

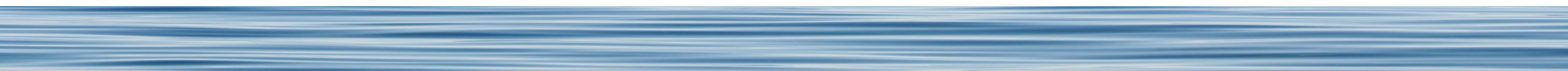
Analysis of Data in Mission Reach by Source/Pathway

SRRTTF-TTWG Data Synthesis Workshop

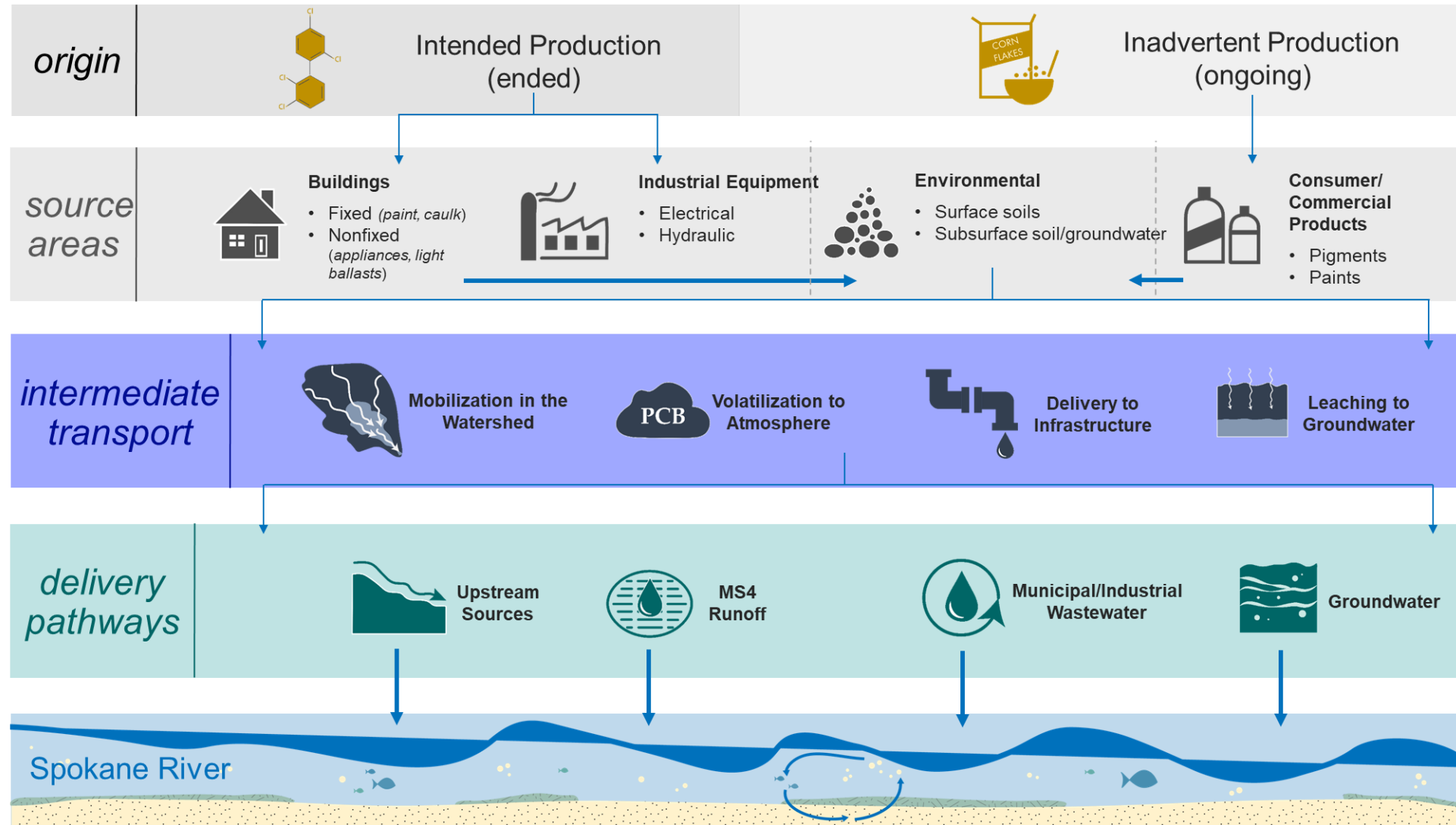
January 31, 2022



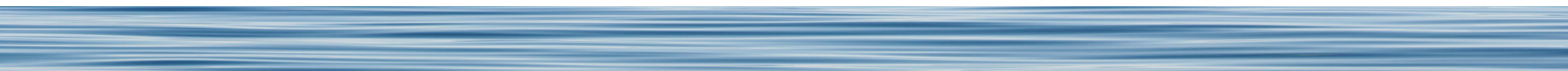
Objective

- Summarize data describing the potential cause(s) for the increase in PCB concentrations in Mission Reach
 - Review the extent to which available data can implicate (or absolve) potential causes
 - Identify key data gaps and define studies which can address those gaps
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Conceptual Model

