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Overview of BC Air Quality Monitoring Network

Workshop on AQ Assessment Tools
March 9, 2011
Vancouver, BC

Overview

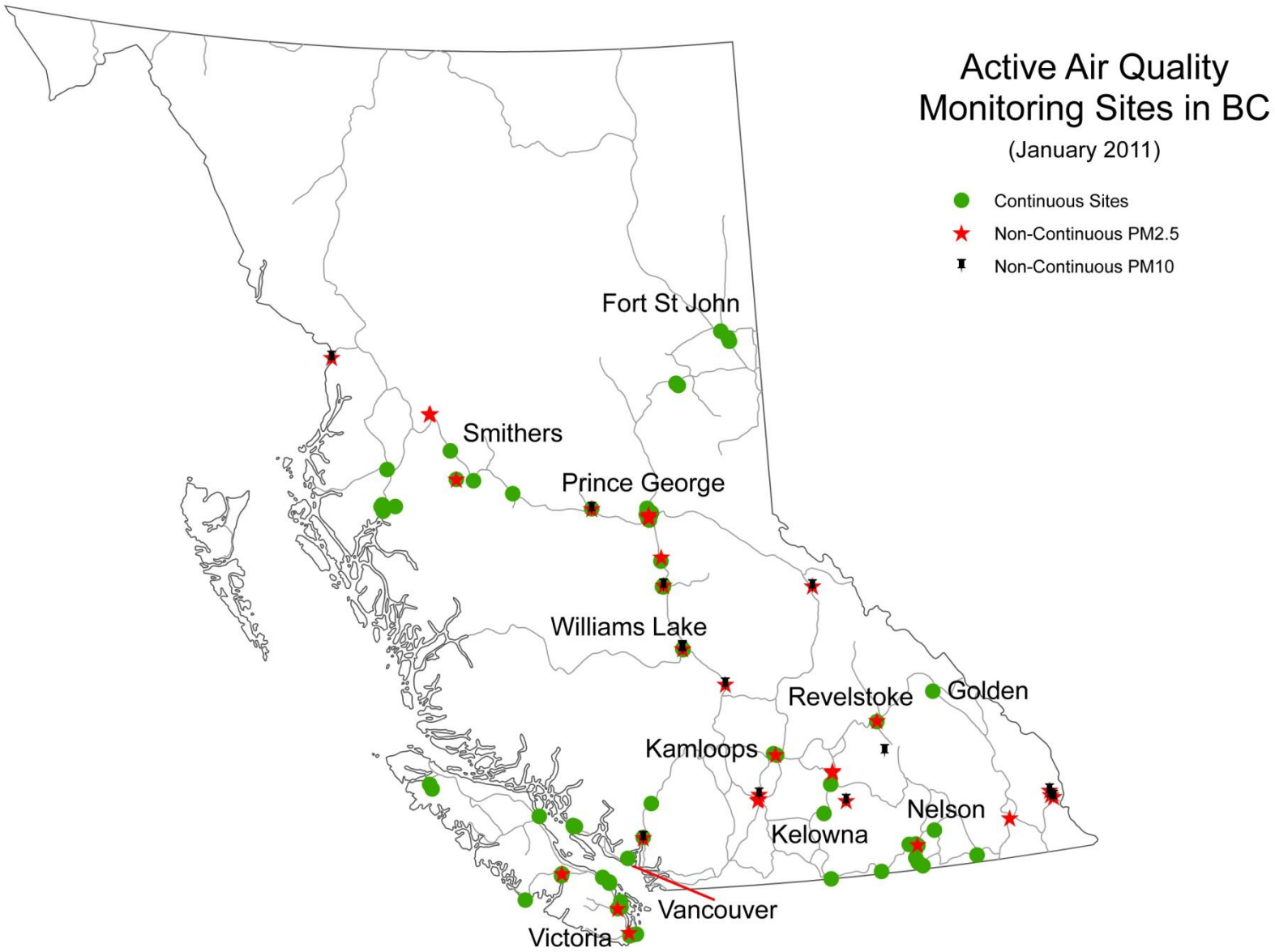
- Introduction to air quality (AQ) monitoring network in BC
  - Where we monitor
  - What we monitor for
  - QA/QC process
  - Data reporting
- Brief summary of AQ levels in BC

Monitoring Objectives

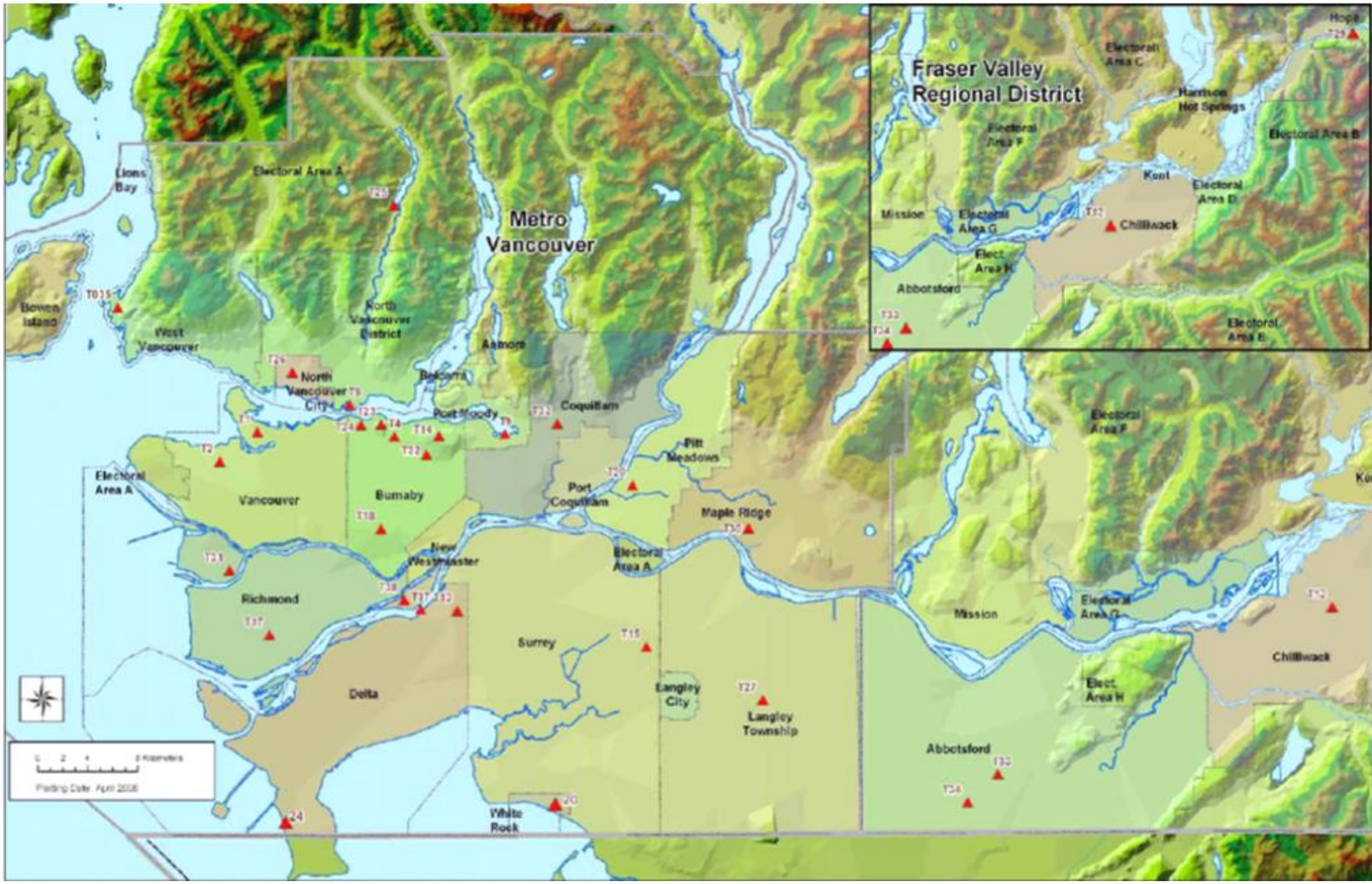
- Monitoring done for a variety of purposes:
  - Assess population exposure and trends
  - Compliance with Canada-wide Standards
  - Track progress toward national objectives
  - Public reporting of AQHI
  - Source apportionment
  - Airshed management and planning
  - Tracking background concentrations

