

Characterization of PCBs in the Spokane County Regional Water Reclamation Facility

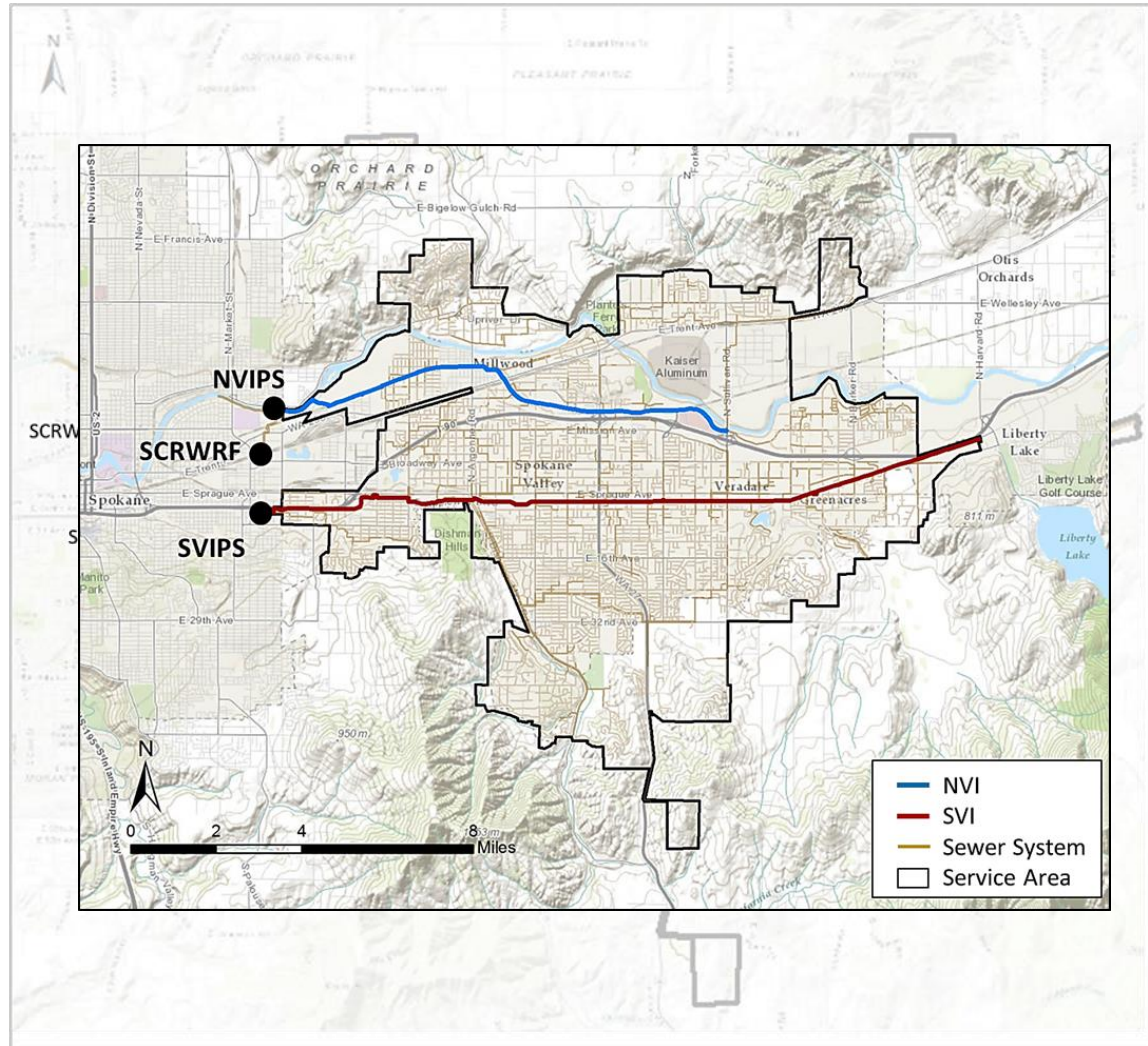
Discussion of 2019 Annual Report Findings

Inadvertently Produced PCBs Workshop

8 October 2019

Spokane County Regional Water Reclamation Facility (SCRWRF)

- Class IV Facility
- Capacity of 8 MGD
- North Valley Interceptor (NVI)
 - 13,000 acres
 - 2.2 MGD
- Spokane Valley Interceptor (SVI)
 - 24,000 acres
 - 5.7 MGD



What we
know
regarding
PCB
sources

PCBs appear to be
caused by many small
distributed sources

Aroclors and Aroclor
mixtures appear to be a
main source of PCBs

PCB-11 appears to be a
main PCB source not
associated with Aroclors

What did
we learn?