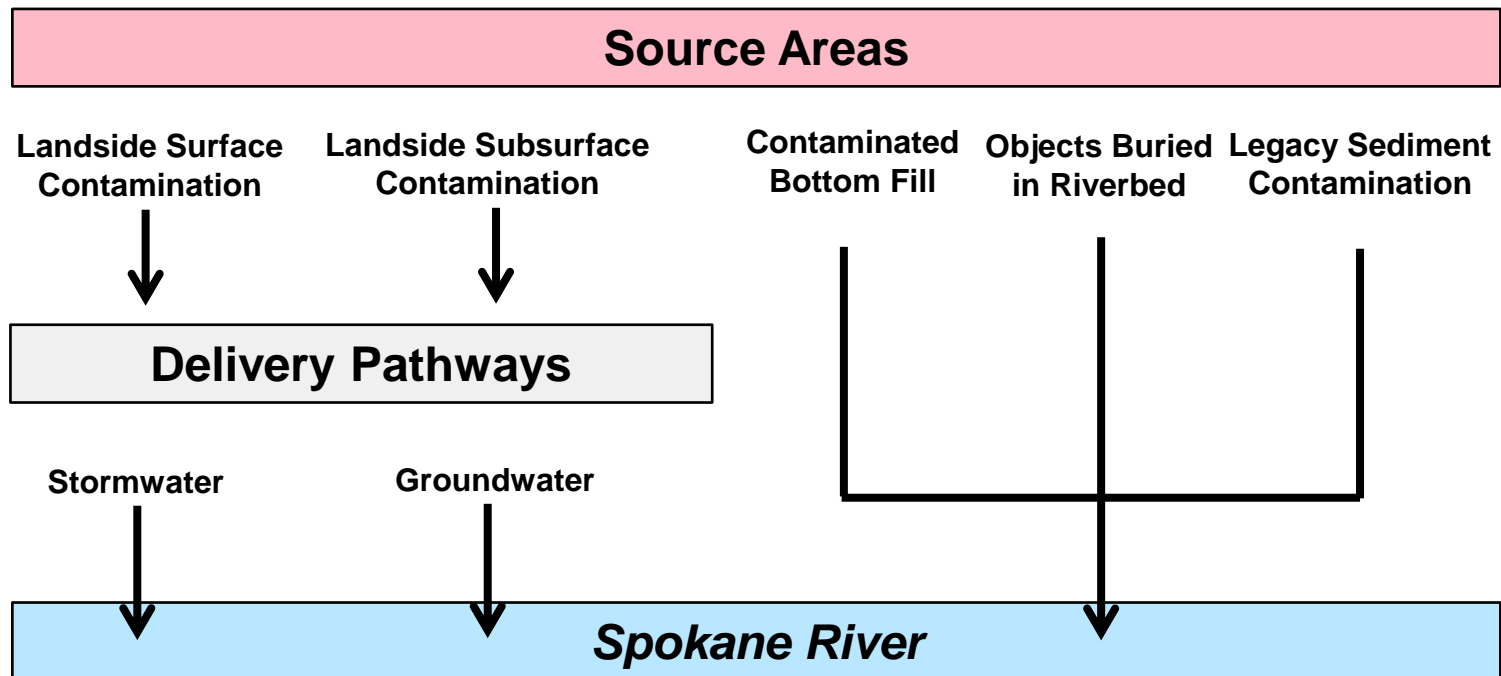


Potentially Important Source Areas for Mission Reach

- Landside surface (i.e., delivered vis stormwater) contamination
 - Landside subsurface (i.e., delivered vis groundwater) contamination
 - Contaminated river fill
 - Objects buried in riverbed
 - Legacy sediment contamination
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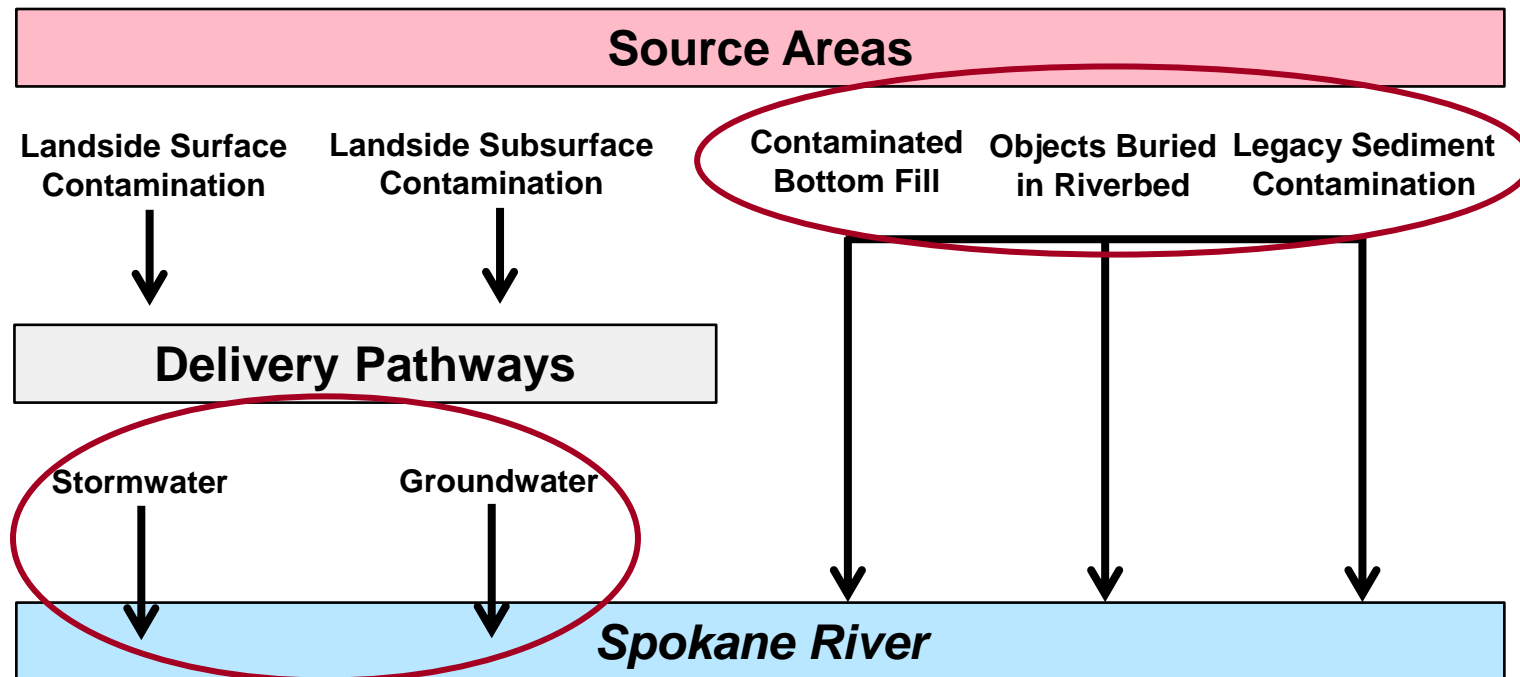
Sources and Delivery Pathways

- Some sources require a mechanism to deliver them to the river
 - Presence of contamination does not necessarily indicate an important source
 - Patches of contamination have been identified throughout the watershed



Sources and Delivery Pathways

- Some sources require a mechanism to deliver them to the river
 - Presence of contamination does not necessarily indicate an important source
 - Patches of contamination have been identified throughout the watershed
 - Delivery pathways influence how we assess the significance of a source



Landside Surface Contamination

Why might this source be important?