AQ Monitoring in BC

- BC monitoring network:
  - Comprised of ~150 sites
  - Provides near real-time information
  - Supported by BC Ministry of Environment staff
- Monitoring sites operated by:
  - BC Ministry of Environment regional offices, in cooperation with Environment Canada
  - Metro Vancouver (26 sites in LFV)
  - Permittees


Active Air Quality
Monitoring Sites in BC
(January 2011)
Continuous Sites
Non-Continuous PM2.5
Non-Continuous PM10
Fort St John
Smithers
Prince George
Williams Lake
Revelstoke
Golden
Kamloops
Nelson
Kelowna
Vancouver
Victoria

Lower Fraser Valley Monitoring Network



Rationale For Monitoring

- **Higher population** – Urban scale
- **Hot spot** – High concentration or near source; typically neighbourhood scale
- **Permittee** -- Permit-defined location; may be fenceline

Rationale For Monitoring

- **Surveillance/mobile** – Semi-permanent; used to fill gaps and/or define baseline
- **Special study** – Typically short-term to support source apportionment, assessment of spatial variability and/or identification of parameters of interest

Parameters Monitored

- Criteria gases:
  - Ozone (O3) - Nitrogen oxides (NOx)
  - Sulphur dioxide (SO2) - Carbon monoxide (CO)
  - Hydrogen sulphide (H2S)
- Fine Particulates: PM2.5 and PM10
- VOCs: Canister sampling at handful of NAPS sites
- Speciated PM: Handful of NAPS sites

QA/QC Procedures

- Monitors regularly calibrated, maintained and operated
- Audited at least once per year
- Data validated according to rules developed by National Air Pollution Surveillance (NAPS) Program

