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CMP Wastewater Monitoring Program: Compounds of Emerging Concern in Canadian Municipal Wastewater

Great Lakes Bionational Toxics Strategy Integration Workshop
Chicago IL
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Water Science & Technology
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Presentation Outline

- Canada's Chemicals Management Plan
- Monitoring and Surveillance Program
- Wastewater monitoring program: rationale, objectives, structure
- Selected results

Environment Canada's Chemicals Management Plan

- www.chemicalsubstances.gc.ca

- Categorization of existing substances:
  - Persistent
  - Bioaccumulative
  - Inherently toxic to environmental organisms

- Management of risks
- Protection of environmental health and human health (through Health Canada)

CMP Monitoring and Surveillance

- Purposes of monitoring and surveillance:
  - Quantify exposure levels and generate science-based information necessary to identify risks and inform risk management
  - Understand environmental fate and behaviour of chemicals
  - Evaluate performance of control actions
- Media:
  - Surface water
  - Sediments
  - Aquatic and terrestrial biota
  - Air and precipitation
  - Municipal wastewater (including biosolids)
  - Waste (landfill leachate and biogas)

Rationale for CMP Wastewater Monitoring Program

- Wastewater effluents and residuals (solids) may be important sources of a variety of chemical substances to the environment, through consumer products

- "Legacy" contaminants: pesticides, PAHs, PCBs, metals
- "Emerging" contaminants: endocrine-disrupting compounds, flame retardants, perfluorinated compounds, personal care products, pharmaceuticals
- "Trace" contaminants: present in environmental matrices in ppb to ppt levels, or less!

CMP Wastewater Monitoring Program Objectives

- Temporal trends in influents (warm, cold)
- Fate of compounds during wastewater treatment: disappearance, partitioning to solids
- Concentrations entering environment
- Baseline data to evaluate future **control** measures

