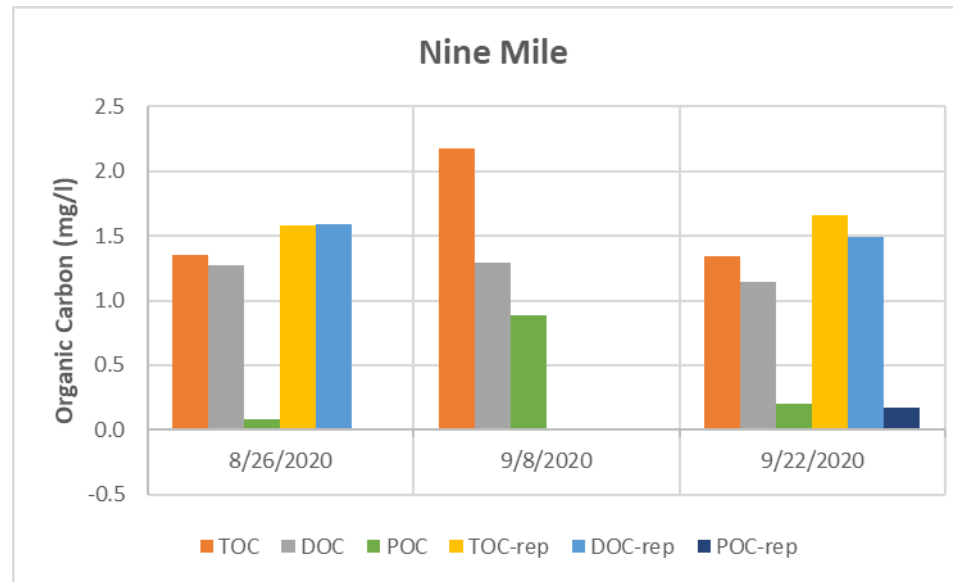
- POC concentrations less well-behaved at other sites
 - TOC and DOC are at similar levels



- Depending upon how negative DOC values are treated, total PCB concentration will vary by 33%

Converting Dissolved PCB to Total

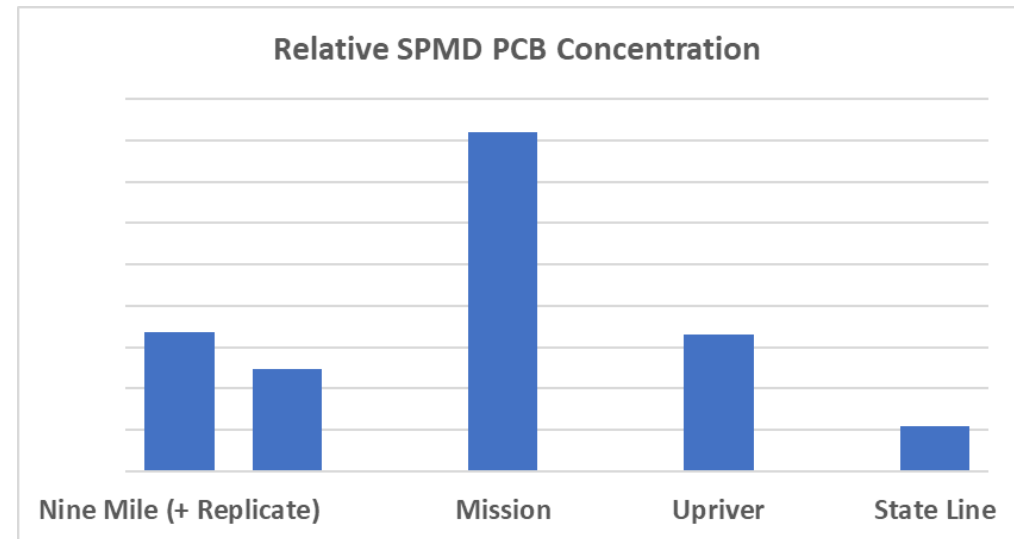
- POC concentrations less well-behaved at other sites
 - POC can vary across time



- Total PCB concentrations calculated using replicate organic carbon data are 53% greater than those calculated using primary samples