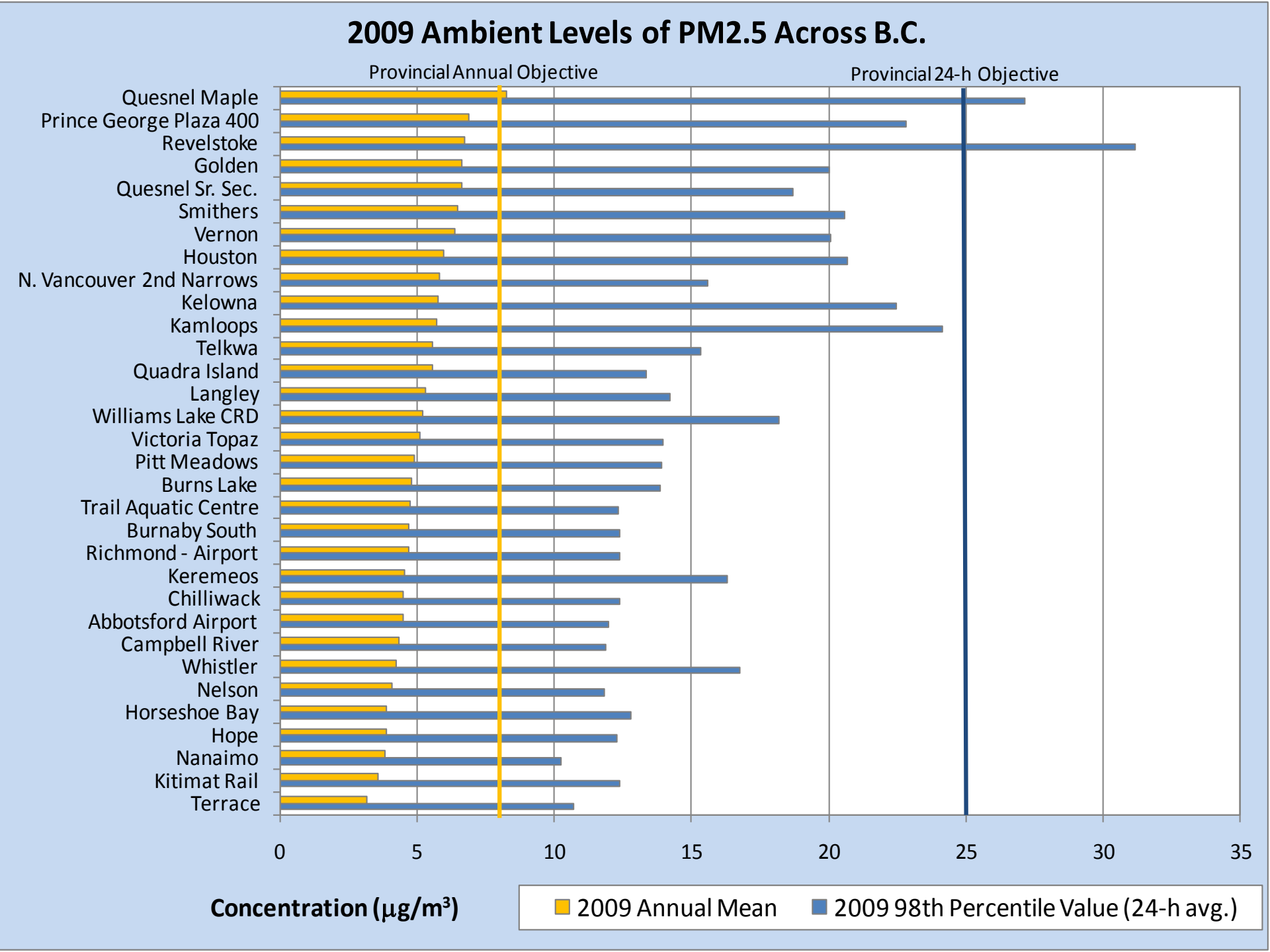
AQ Reporting

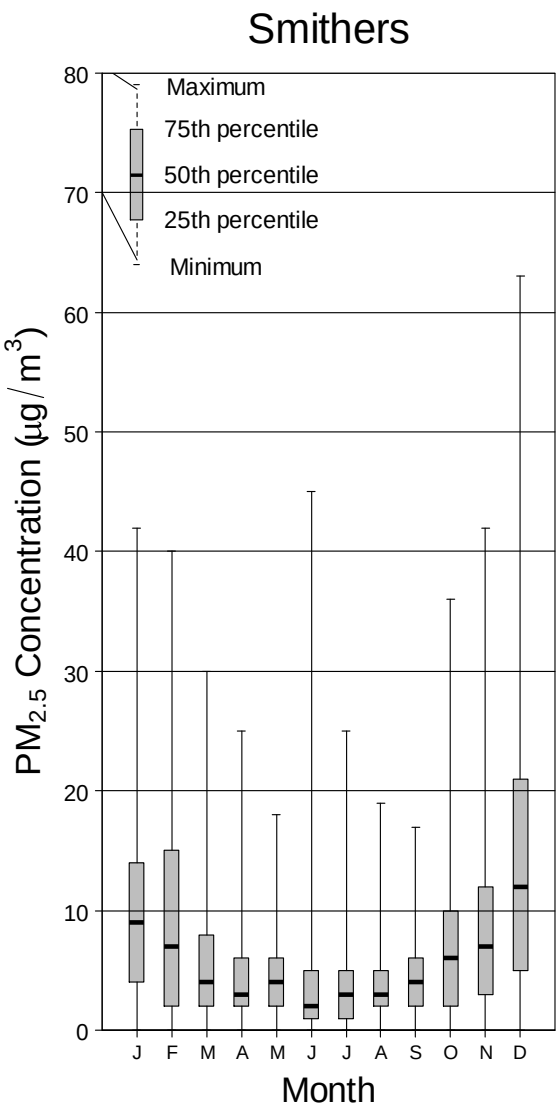
- Real-time data reported available at: www.bcairquality.ca
- External access to historical data -- testing
- Annual BC Lung State of the Air Report: www.bc.lung.ca/airquality/stateoftheair-report.html
- Detailed regional or airshed reports: www.bcairquality.ca/reports/topic_Monitoring.html www.metrovancouver.org

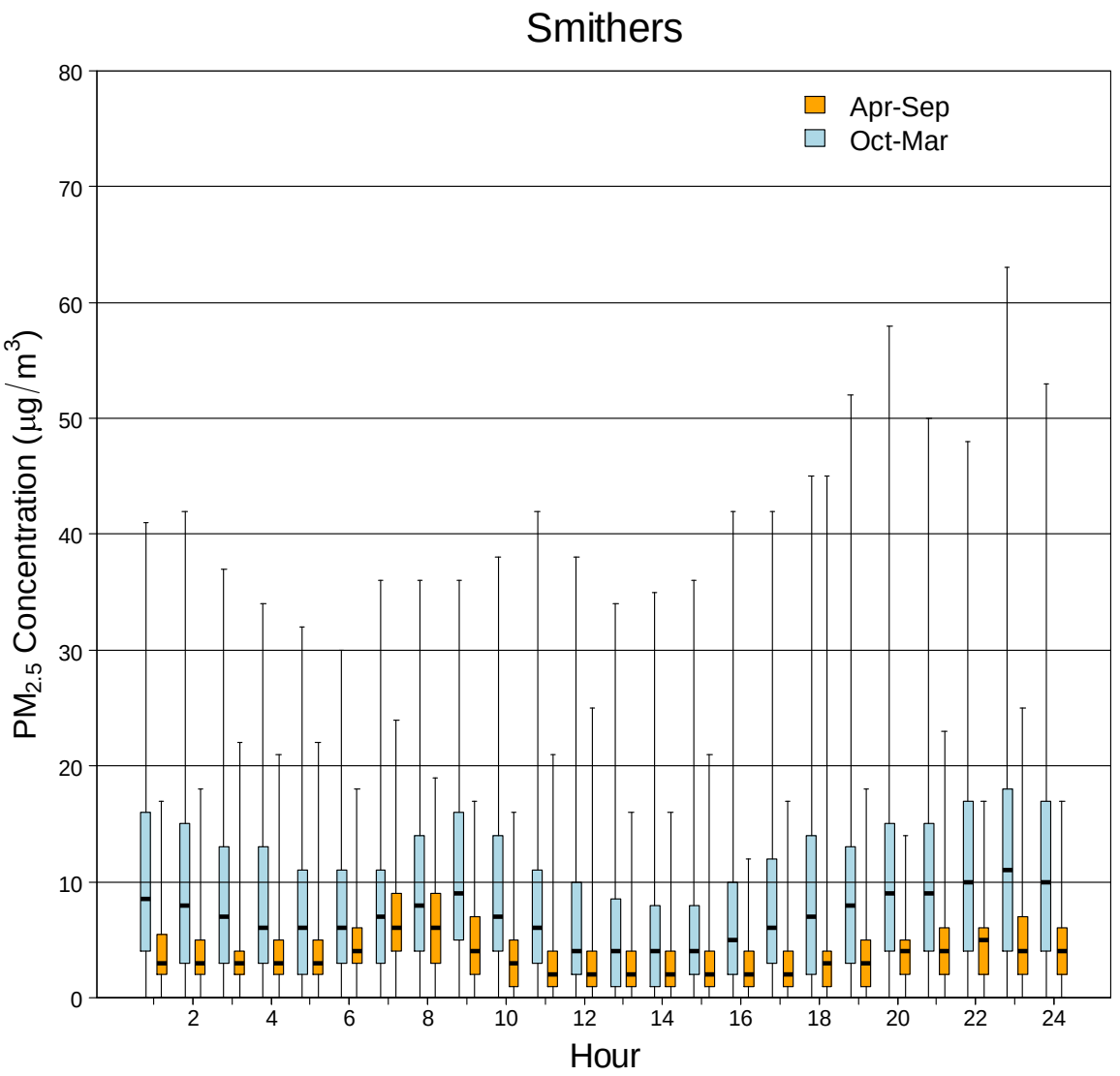
What Can AQ Data Tell Us?