PCB sources have not
changed over time

Sources differ among
land uses

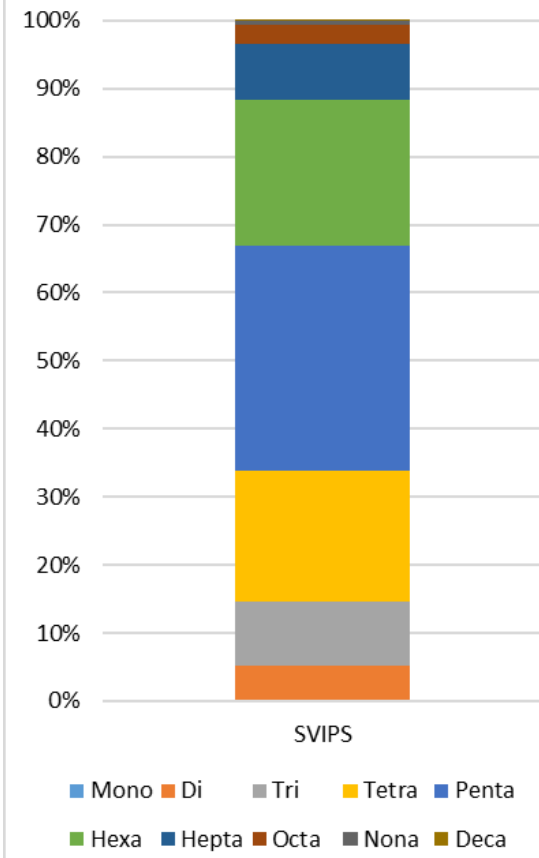
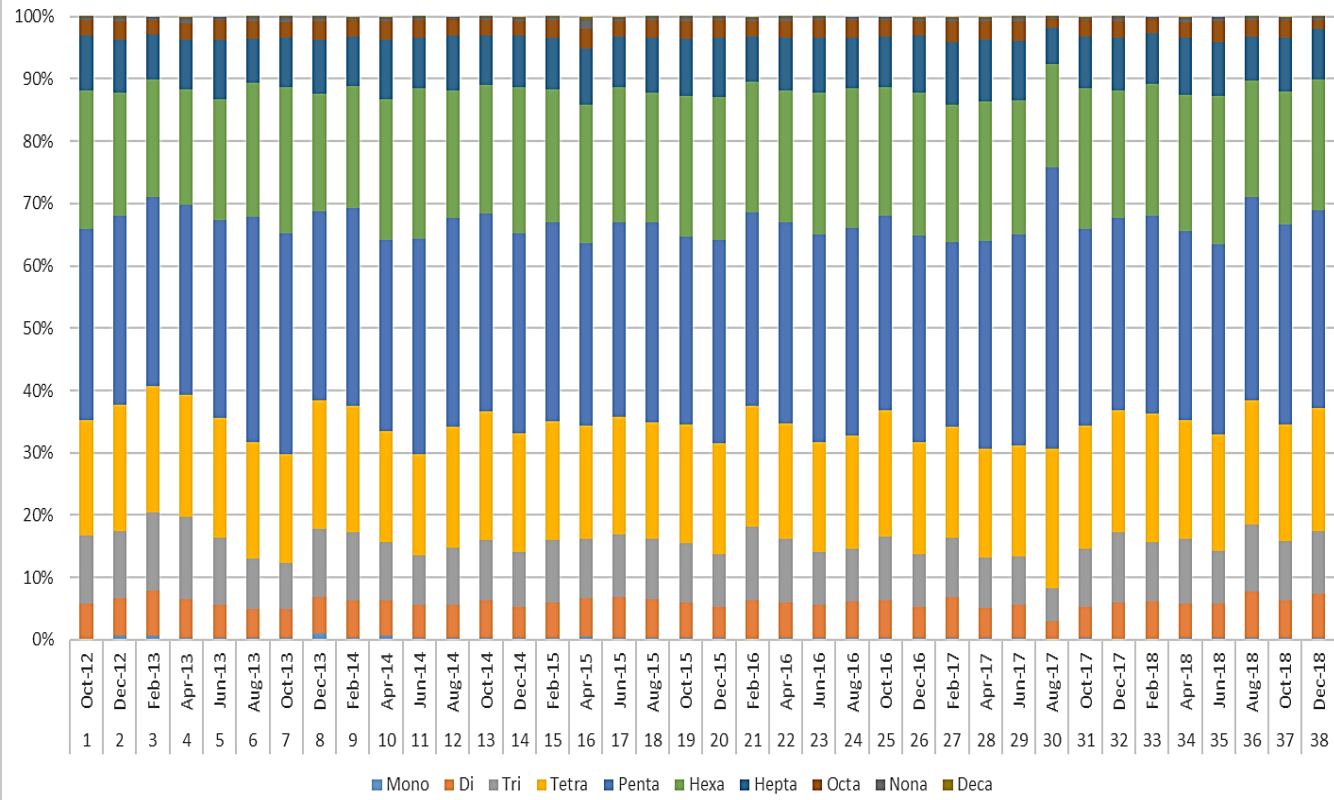
PCB-11 appears to be
decreasing in the influent