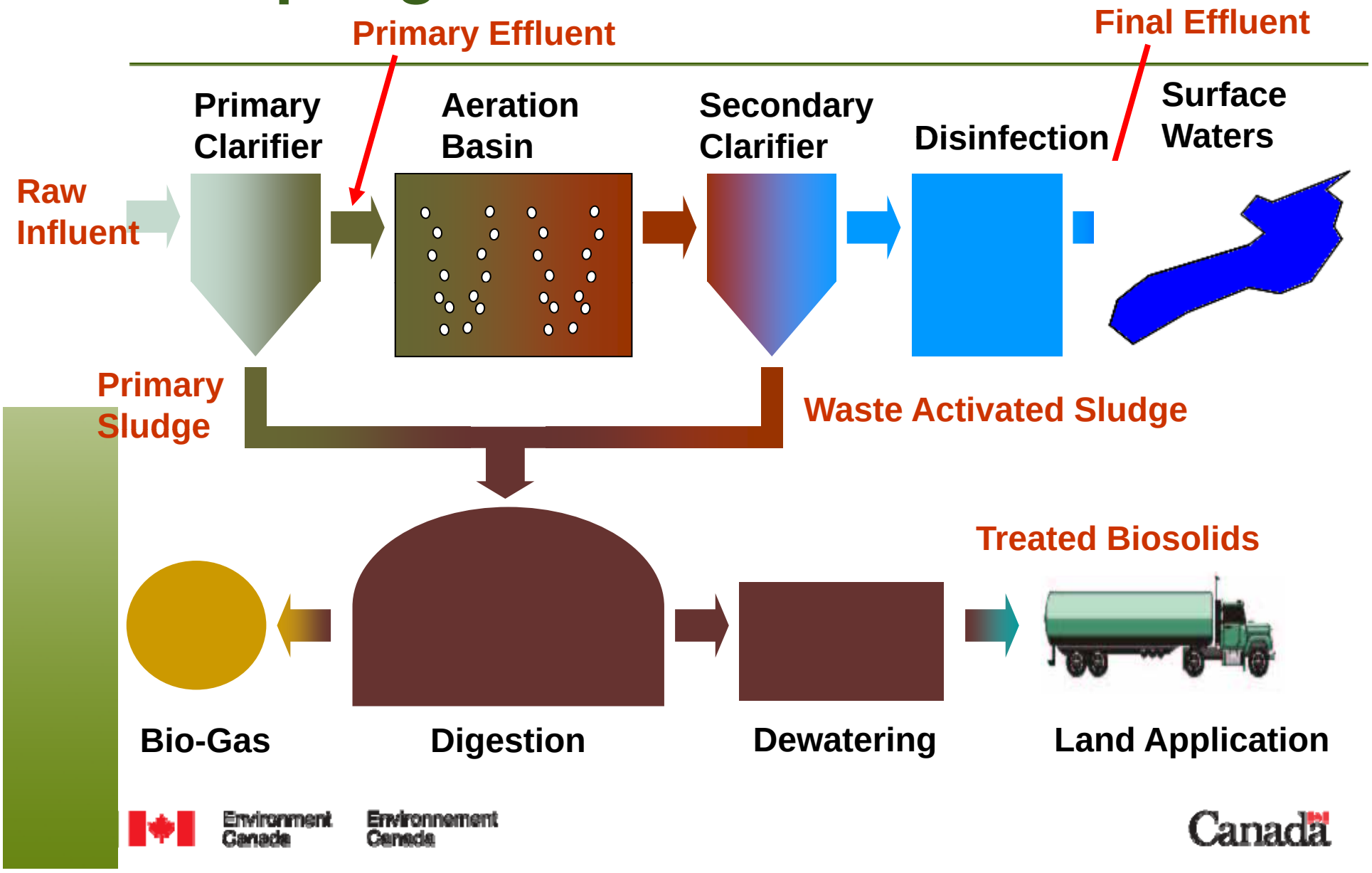
Consultation for Selection of WWTPs

- Water quality monitoring sites
- Shellfish monitoring sites
- Environment Canada Arctic wastewater working group
- Risk assessment recommendations
- Representative of typical Canadian treatment processes
- Representative of geographical variations
- Large volume discharges

WWTPs selected for Years 1 and 2

- 25 WWTPs
- At least 1 per province and territory
- Primary, secondary, advanced, and lagoon treatment
- About 15% of the Canadian population
- 6 WWTPs on the Great Lakes

Sampling Plan



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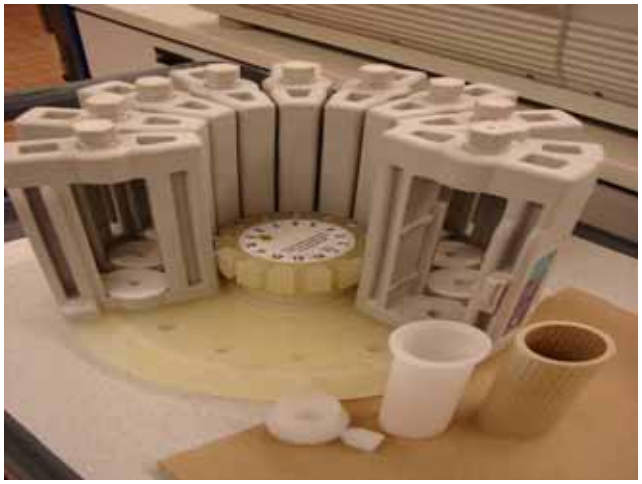
Sampling Times and Methods

- Cold temperatures (January to April)
- Warm temperatures (July to October)

- Liquid: 24-hour equal volume composite, refrigerated autosamplers
- Solids: grab

Selection of Analytes

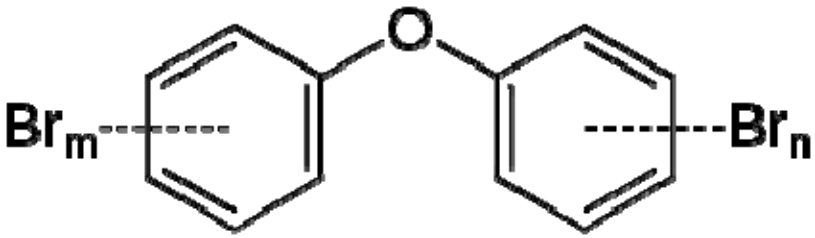
- Risk assessment and risk management priorities
- Availability of analytical methods and capacity
- Availability of $$$