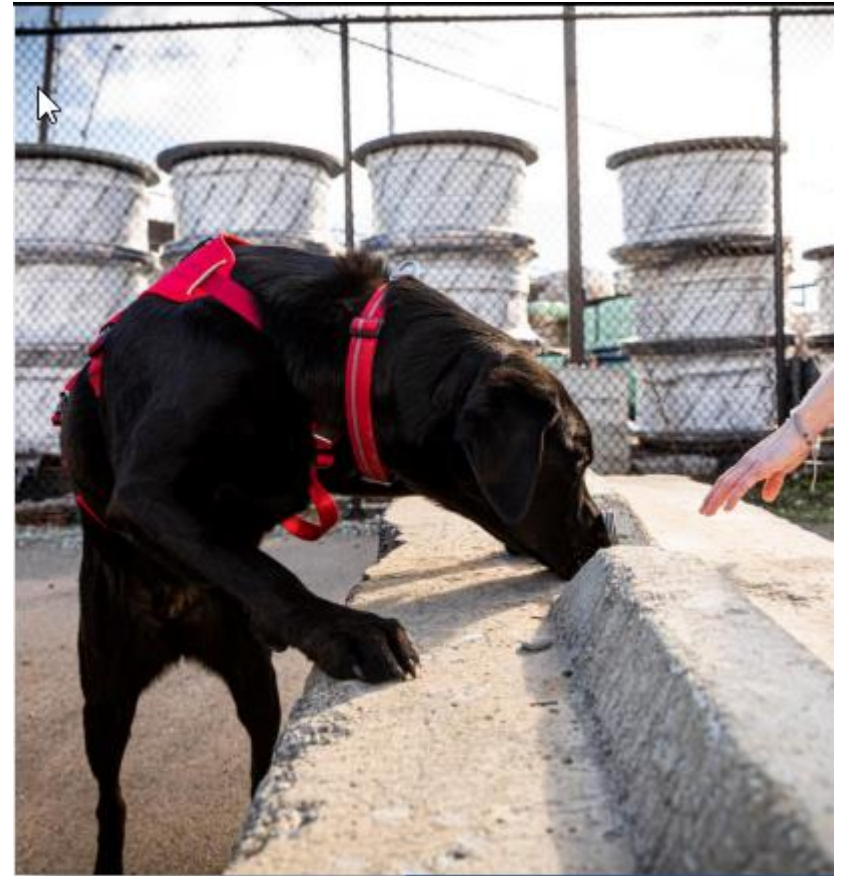
- PCB-contamination in the contributing watershed is discharged to the Mission Reach via stormwater



Landside Surface Contamination

What data do we have and what does it show?

- Three lines of evidence
 1. PCB contamination has been identified in the Mission Reach
 2. Elevated PCB concentrations have been observed in stormwater discharging to the Mission Reach
 3. Similar homolog patterns exist between stormwater and biofilm contamination



Evidence of Landside Surface Contamination

1. PCB contamination identified in the Mission Reach watershed

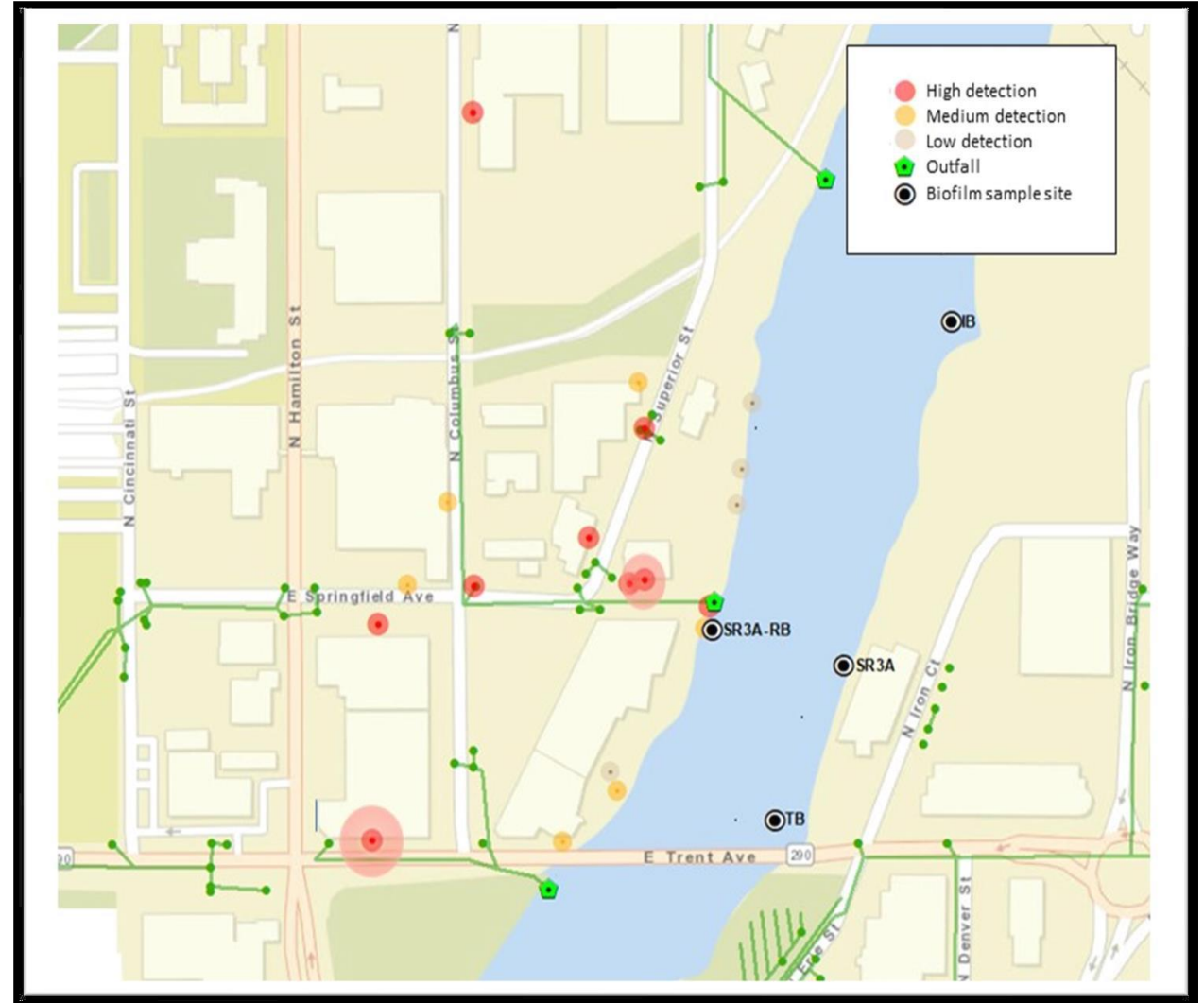
- Historical data
 - City of Spokane hazard assessment indicates areas of historical PCB contamination
 - Urban Waters program identified PCB contamination
 - Ecology review of Sanborn maps show historical presence of businesses potentially associated with PCB use



Evidence of Landside Surface Contamination

1. PCB contamination identified in the Mission Reach watershed

- PCB-sniffing dog Jasper
 - Identified several areas of potential PCB contamination in Mission Reach watershed
 - Some of these areas contribute to a stormwater outfall near an observed river hot spot