- Status of current air quality (e.g. relative to established objectives/standards)
- Infer sources from spatial and temporal variability, co-pollutants and meteorology
- Trends

Note: For provincial and national air quality objectives and standards, see: www.bcairquality.ca


2009 Ambient Levels of PM2.5 Across B.C.
Provincial Annual Objective
Provincial 24-h Objective
Quesnel Maple
Prince George Plaza 400
Revelstoke
Golden
Quesnel Sr. Sec.
Smithers
Vernon
Houston
N. Vancouver 2nd Narrows
Kelowna
Kamloops
Telkwa
Quadra Island
Langley
Williams Lake CRD
Victoria Topaz
Pitt Meadows
Burns Lake
Trail Aquatic Centre
Burnaby South
Richmond - Airport
Keremeos
Chilliwack
Abbotsford Airport
Campbell River
Whistler
Nelson
Horseshoe Bay
Hope
Nanaimo
Kitimat Rail
Terrace
0
5
10
15
20
25
30
35
Concentration (µg/m³)
2009 Annual Mean
2009 98th Percentile Value (24-h avg.)





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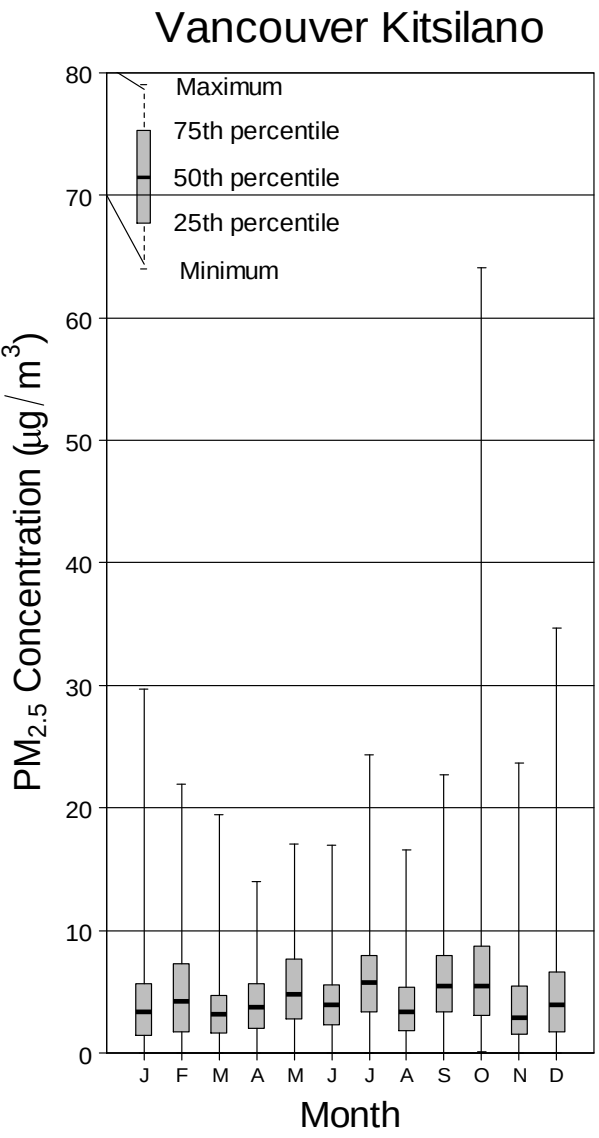