CMP Wastewater Monitoring Program Analytes

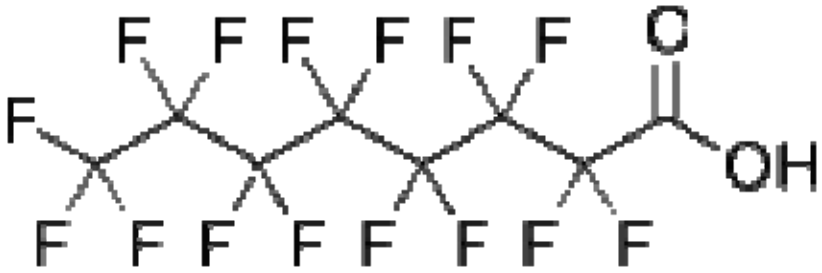
- Bisphenol A and other phenols
- Perfluorinated compounds (PFOA, PFOS etc.)
- Brominated flame retardants (PBDEs and others)
- Nonylphenols
- Volatile methyl siloxanes
- Pharmaceuticals and personal care products
- Selected metals
- Conventional wastewater parameters

Preliminary Results: PBDEs and PFOA



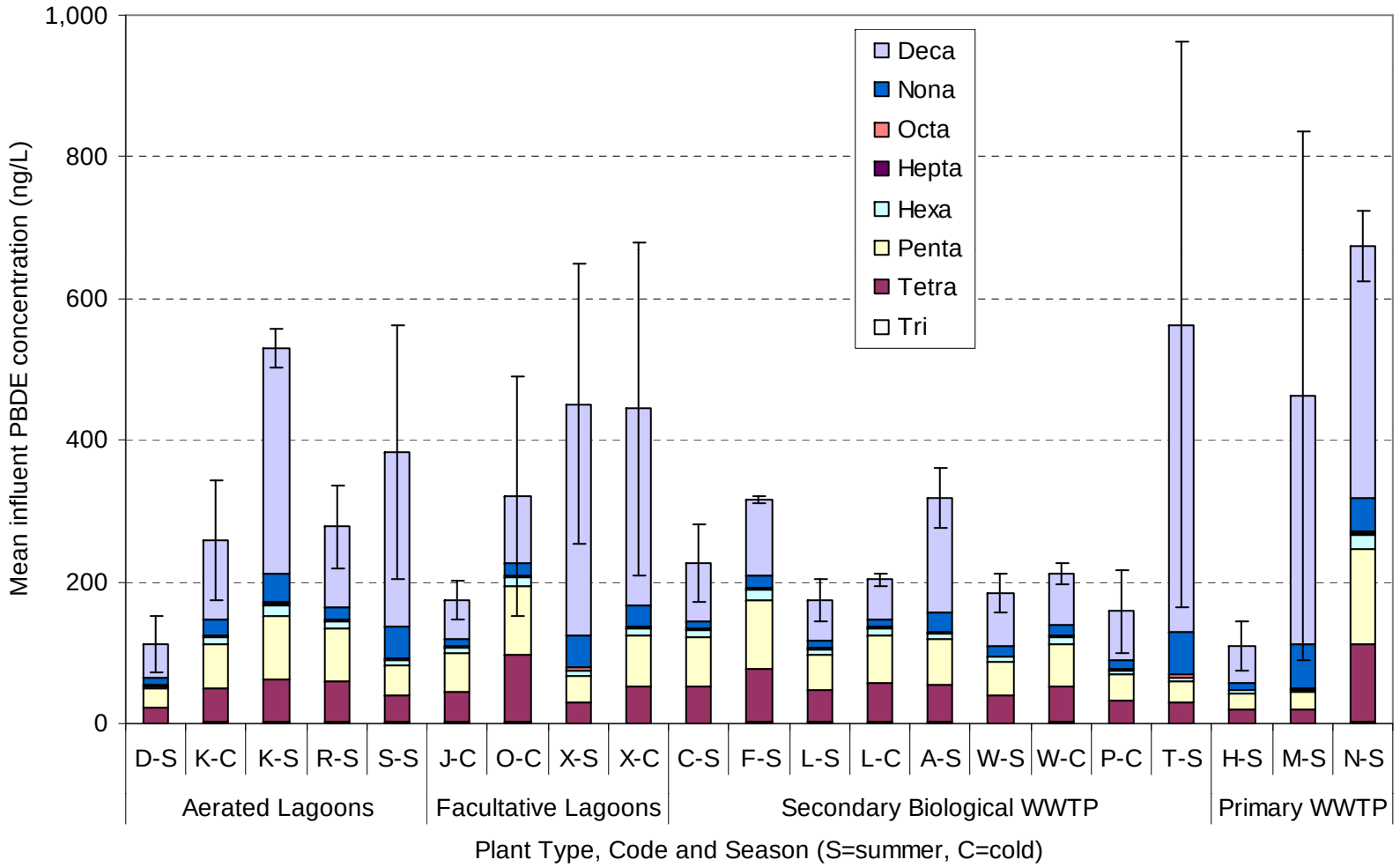
Polybrominated diphenyl ethers: flame retardants in plastics – furniture, TV cabinets, stereos, computers, carpets, curtains, textiles, adhesives, sealants and coatings