Evidence of Landside Surface Contamination

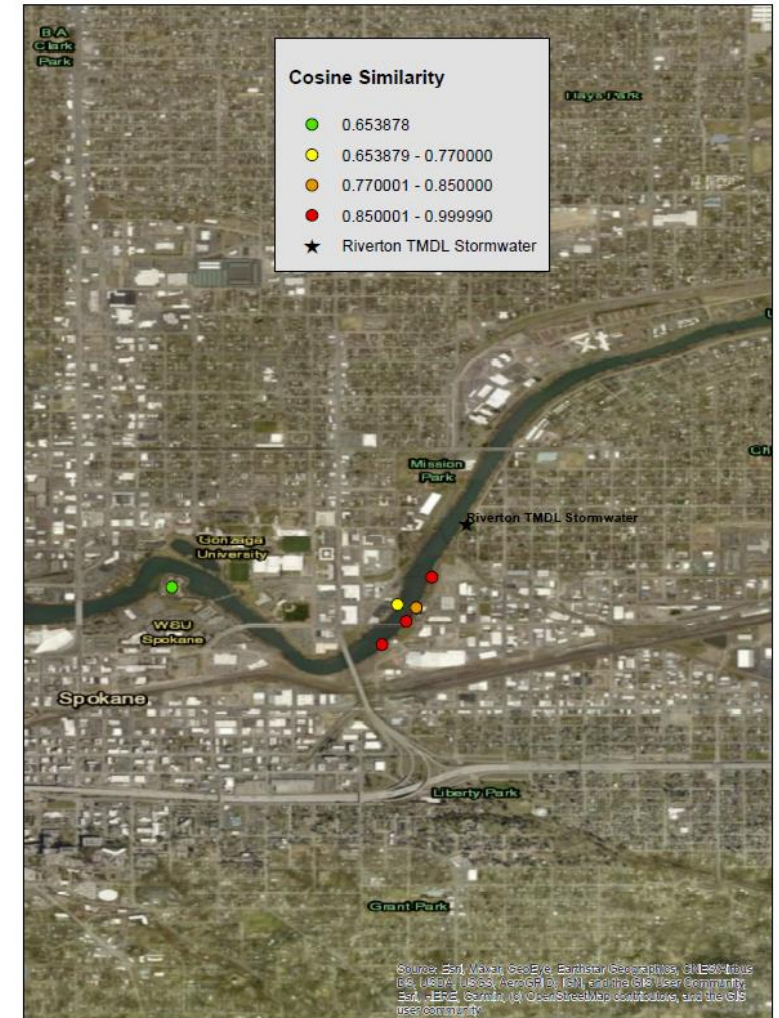
2. Elevated stormwater PCB concentrations observed in Mission Reach

- Union Basin stormwater and CSO 34
 - Historical PCB concentration have been routinely elevated (>100,000 pg/l)
- Riverton, Mission, and Superior stormwater basins
 - Observed PCB concentrations are consistent with typical stormwater (~20,000 pg/l)

Evidence of Landside Surface Contamination

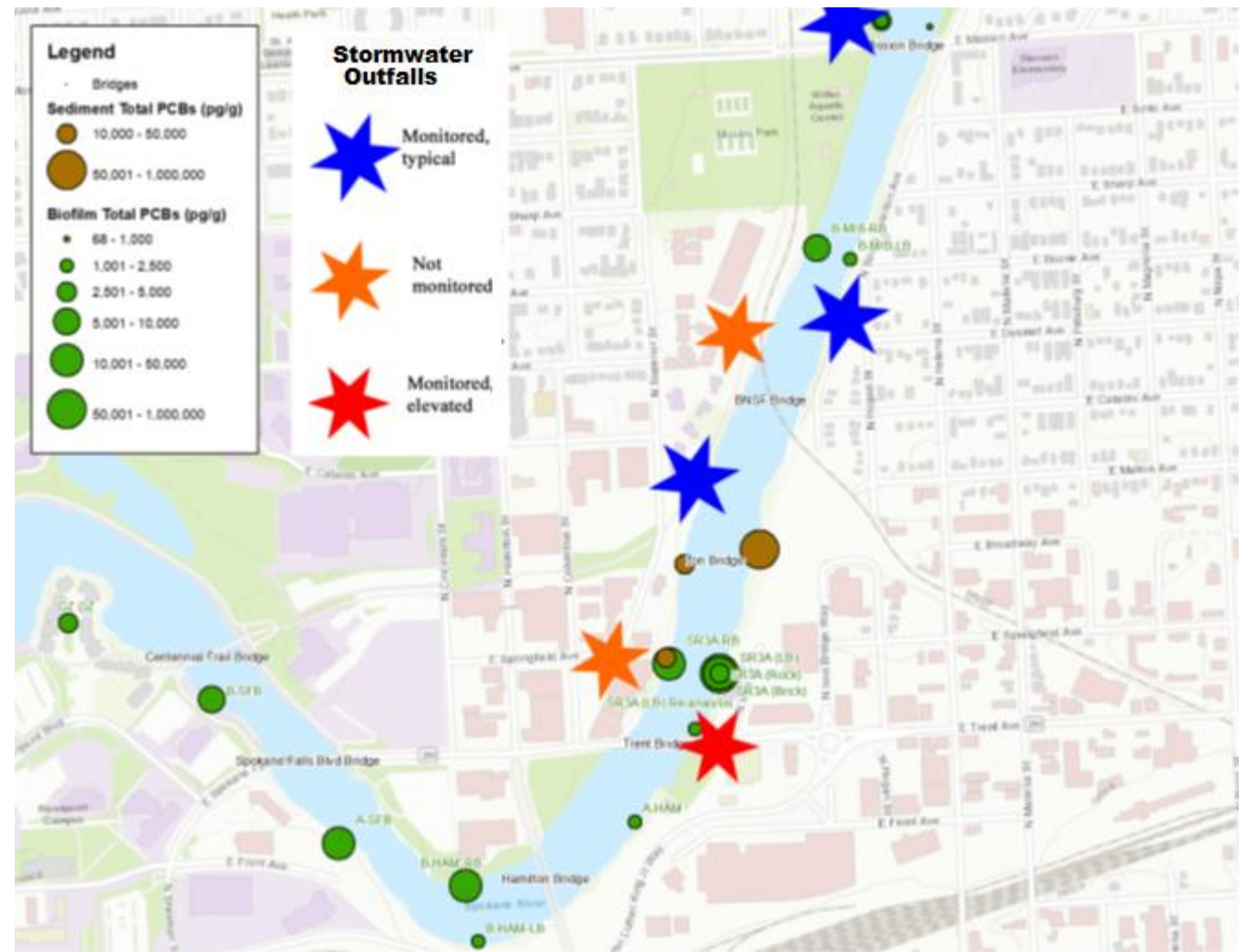
3. Pattern similarity between stormwater and biofilm contamination

- EPA conducted pattern similarity analysis between homolog distributions in Mission Reach stormwater and biofilm
 - High degree of similarity between stormwater and biofilm patterns
- Correlation does not equal causation
 - Doesn't prove that stormwater is causing biofilm contamination
 - Does indicate that the source of the contamination between the two could be similar



Evidence against Landside Surface Contamination

- Outfalls with the highest PCB concentrations are located downstream of the biofilm and sediment hot spots
 - Sources located upstream of biofilm and sediment hot spots have typical concentrations
 - Some basins have not been monitored
- Biofilm samples were collected during dry weather conditions