Interim Finding

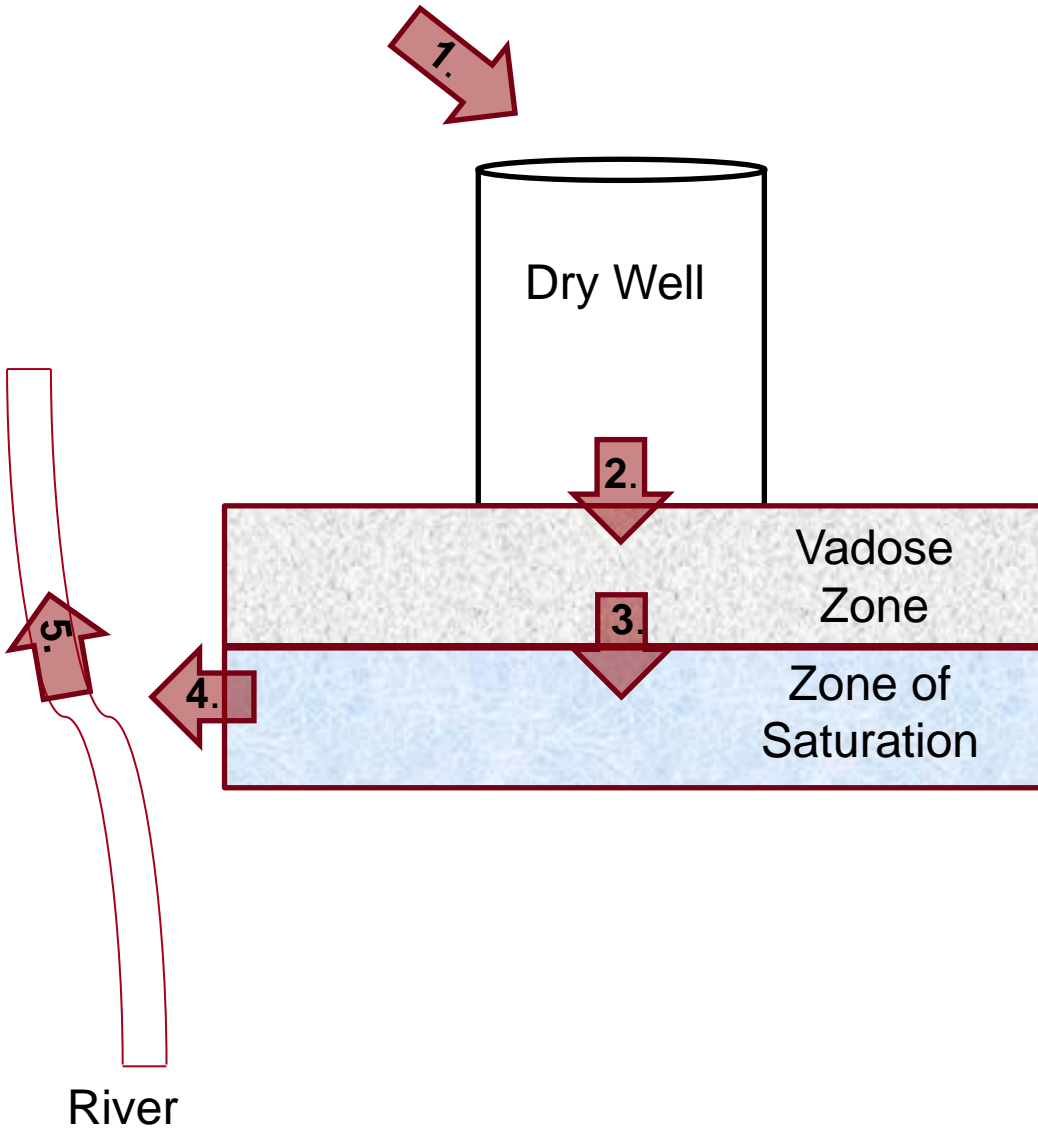
- Still processing data to calculate concentrations
- Examination of un-processed data implies presence of PCB load near Mission Reach
- Signal absent further downstream
 - Consistent with prior monitoring
 - Localized source that get diluted?
 - Instream loss processes?



Summary

- First round of sampling completed
 - Laboratory results are being processed
- Hesitant to conclude too much on a single, non-validated data set, but:
 - Initial data consistent with the presence of a PCB source in Mission Reach
 - Adaptive management may be needed if program will be used to support long-term trend assessment
 - Refined PRCs, additional organic carbon monitoring, more SPMD samples?

Draft Conceptual Model of PCB Delivery from Dry Wells to Spokane River



Steps

1. Stormwater PCB load delivered to well
2. PCB delivery to unsaturated (vadose) zone
3. PCB delivery to zone of saturation
4. PCB delivery to river
5. PCB transport downstream

Key Unknowns

- Do vadose zone soils effectively trap PCBs?
- Where does the water from wells enter the river?
- What is the timing of delivery?

Study Possibilities

- Sample at the downstream end
 - When/where to ensure dry well load is captured?
- Isolate component unknowns
 - Tracer studies. soil profiles, gw monitoring adjacent to dry well