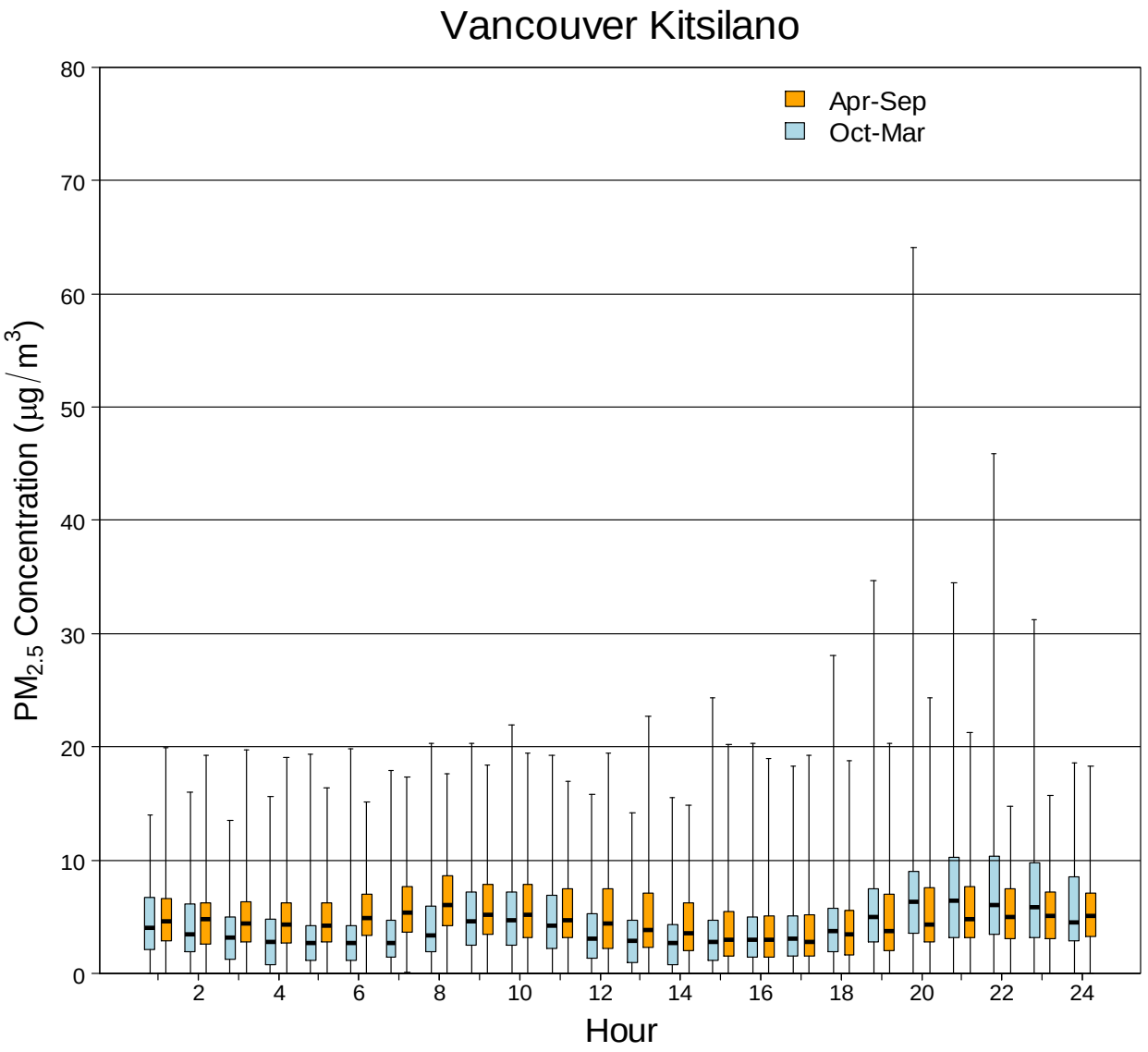

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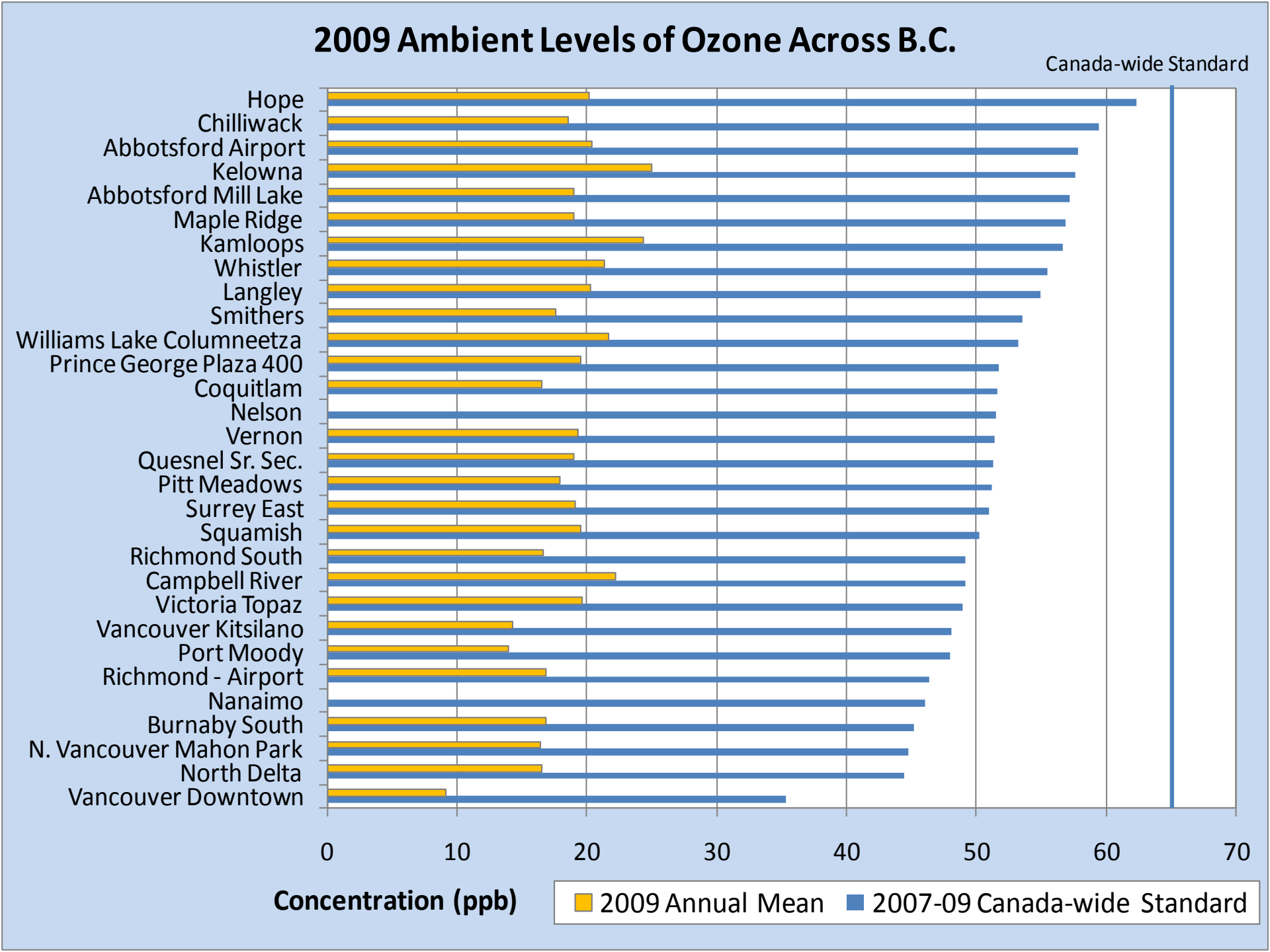
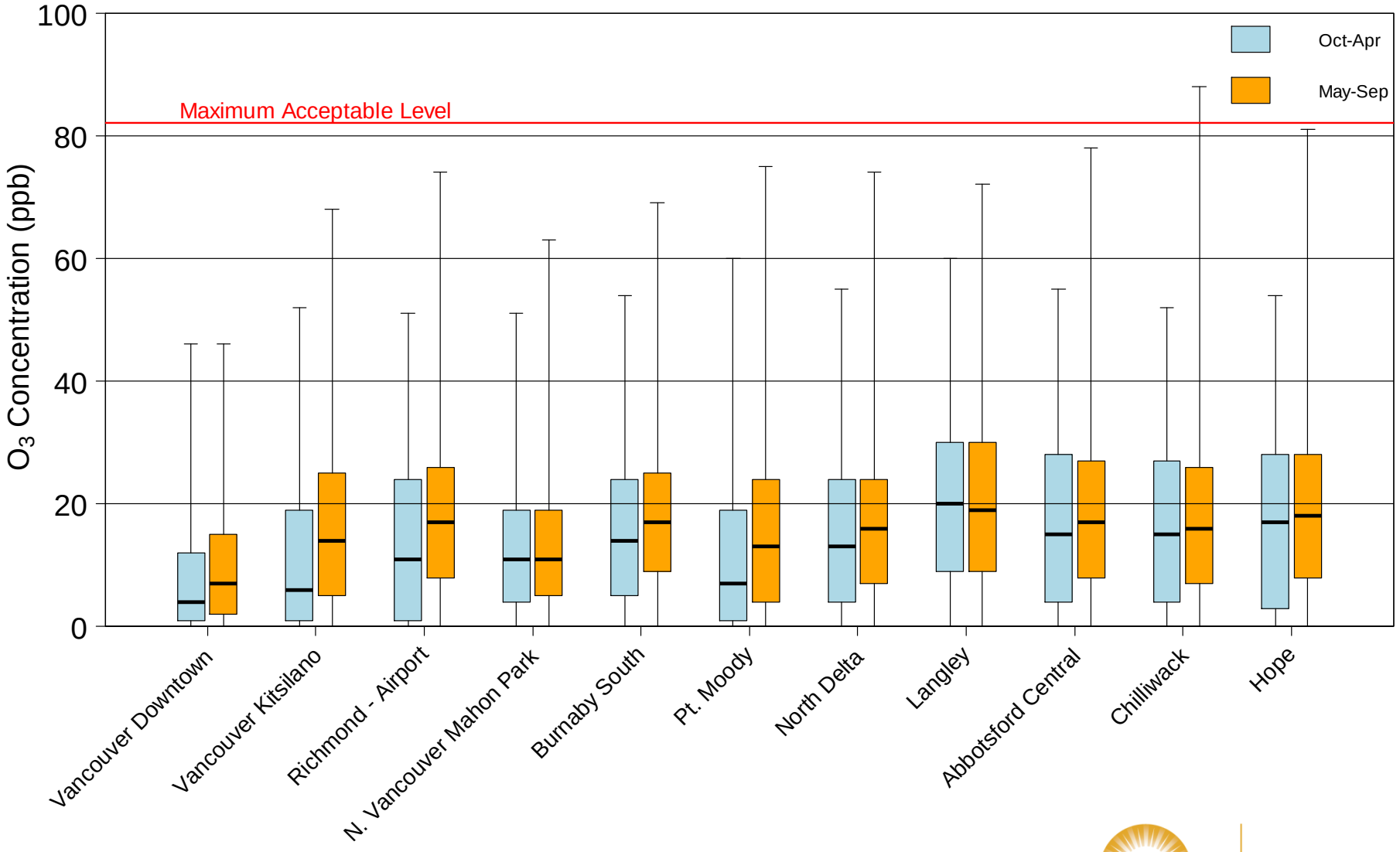
2009 Ambient Levels of Ozone Across B.C.