Landside Surface Contamination

Conclusions and Key Data Gaps

- Conclusions
 - PCB contamination exists in the Mission Reach watershed
 - Highest known stormwater PCB concentrations enter the river downstream of the biofilm and sediment hot spots
- Key data gaps
 - What are the stormwater PCB concentrations in the unmonitored outfalls?
 - What is the PCB concentration associated with the areas identified by Jasper?
 - To what extent does stormwater influence biofilm and sediment PCBs?
- Potential studies to fill gaps
 - Stormwater monitoring of Springfield outfall
 - Landside contamination monitoring at Jasper-identified hot spots
 - More detailed review of historical land use

Landside Subsurface Contamination

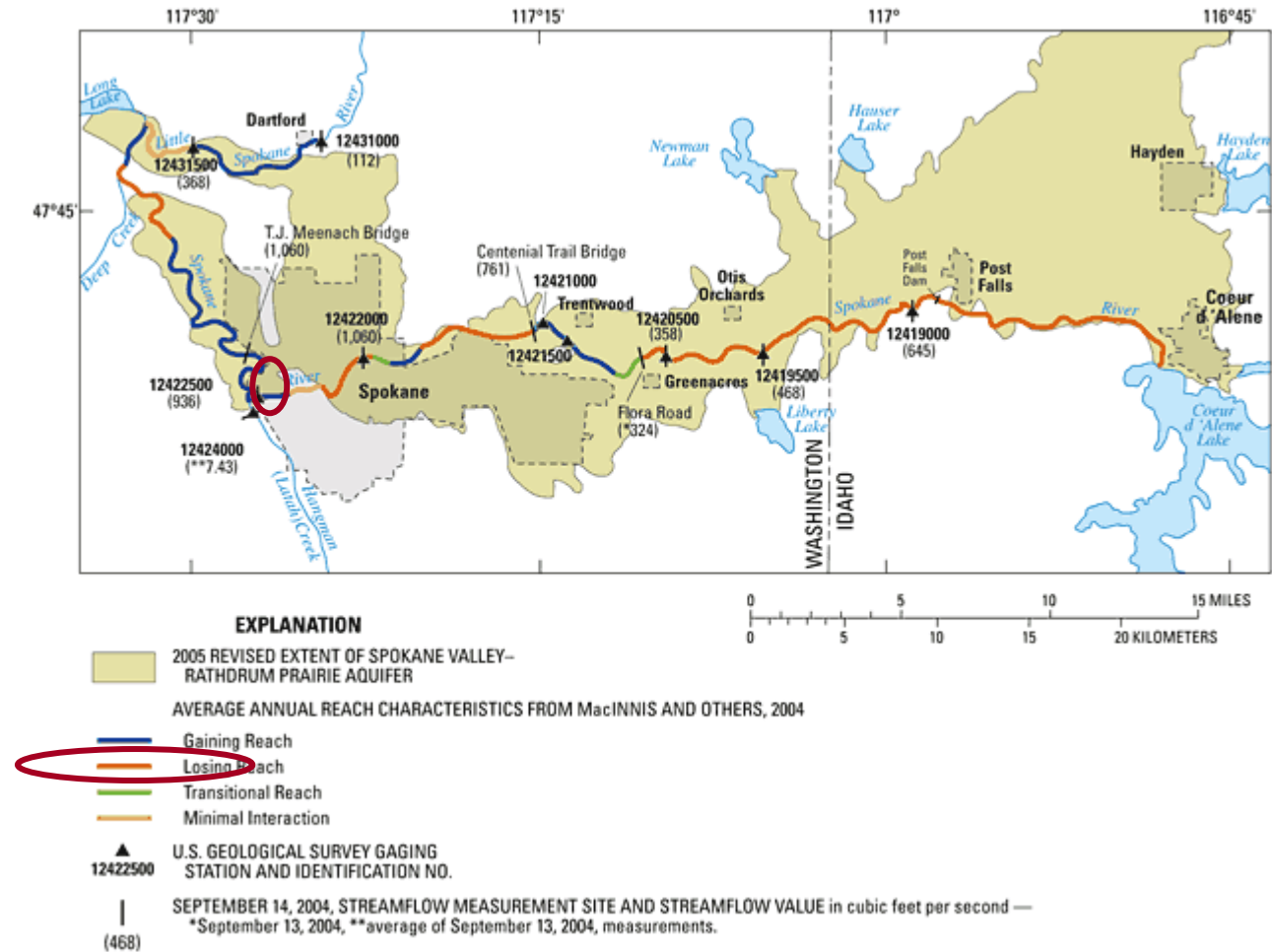
Why might this source be important?

- The Spokane River actively interacts with the groundwater aquifer
- Groundwater PCB contamination exists elsewhere in the Spokane River watershed
 - Groundwater PCB concentrations at contaminated sites have exceeded 1 ug/l

Landside Subsurface Contamination

What data do we have and what does it show?

- USGS determined that net water movement in the Mission Reach is from the river to the aquifer
 - This would indicate that no pathway exists for subsurface contamination to enter the Mission Reach
 - “additional information still is needed for increased understanding of the hydrologic system”



Landside Subsurface Contamination

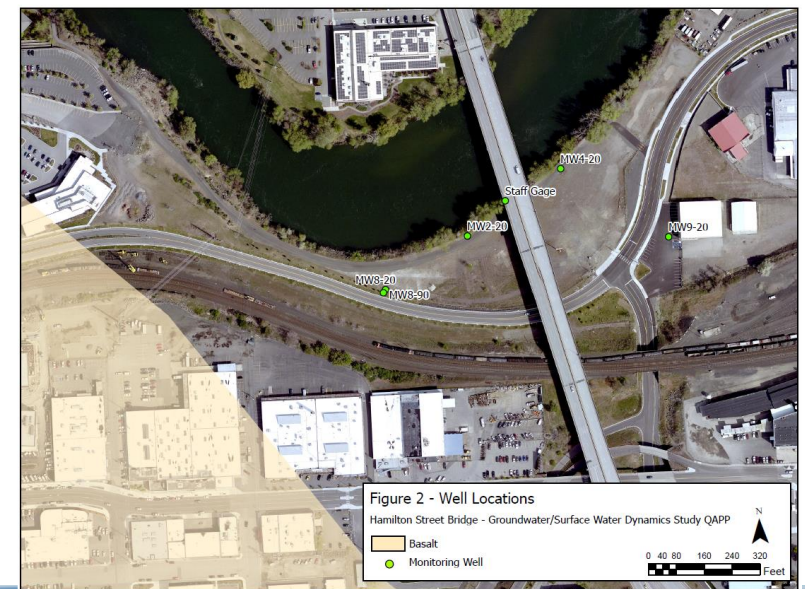
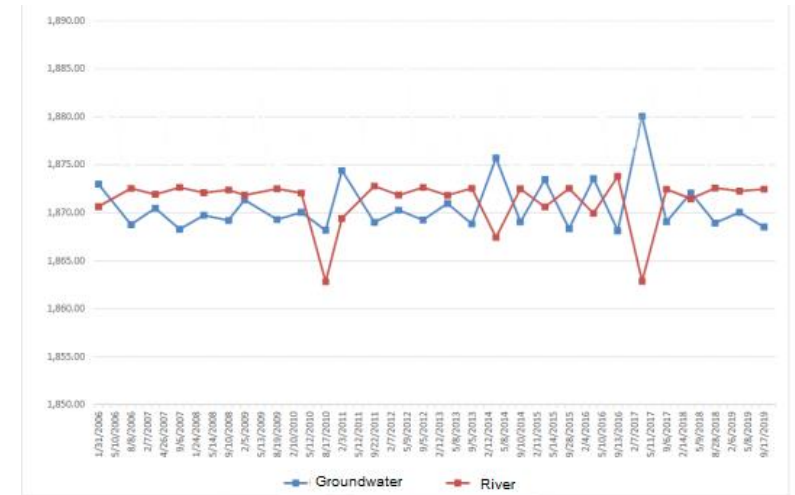
What data do we have and what does it show?

