Spatial and Temporal Differences and Congener Content in Bulk Air Deposition of PCBs in the Green/Duwamish River Basin

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Study Objectives

- compare bulk atmospheric deposition rates of PCBs in areas of different land use within the Green/Duwamish River Basin

- to provide information to assist in understanding atmospheric sources to the Lower Duwamish Waterway
**Study Design**

<table>
<thead>
<tr>
<th>Site</th>
<th>Land use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duwamish</td>
<td>Industrial &amp; urban</td>
</tr>
<tr>
<td>South Park</td>
<td>Suburban, industrial, residential</td>
</tr>
<tr>
<td>Georgetown (2013 only)</td>
<td>Industrial, urban residential</td>
</tr>
<tr>
<td>Beacon Hill</td>
<td>Regional urban</td>
</tr>
<tr>
<td>Kent downtown</td>
<td>Suburban &amp; commercial (with rail)</td>
</tr>
<tr>
<td>Kent Senior Center</td>
<td>Suburban &amp; commercial (without rail)</td>
</tr>
<tr>
<td>Enumclaw</td>
<td>Rural</td>
</tr>
</tbody>
</table>

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**Study Sampling Locations**

- Air Deposition Stations
- Waterbody
- Stream

King County

Department of Natural Resources and Parks
Water and Land Resources Division

[Map showing study locations]
Study Design

- Bulk = particles (dry) and rainfall (wet)
- Passive Sampler
Study Design

- **Analytes**: metals (including Hg), PAHs, PCB congeners, dioxin/furan congeners.

- **Schedule**
  - Phase I: August 2011 thru October 2012
  - Phase II: April thru December 2013
  - Continuous sampling: metals, Hg, PAHs
  - Intermittent sampling: PCBs, Dioxin/furans over same time periods
  - Sample deployment: ~2 weeks during wet season, ~4 weeks during dry season.
Spatial Trends in Flux (all data)

Stations that do not share a letter are significantly different (p<0.05)
Temporal Trends in Flux - 2011/2012

The graph shows the temporal trends in flux across different months from August to November. The data points are color-coded to represent different locations:

- **Beacon Hill** (red stars)
- **Duwamish** (green plus signs)
- **South Park** (green circles)
- **Kent** (blue triangles)
- **Kent Sr Ctr** (black crosses)
- **Enumclaw** (purple squares)

The y-axis represents the total PCBs flux expressed in ng/m²-day.
Temporal Trends in Flux - 2013

- Duwamish
- Georgetown
- South Park

Total PCB Flux ng/m²-day

- April
- June
- August
- October
- December

2013
Aroclor Congener Patterns – Pure Product

Figures taken from “EPA Wastes - About PCBs” website
Aroclor Congener Patterns – Pure Product

Figures taken from “EPA Wastes - About PCBs” website
% of Total Flux – Congeners (All Data)

Duwamish

Georgetown

South Park
% of Total Flux – Congeners (All Data)

Kent

Kent SC

Enumclaw
Findings

- PCB fluxes at Georgetown are significantly higher than all other stations.
- PCB fluxes at South Park are significantly higher than all stations except Georgetown and Duwamish.
- Enumclaw deposition are significantly lower, except at Kent SC.
- Duwamish, Georgetown and South Park deposition have most temporal variability.
- Enumclaw congener profile distinct from all other stations – more low congeners. Georgetown and South Park profiles appear more similar than Duwamish.
Bulk Air Deposition Study

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2011/2012 Bulk Air Deposition Data Report
Google: “King County Bulk Air Data Report”