Distribution of 1h Ozone Measurements Across B.C. in 2008



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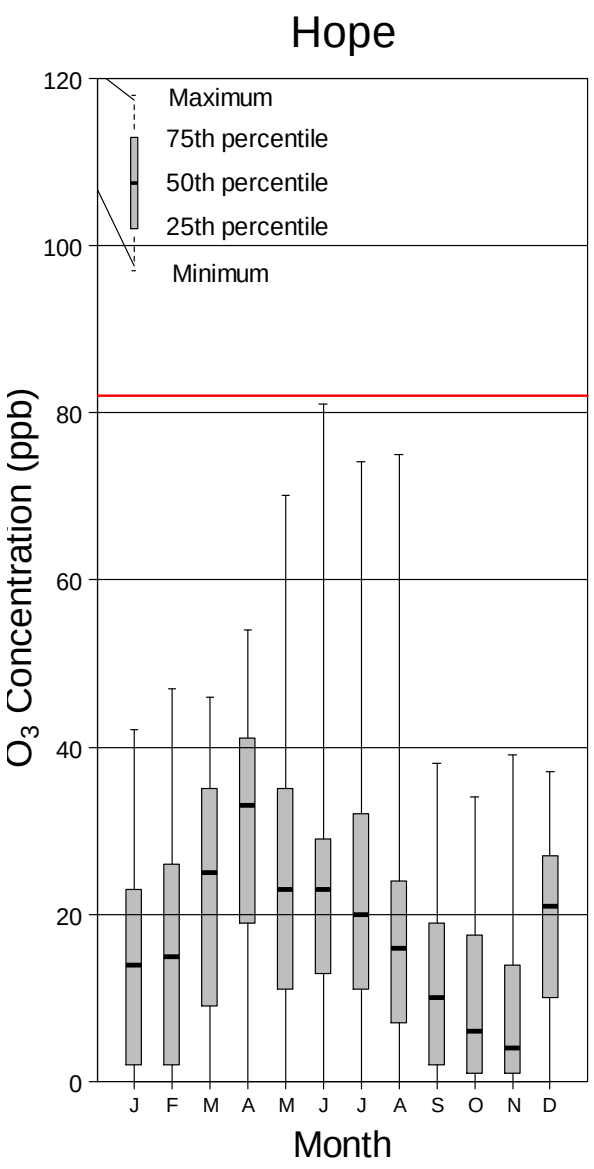