Effluent is difficult to
assess

Sources of PCBs have not
changed over time

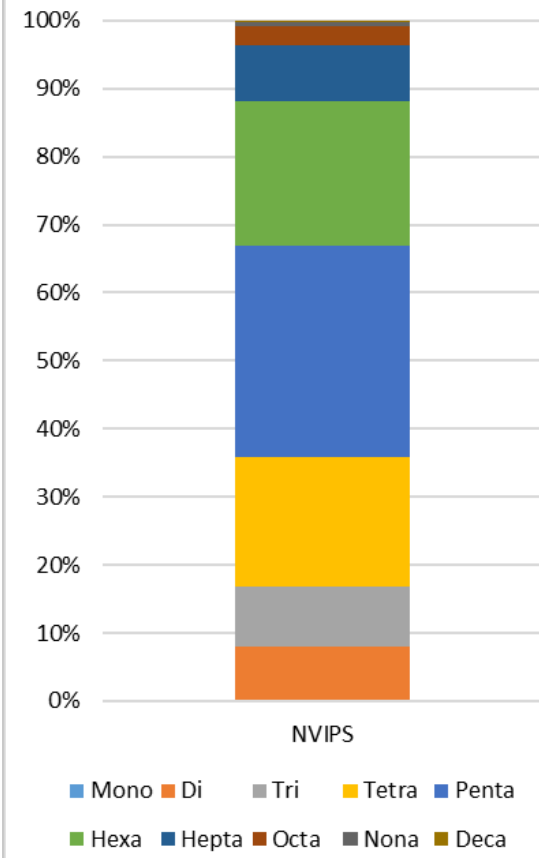
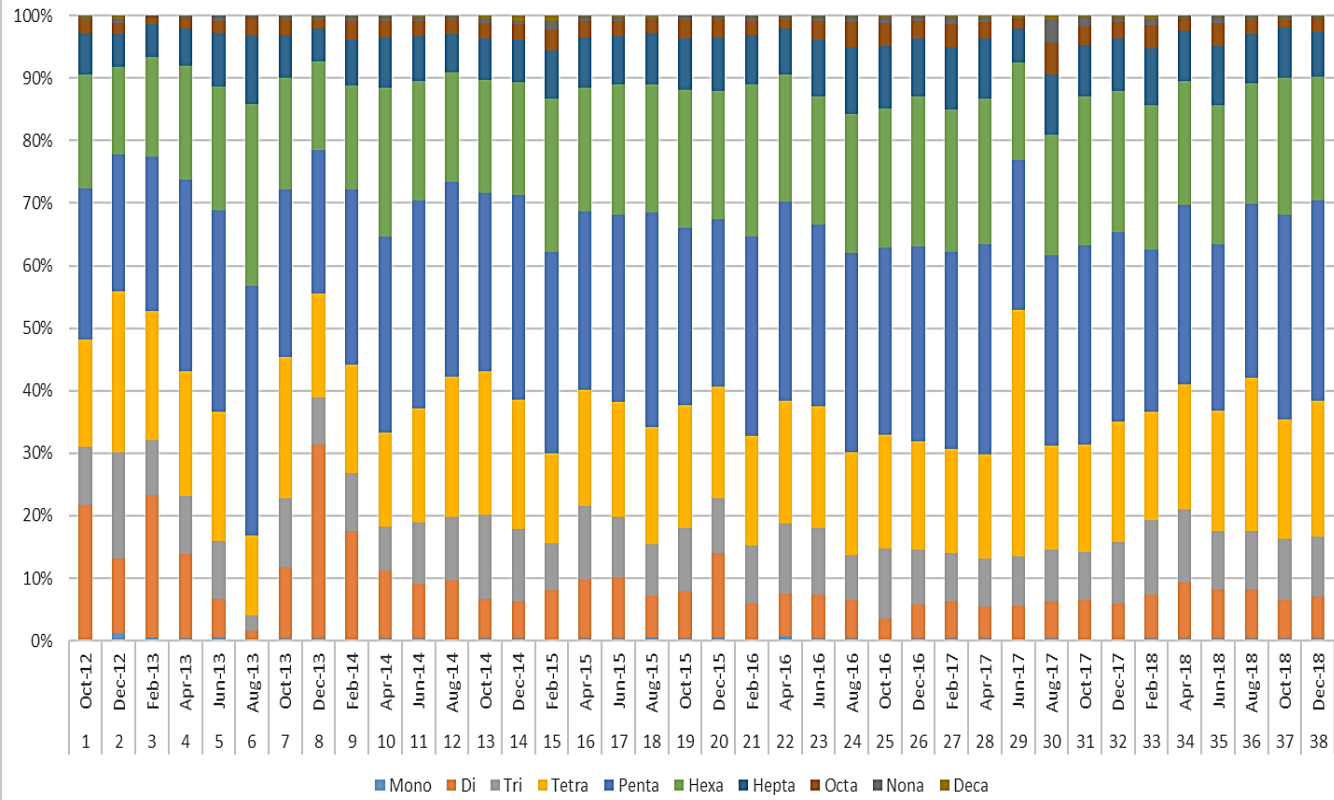
SVI Homolog Time Series and Average Homolog Composition

SVIPS



NVI Homolog Time Series and Average Homolog Composition

NVIPS



Positive Matrix Factorization (PMF)