Perfluoro-octanoic acid (PFOA): water and oil repellant in fabrics (e.g. carpets and outdoor clothing), fire-fighting foam



References: www.chemicalsubstances.gc.ca and www.wikipedia.org

Influent Concentrations of PBDEs



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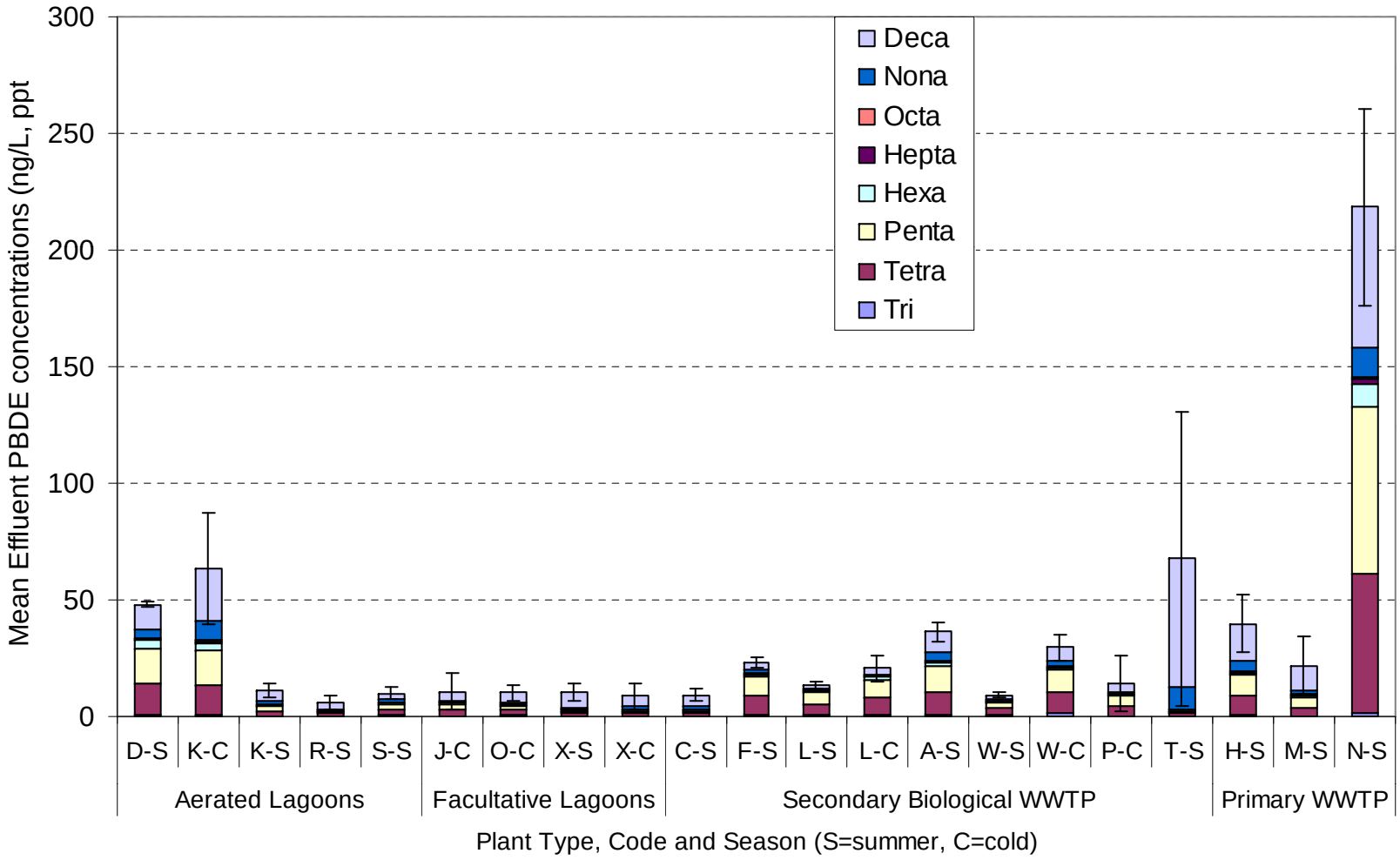
Effluent Concentrations of PBDEs