- Other evidence exists that water can move from the aquifer to the river in the Mission Reach
 - River stage and groundwater elevation monitoring data from the Hamilton Street Bridge Ecology Cleanup Site
 - Presence of artesian well
- Piezometer feasibility assessment

Landside Subsurface Contamination

What data do we have and what does it show?

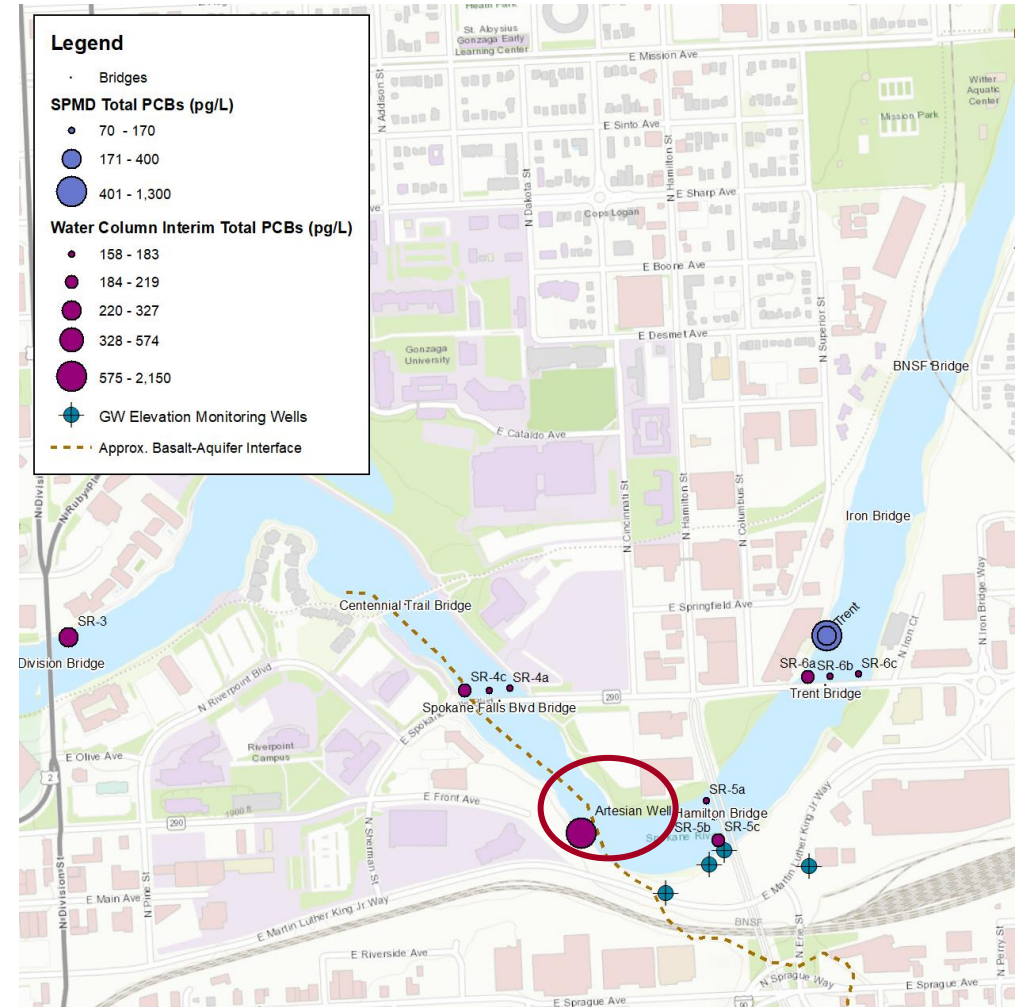
- Semi-annual river stage and groundwater elevation data from Hamilton Street show periods of time where groundwater elevation is higher than river stage
 - Indicates that the potential exists for groundwater to flow into river
- SRRTTF/Spokane County have initiated a study to continuously monitor groundwater elevation at multiple locations and surface water level at Hamilton Bridge



Landside Subsurface Contamination

What data do we have and what does it show?

- Ecology temperature float of the river in 2020 identified the presence of flowing well in Mission Reach
 - Located near Basalt-Aquifer interface
- 2021 water quality sampling showed elevated PCB concentrations in well
 - PCB concentration ~2000 pg/l measured during 2021 monitoring
 - >10x higher than typical river PCB concentration



Landside Subsurface Contamination

Piezometer feasibility assessment

- The feasibility of using temporary drive point piezometers to measure groundwater quality directly adjacent to the Mission Reach was tested in summer of 2021
 - Piezometers successfully deployed at two of three sites to measure temperature and conductivity
 - Could theoretically be deployed to measure groundwater PCB concentrations



Landside Subsurface Contamination

Conclusions

- Water movement is generally, but not always, from the river to the aquifer
 - Study is underway to provide more information on direction of flow
- Historical land use activities are conducive to groundwater contamination
- Artesian well sample from 2021 suggests groundwater contamination exists

Landside Subsurface Contamination

Key Data Gaps and How to Address Them

- Key data gaps
 - When and where does groundwater flow into Mission Reach?
 - What is the PCB concentration associated with that inflow?
 - What source(s) is contributing to elevated PCB concentration?
- Potential studies to fill gaps
 - Follow-up monitoring of artesian well PCB concentration
 - Further our understanding of groundwater hydrology
 - Use calculated flows to conduct groundwater load calculation
 - Groundwater quality sampling via piezometers
 - Contingent upon knowledge of locations and times that groundwater flows into Mission Reach
 - Others?