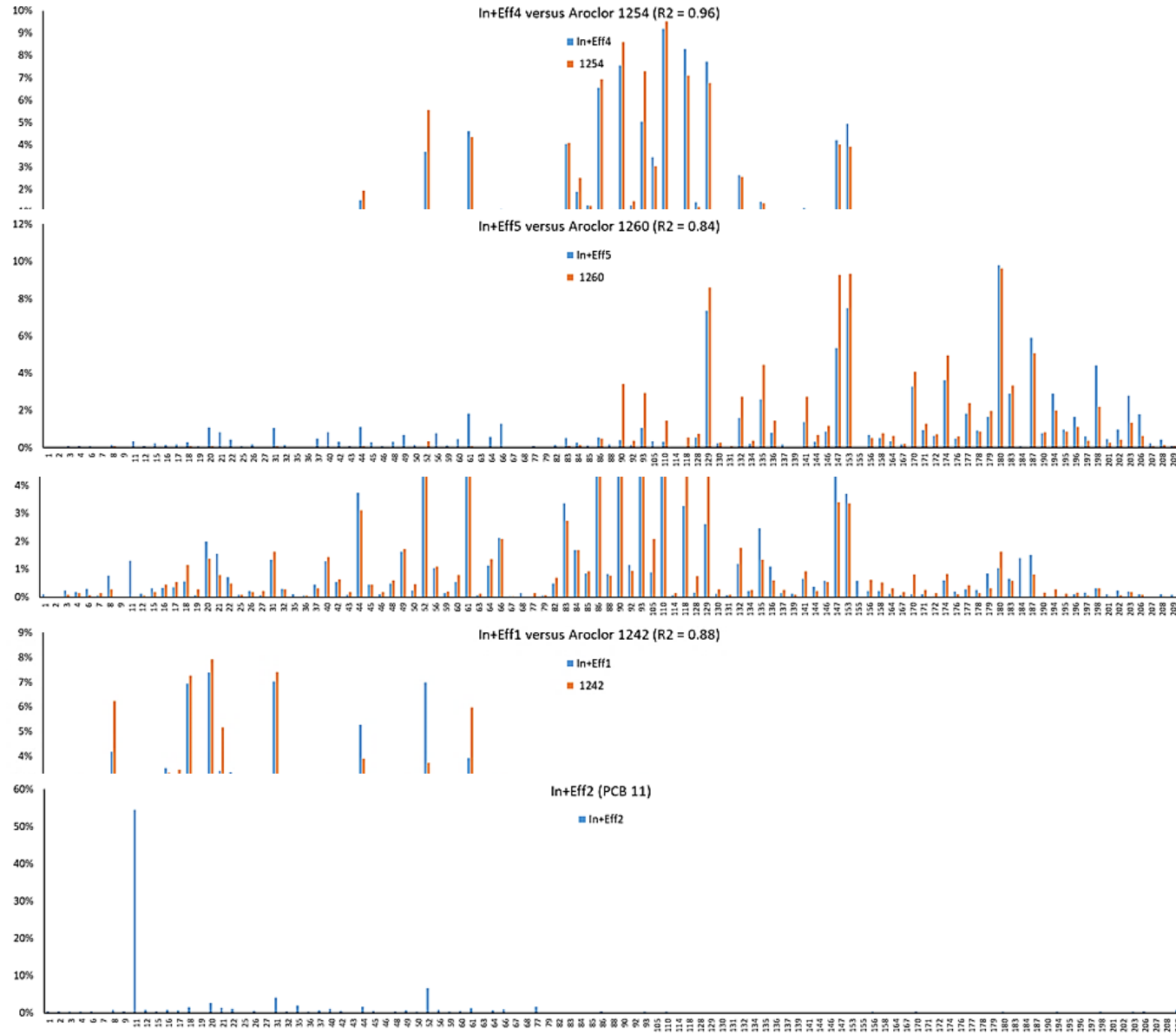
Aroclor 1254

Aroclor 1260

Aroclor 1248/
mixed Aroclors

Aroclor 1242/
dissolved phase

PCB-11



Inadvertent PCB Sources

Congeners associated with inadvertent PCBs tend to display poor model fit ($R^2 < 0.75$) in the PMF analysis

Sources may be different than identified, but then sources are unknown and likely from multiple sources

Examples:

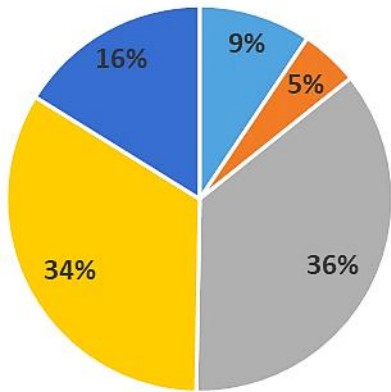
- PCBs 44 and 45 – partial dechlorination
- PCBs 44, 45 and 68 – silicone
- PCBs 206, 208 and 209 – titanium dioxide
- PCBs 206, 207, 208, and 209 – blue/green dyes