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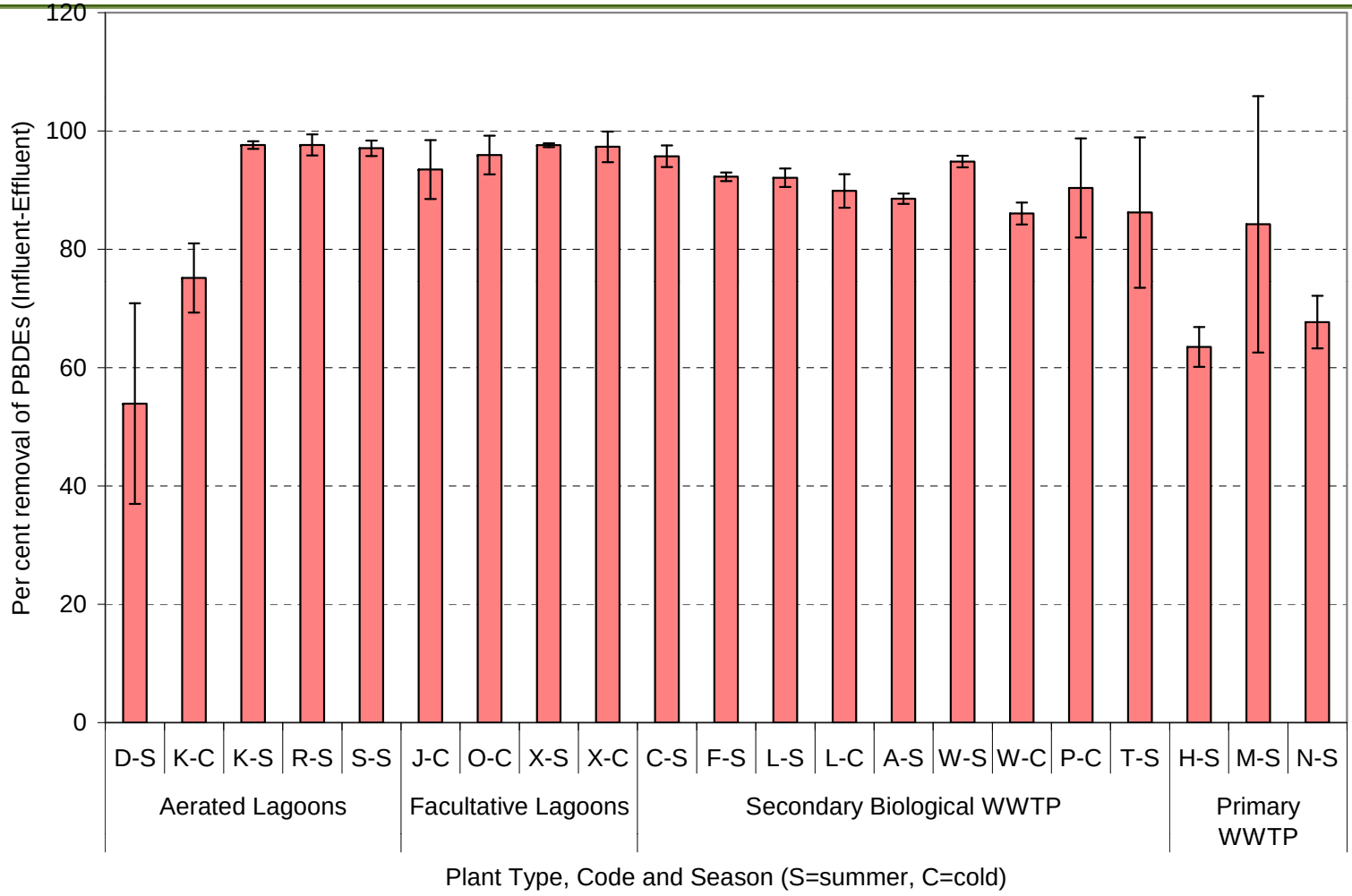
Removal of PBDEs