Legacy Contamination from Upstream Sources

Why might this source be important?

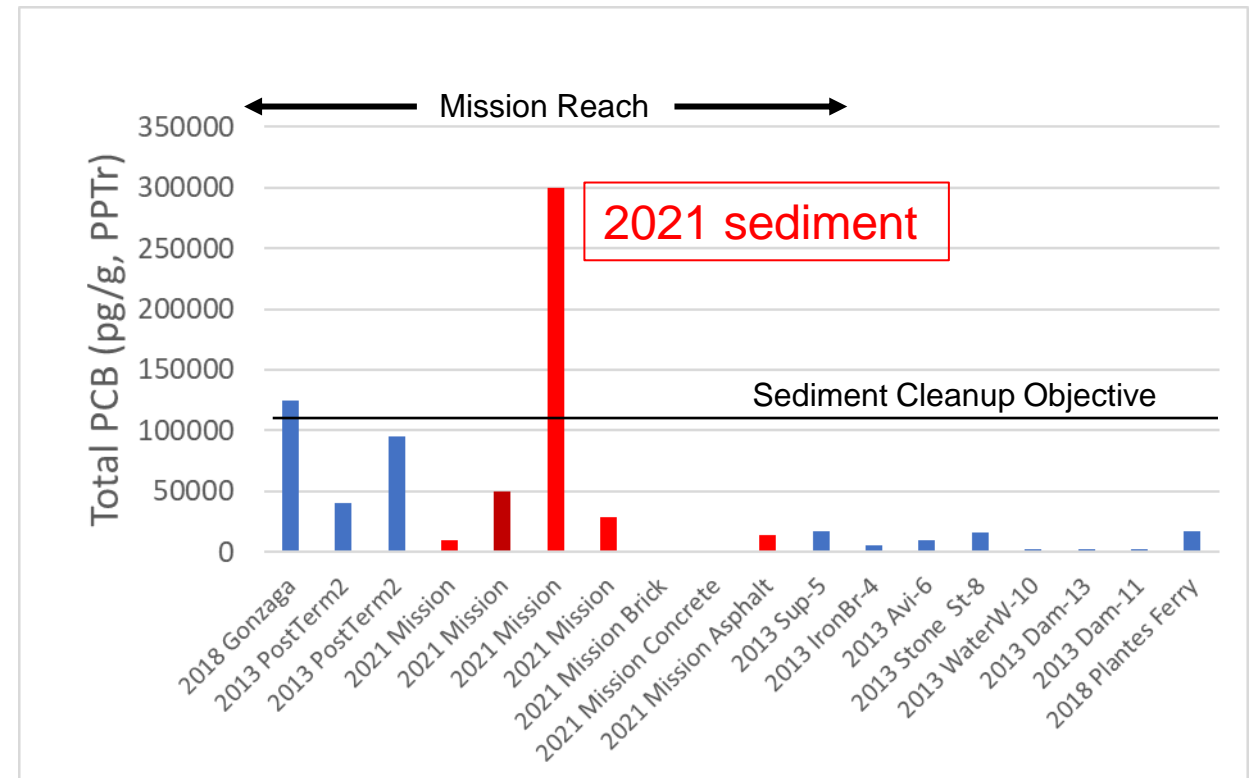
- Historically high levels of PCBs in the Spokane River could still reside in bedded sediments of Mission Reach
- Legacy sediment contamination was identified as an issue (and remediated) at sites upstream of Mission Reach
 - Surficial sediment PCB concentrations of up to 5,000,000 PPTr at Upriver Dam and Donkey Island



Legacy Contamination from Upstream Sources

What data do we have and what does it show?

- Available sediment data show high variability, with some very high PCB concentrations
 - 2021 sediment sampling shows one highly elevated concentration
 - Two of six sites have PCB concentrations exceeding the sediment cleanup objective



Legacy Contamination from Upstream Sources

Conclusions and Key Data Gaps

- Conclusions
 - Sediment PCB concentrations are elevated at certain sites in the Mission Reach
- Key data gaps
 - What is the spatial extent of the elevated sediment concentrations?
 - Are the elevated concentrations caused by legacy contamination from upstream sources or from a localized source within Mission Reach?
 - What is the environmental significance of these concentrations?
- Potential studies to fill gaps
 - Mapping of the areal extent of depositional areas
 - Sediment PCB monitoring with higher spatial resolution
 - Others?

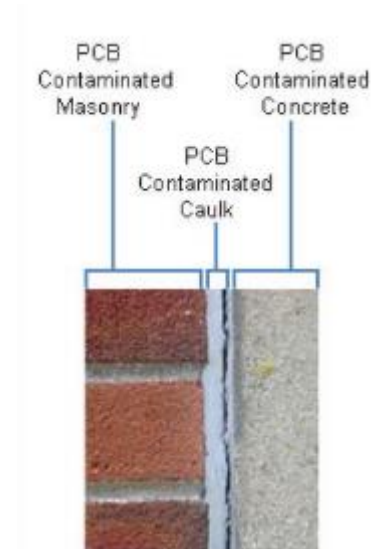
Contaminated River Fill

Why might this source be important?

- Spokane River bottom in Mission Reach has large amounts of brick and concrete



- Building materials have historically been contaminated by PCB-containing caulks and sealants