No evidence of other significant non-Aroclor sources outside of PCB-11

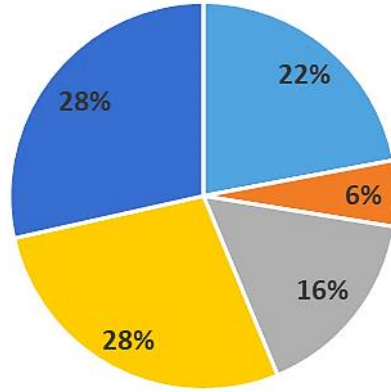
Sources differ among
Land Uses

2019 PMF Analysis by Land Use

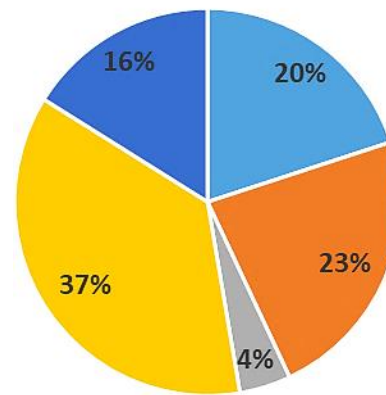
Residential



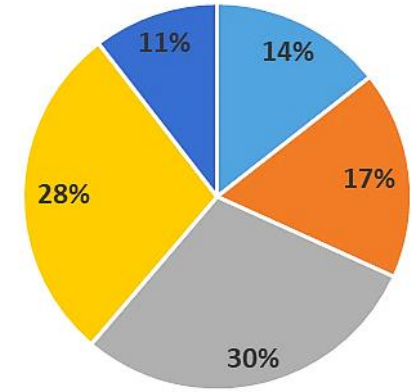
Commercial



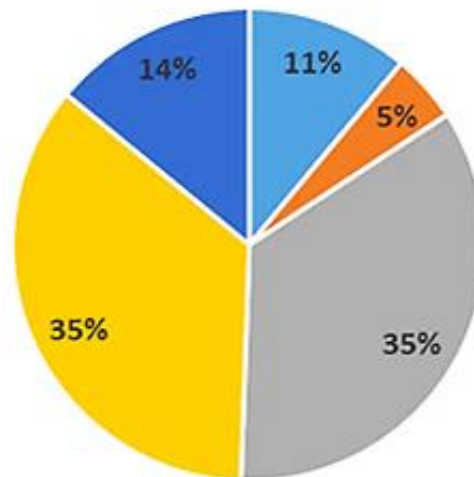
Industrial



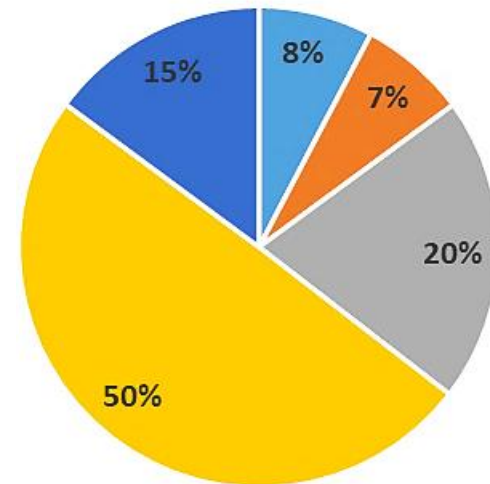
Mixed



SVIPS



NVIPS



- (Aroclor 1260)
- (Aroclor 1254)
- (mix of Aroclors)
- (PCB 11)
- (Dissolved)