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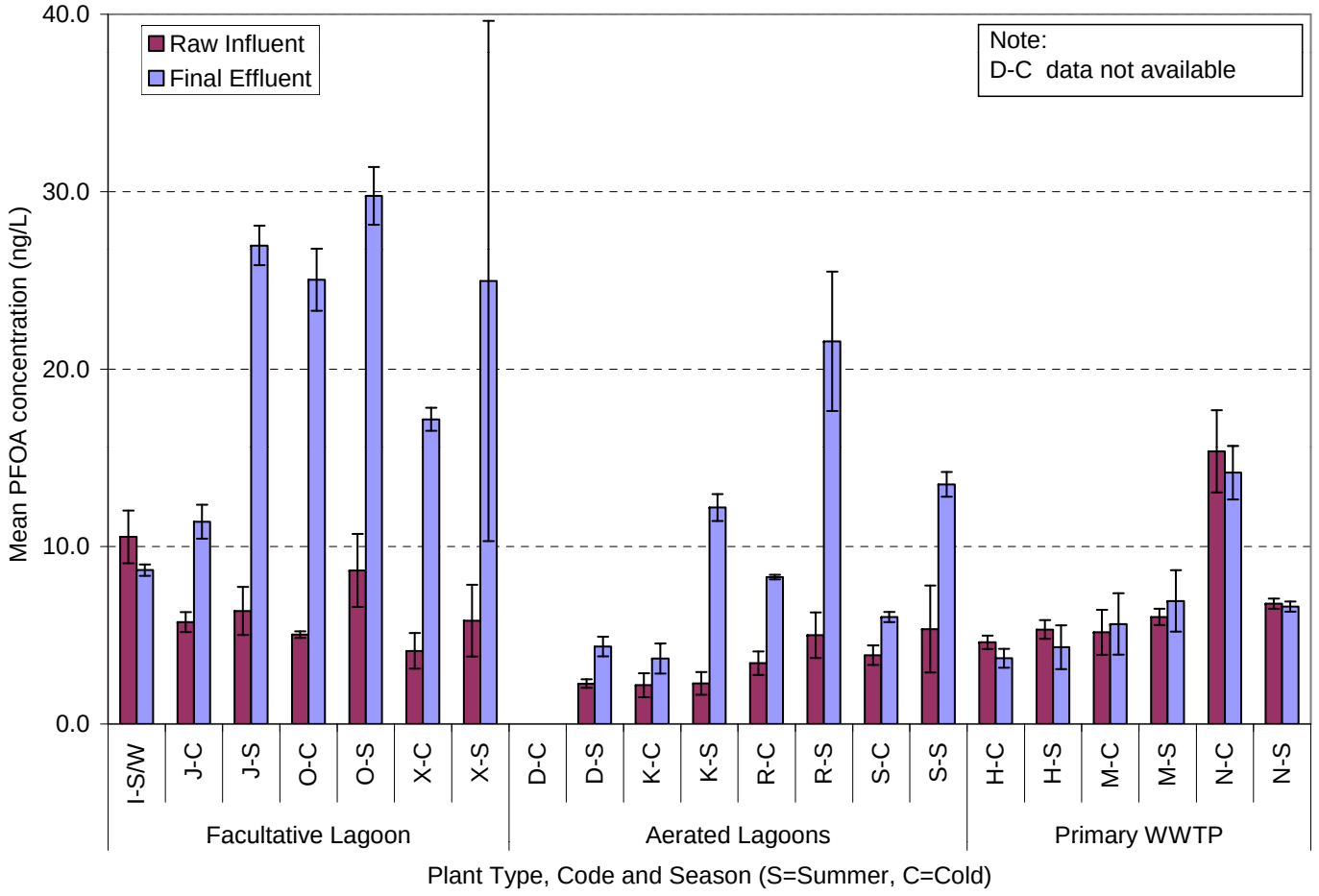
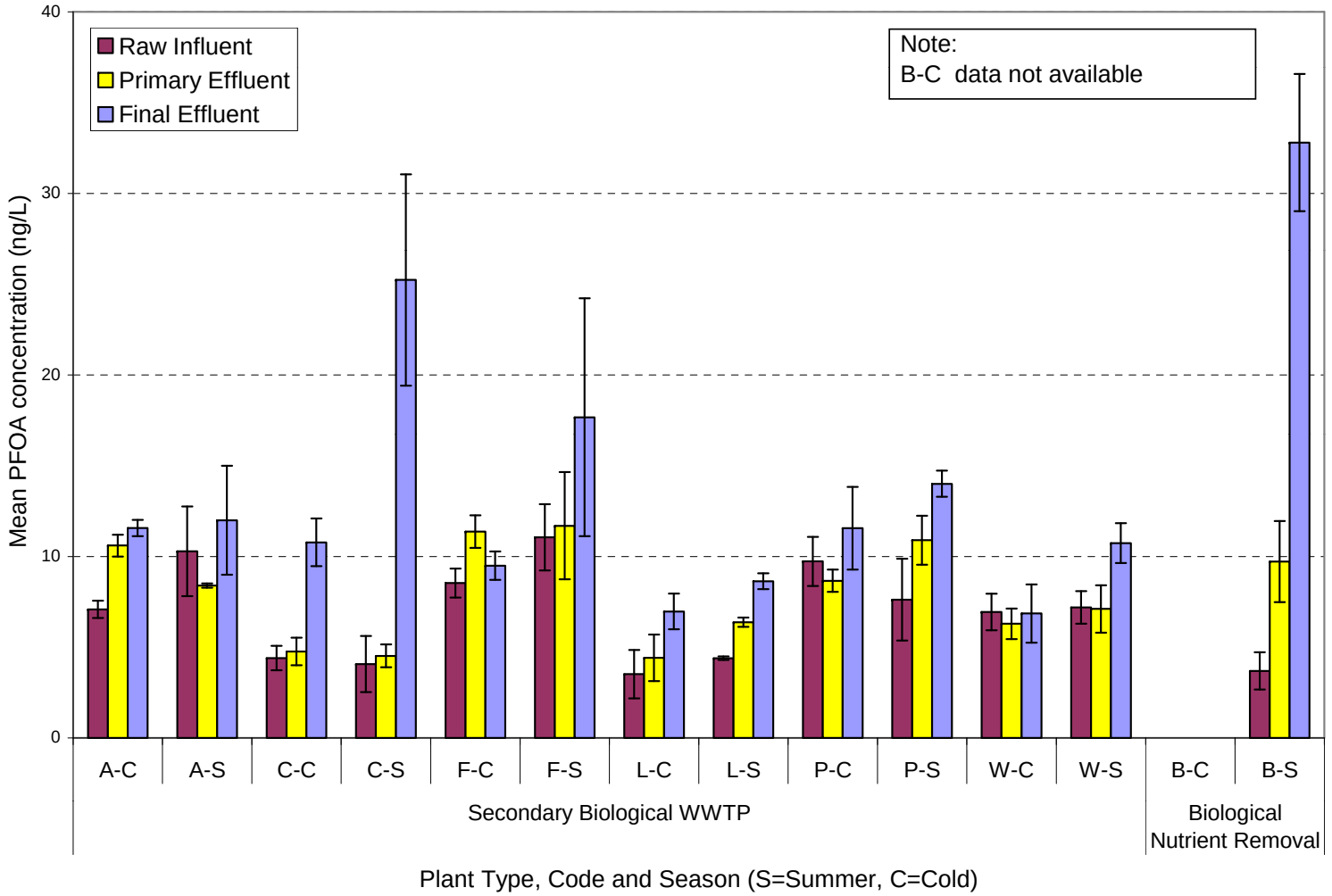
Influent and Effluent Concentrations of PFOA in lagoons and primary treatment



Influent and Effluent Concentrations of PFOA in secondary and advanced treatment



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Added value to CMP Wastewater Monitoring Program

- Collaboration with Environment Canada research scientists
- Collaboration with universities
- Conventional wastewater and solids data for other uses (e.g. ammonia, BOD, phosphorus)
- Co-ordinated site selection: landfill leachate, wastewater, surface water, sediment

Future of the CMP Wastewater Monitoring Program

- Data analysis
  - Warm vs. cold
  - Treatment type: in context of conventionals
- Reporting to Risk Assessment and Risk Management (primary clients)
- Sampling for year 3 (2011-2012)
- Reporting to participating WWTPs
- Journal publications

Thank You