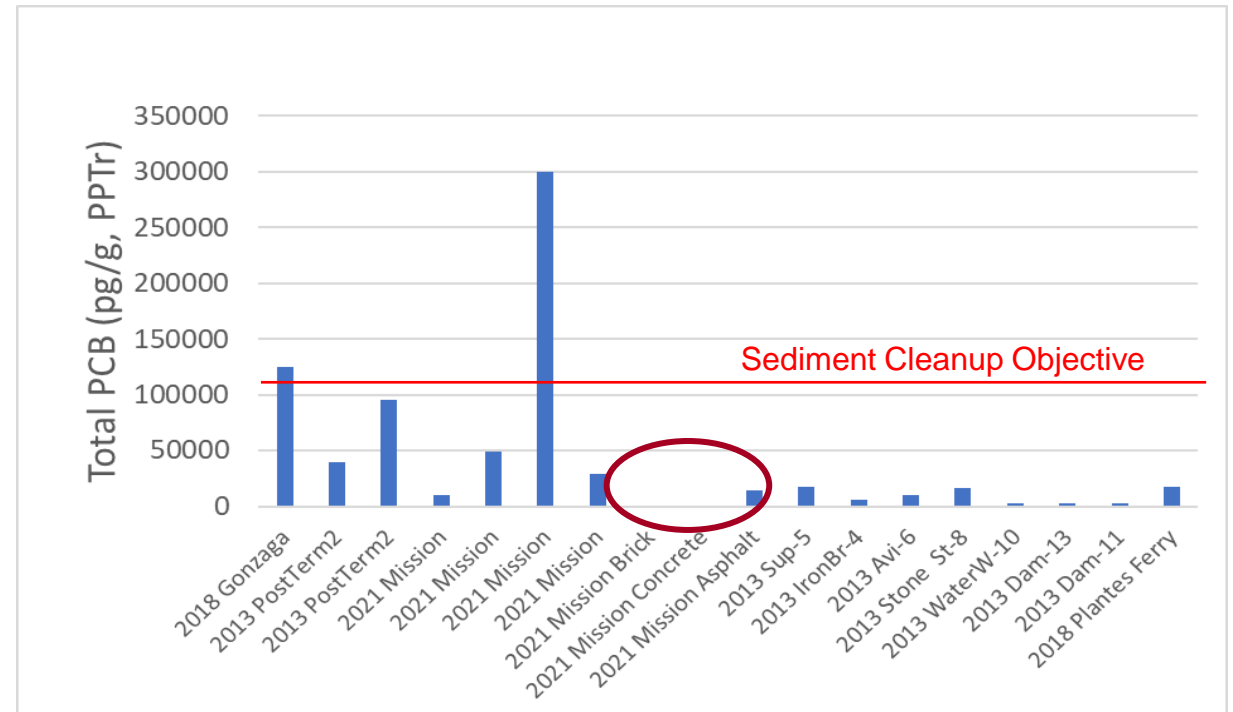


Contaminated River Fill

What data do we have and what does it show?

- Targeted sampling of brick, concrete and asphalt in Mission Reach

- PCB-concentrations in artificial fill are at or below ambient levels



Contaminated River Fill

Conclusions and Key Data Gaps

- Conclusions
 - Available data shows negligible amounts of PCBs in artificial fill material
- Key data gaps
 - Existing sampling was not comprehensive in terms of number of locations
- Potential studies to fill gaps
 - Additional monitoring with greater spatial coverage of artificial fill PCB concentrations
 - Others?

Buried PCB-Containing Objects

Why might this source be important?

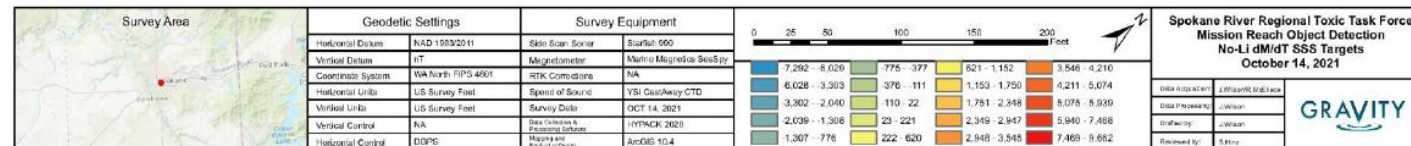
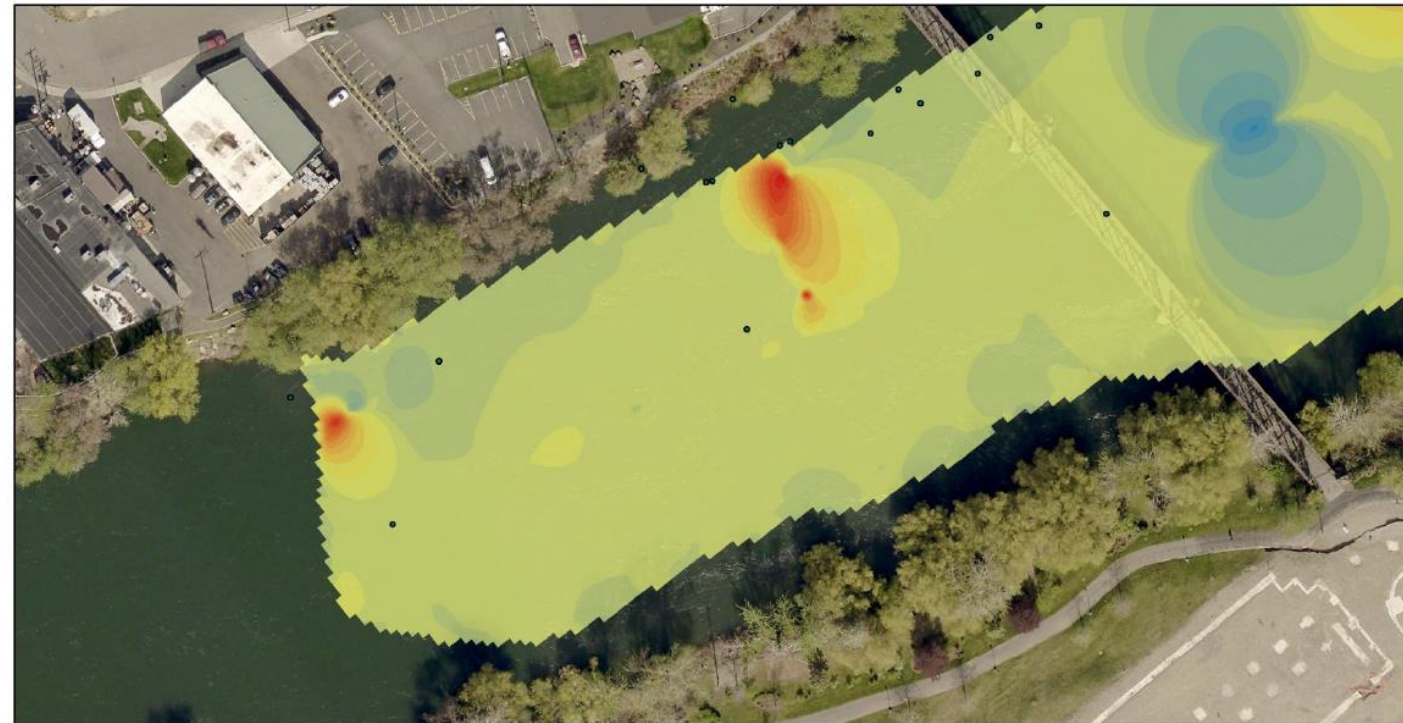
- Objects containing high concentrations of PCBs (e.g., drums, transformers) could be buried in the riverbed
 - Prior evidence of a buried drum near Spokane Falls Blvd.
- The patchy nature of observed sediment and biofilm contamination is consistent with a very localized source such as a buried object



Buried PCB-Containing Objects

What data do we have and what does it show?

- 2021 object detection survey conducted by Gravity shows presence of magnetic anomalies in the riverbed
 - Indicative of buried metallic objects



Buried PCB-Containing Objects

Conclusions and Key Data Gaps

- Conclusions
 - Magnetic anomalies indicative of buried metallic objects have been identified in the Mission Reach
- Key data gaps
 - What do these anomalies represent?
- Potential studies to fill gaps
 - Follow-up via video or diver survey to positively identify objects
 - Others?