PCB-11 appears to be
decreasing in the influent

Annual Average Total Influent PCB-11

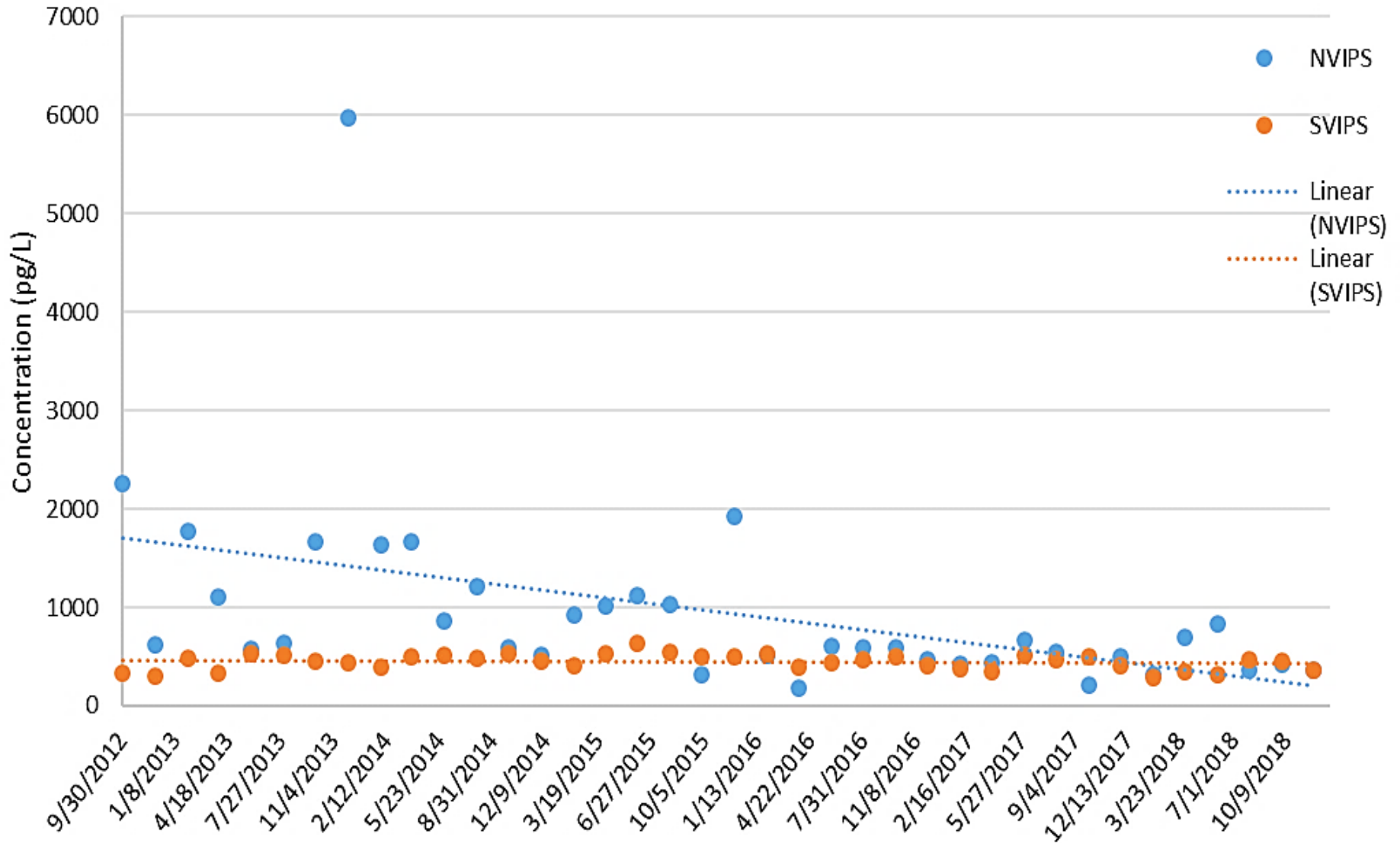


ANOVA

Significant temporal effect

[F(5, 30) = 2.769, p = 0.036]

Influent PCB-11 Time Series

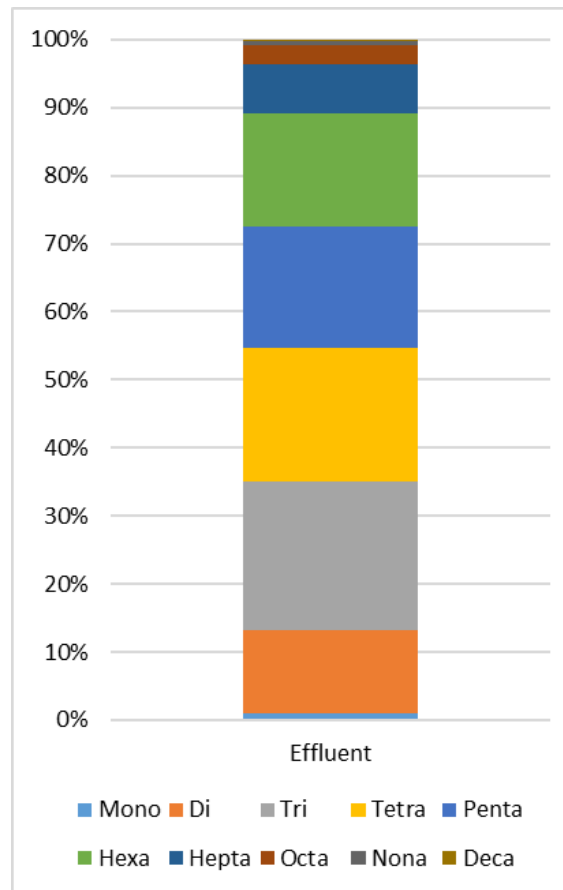


What does this mean for
the effluent?

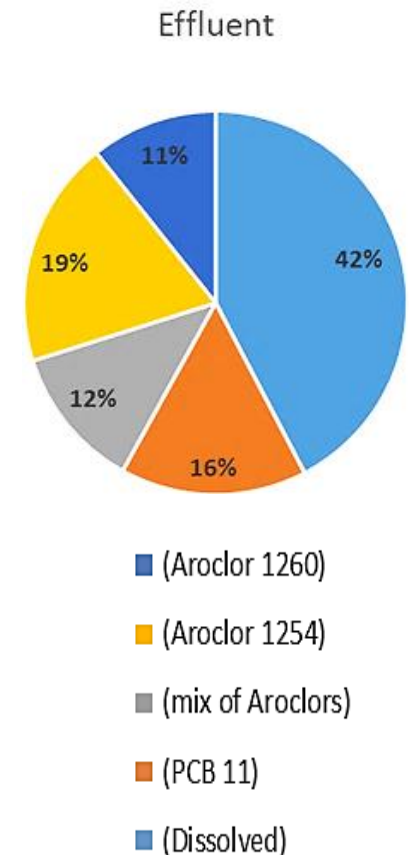
Effluent Average Homolog and 2019 Factor Composition

Effluent is primarily dissolved phase and low molecular weight PCBs.

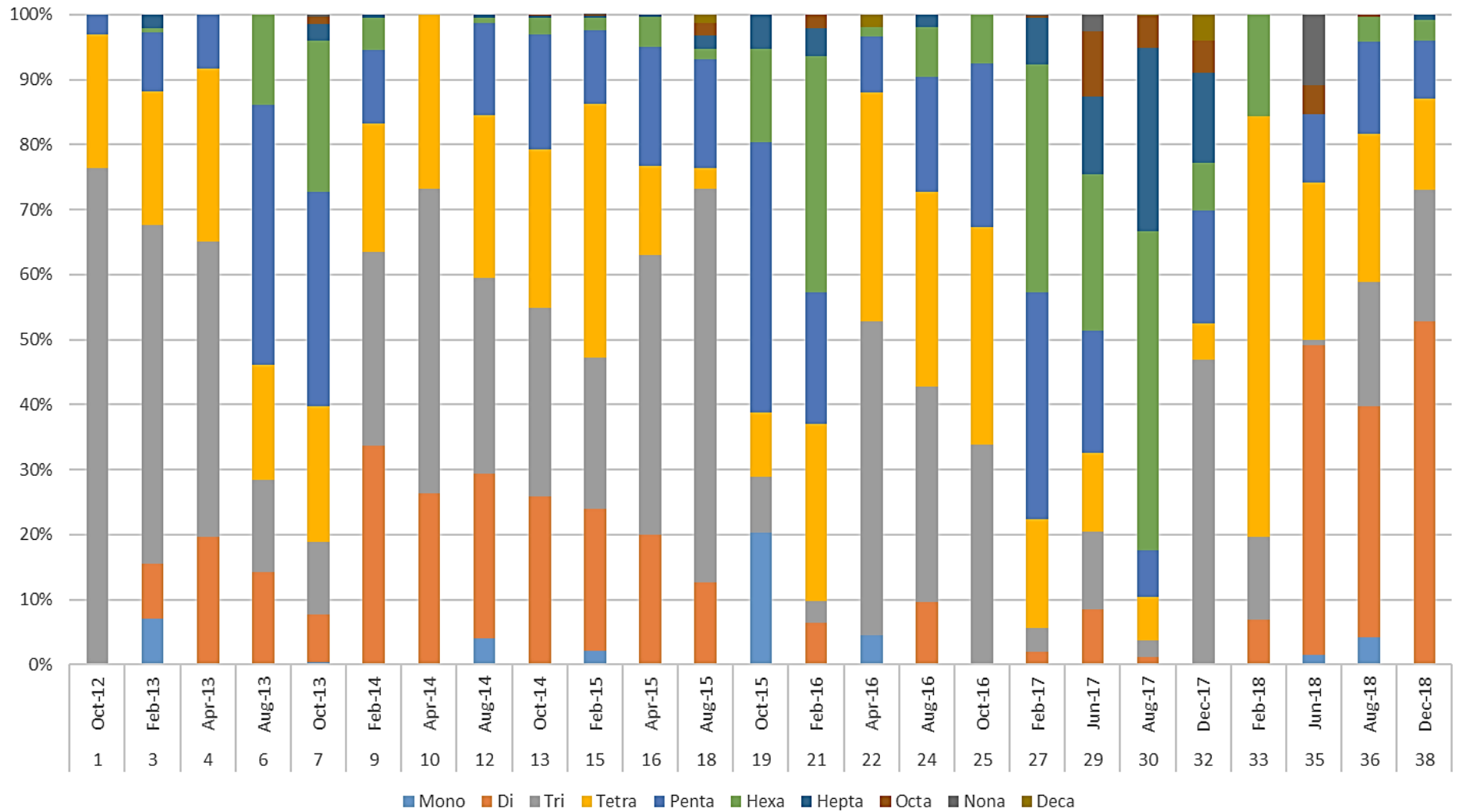
Average Homolog Composition



2019 PMF Analysis



Effluent Homolog Time Series



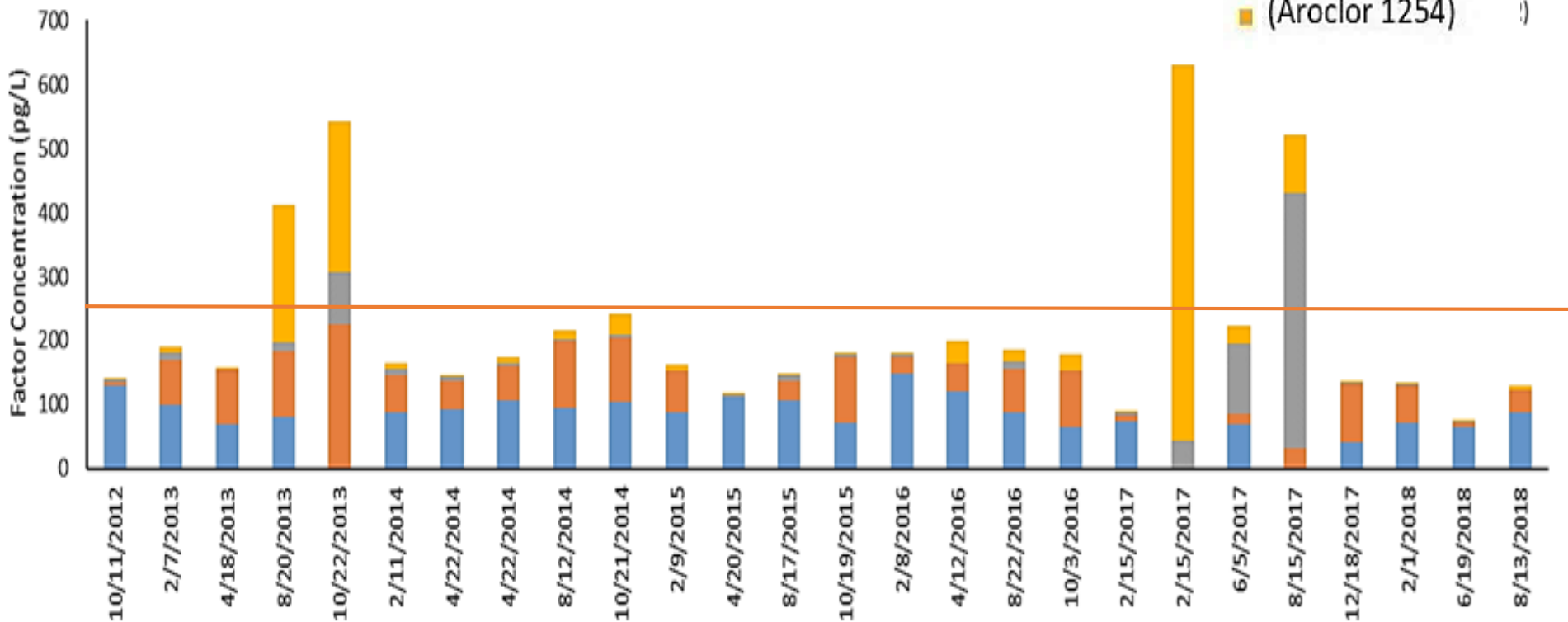
Effluent-only PMF Analysis

(Dissolved phase)

(Aroclor 1248)

(Aroclor 1260)

(Aroclor 1254)

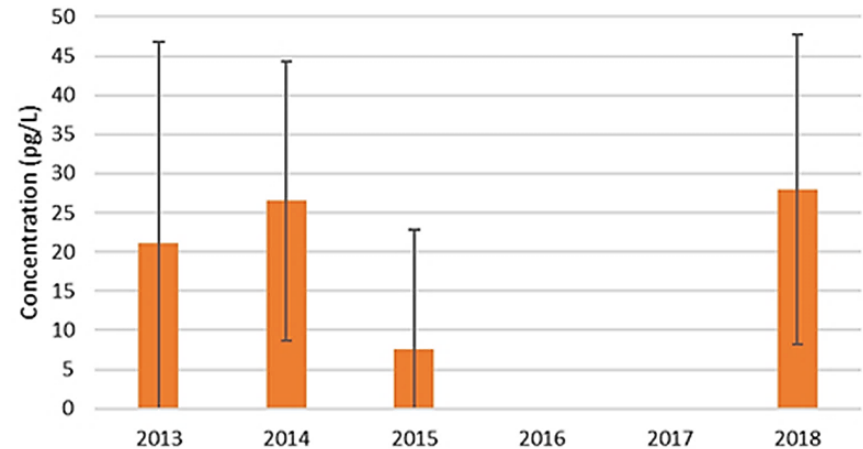


PCB-11 in the Effluent

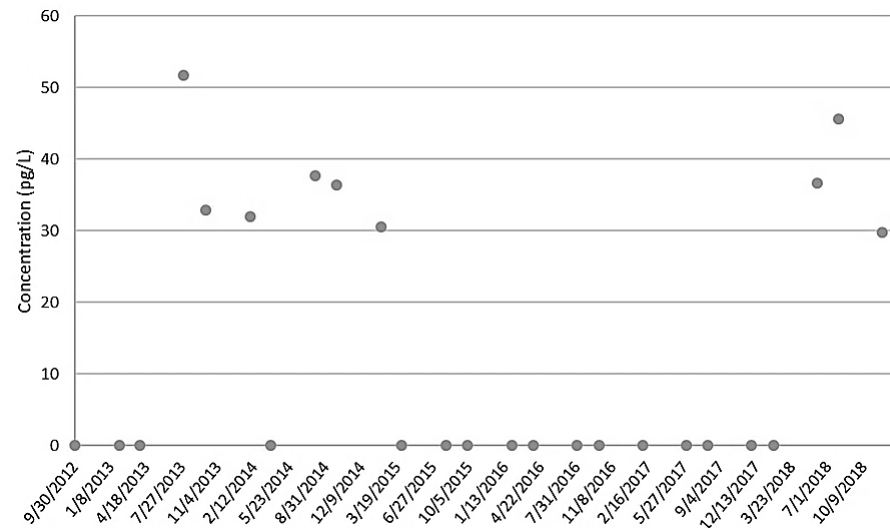
Effluent PCB-11 shows no apparent pattern -- greatly affected by blank correction.

PCB-11 removal efficiency ~98.9%

Annual Average PCB-11



Total PCB-11 Time Series



High PCB Removal Efficiency

Statistics

Number of sample pairs	25
Mean	99.65
Standard deviation	0.26
Minimum	98.74
Maximum	99.92



Questions?

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