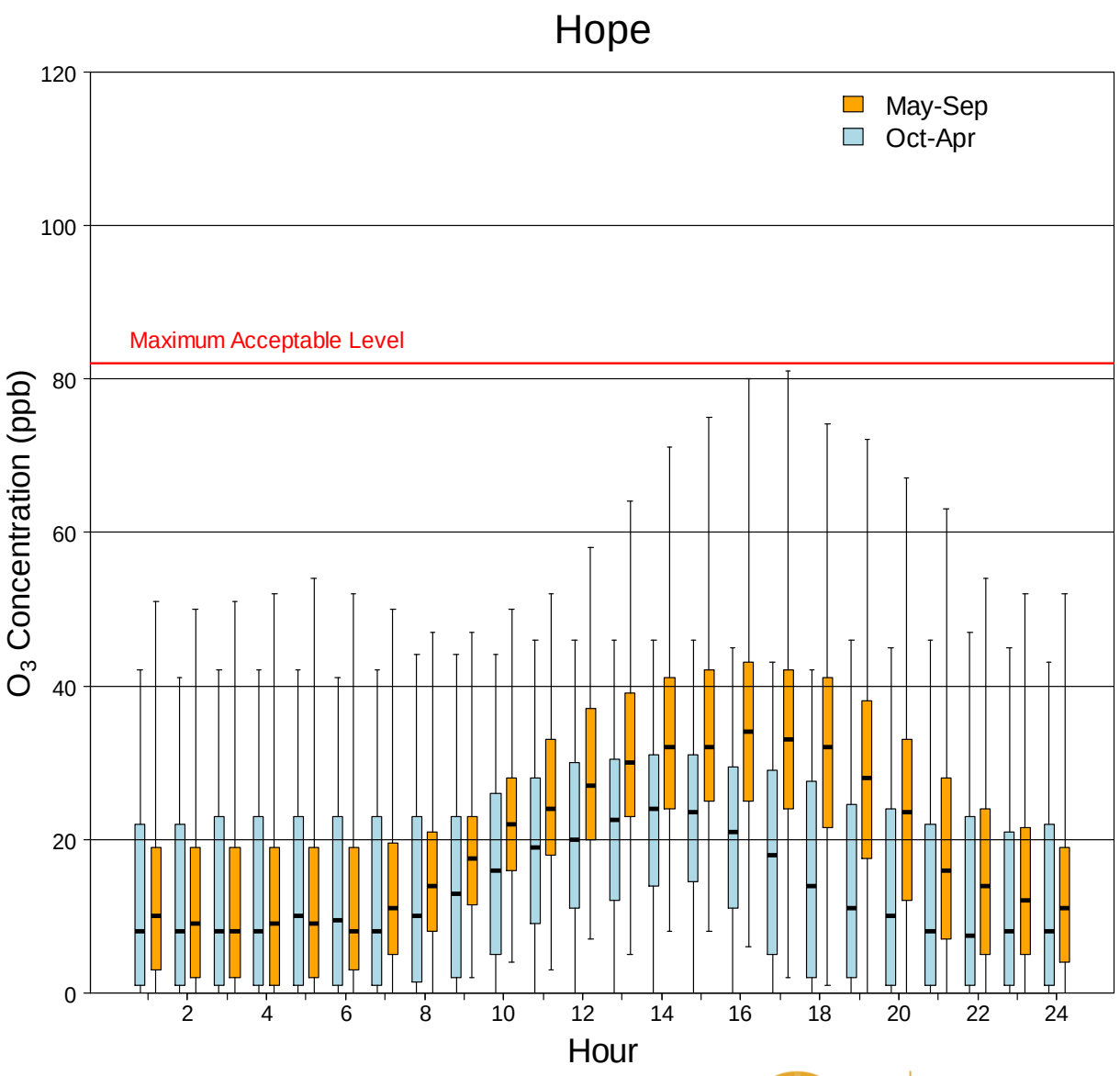

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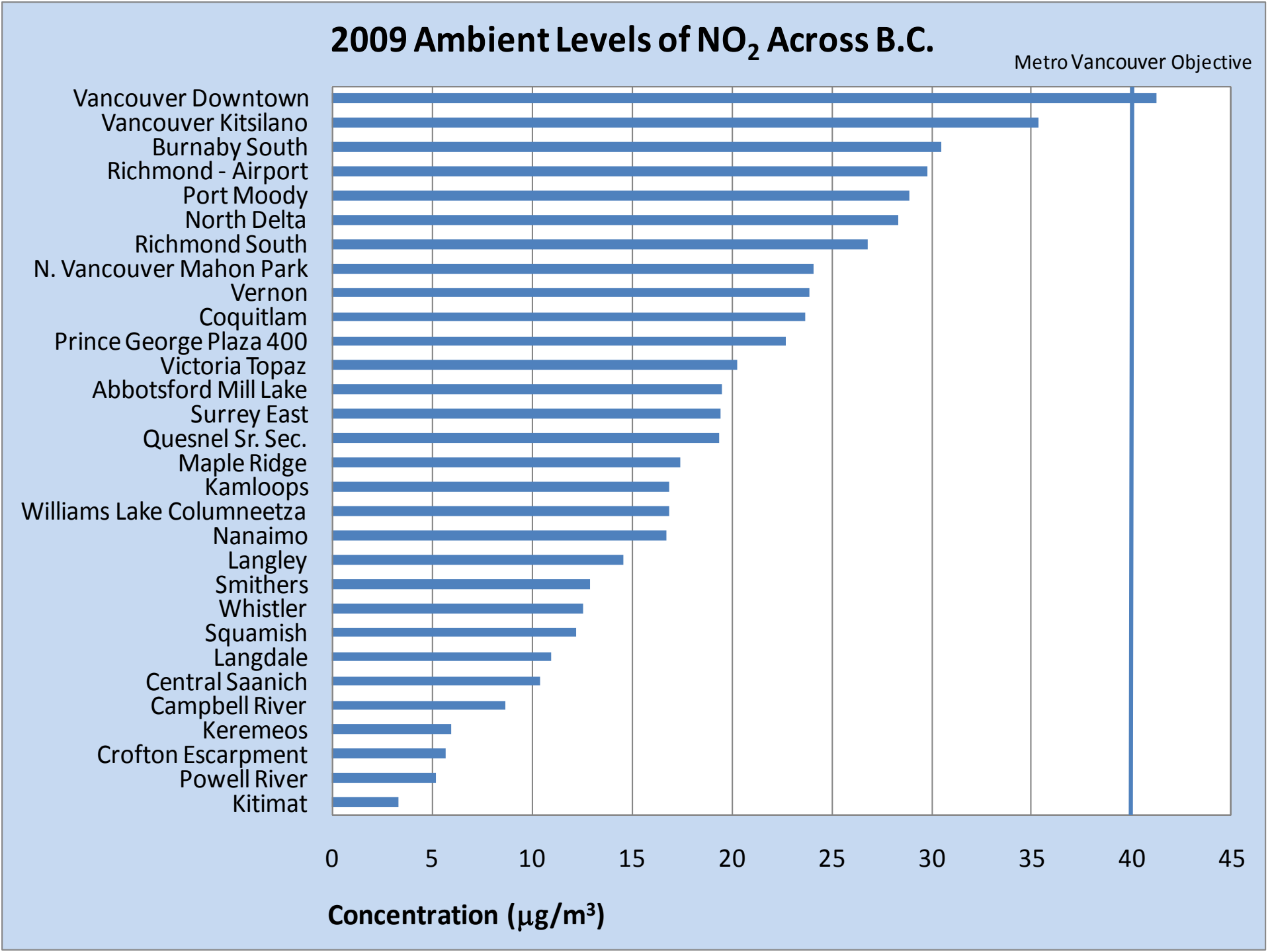
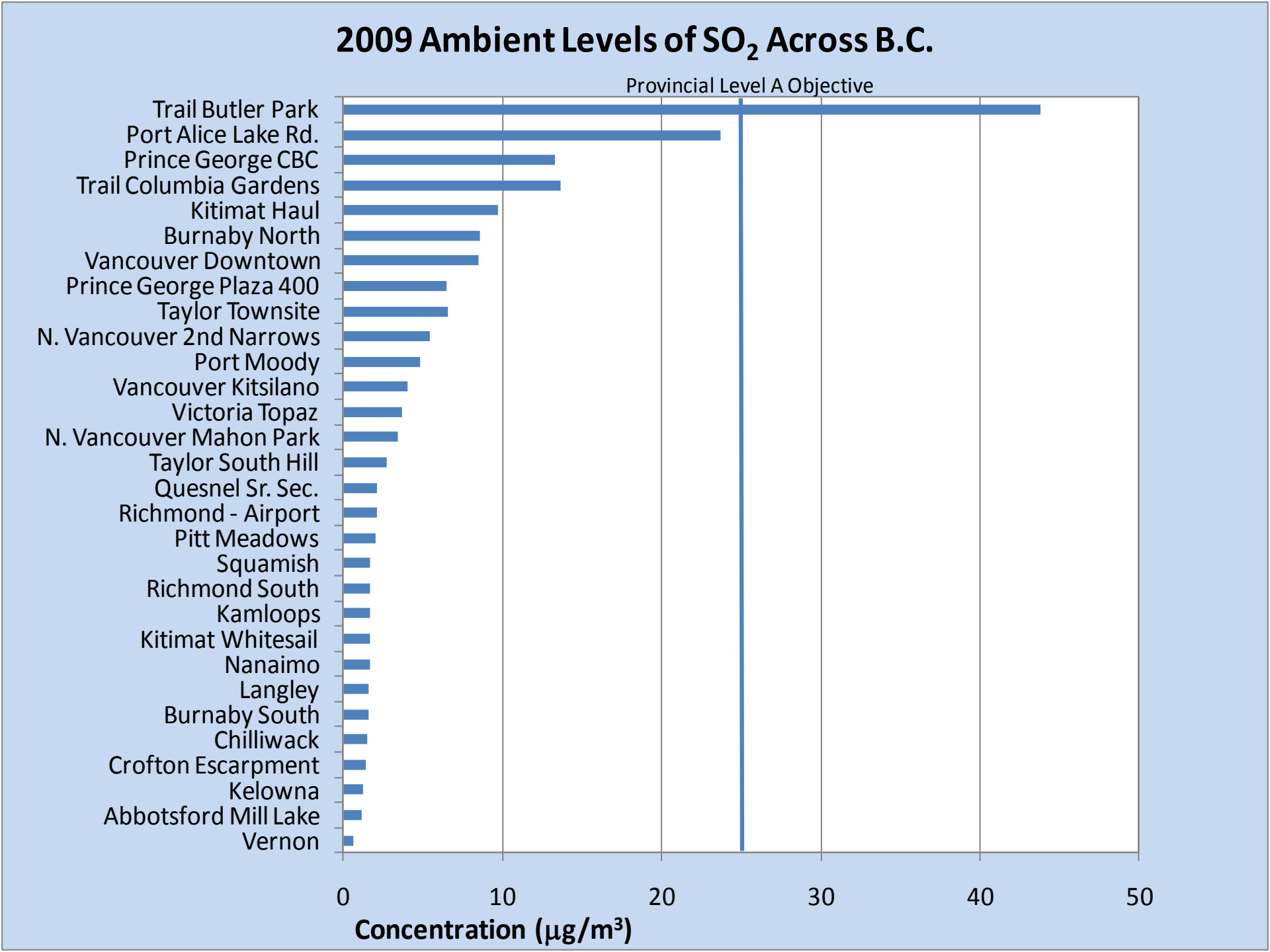
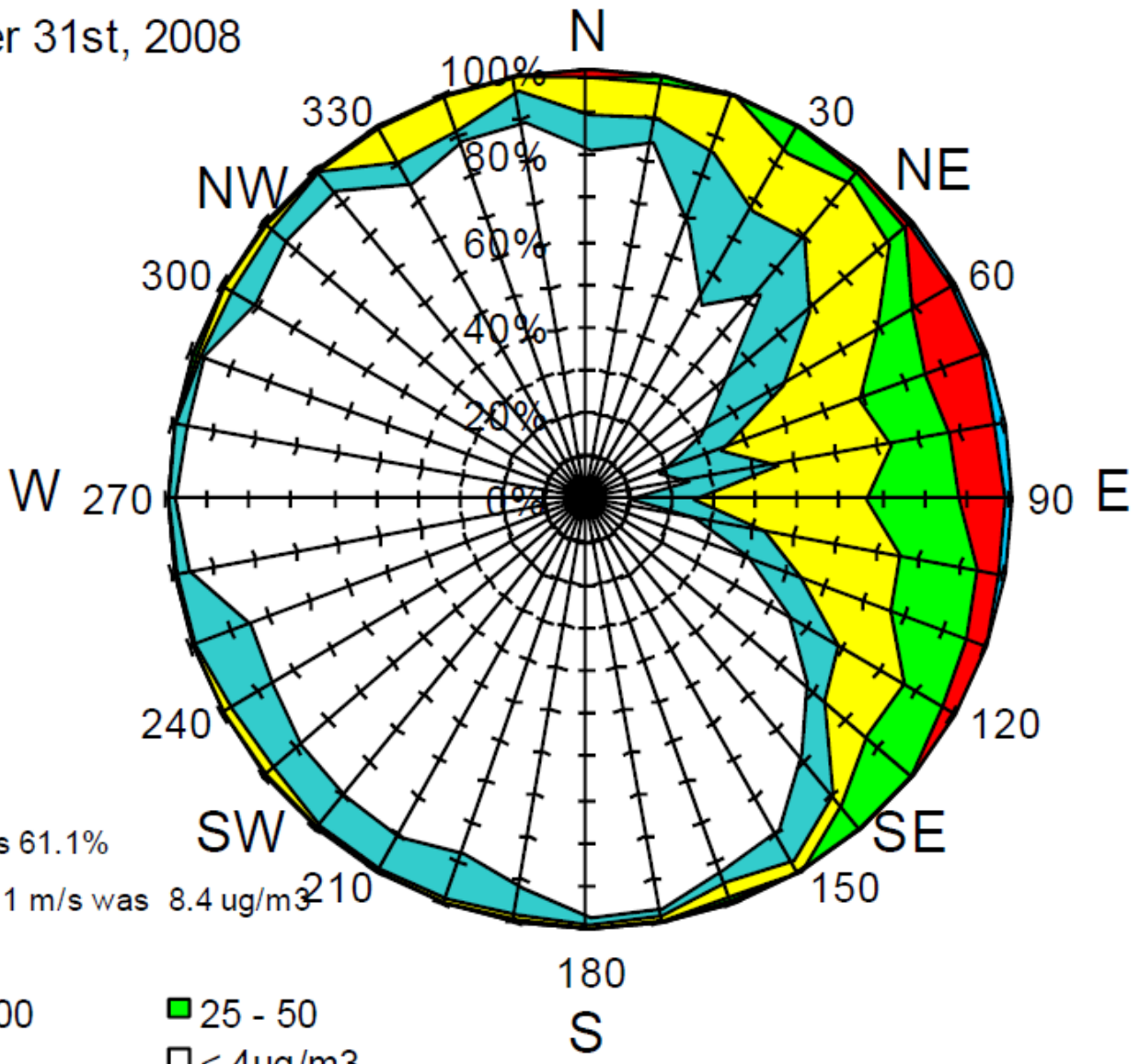

2009 Ambient Levels of NO2 Across B.C.
Metro Vancouver Objective
Vancouver Downtown
Vancouver Kitsilano
Burnaby South
Richmond - Airport
Port Moody
North Delta
Richmond South
N. Vancouver Mahon Park
Vernon
Coquitlam
Prince George Plaza 400
Victoria Topaz
Abbotsford Mill Lake
Surrey East
Quesnel Sr. Sec.
Maple Ridge
Kamloops
Williams Lake Columneetza
Nanaimo
Langley
Smithers
Whistler
Squamish
Langdale
Central Saanich
Campbell River
Keremeos
Crofton Escarpment
Powell River
Kitimat
0
5
10
15
20
25
30
35
40
45
Concentration (µg/m3)


2009 Ambient Levels of SO2 Across B.C.
Provincial Level A Objective
Trail Butler Park
Port Alice Lake Rd.
Prince George CBC
Trail Columbia Gardens
Kitimat Haul
Burnaby North
Vancouver Downtown
Prince George Plaza 400
Taylor Townsite
N. Vancouver 2nd Narrows
Port Moody
Vancouver Kitsilano
Victoria Topaz
N. Vancouver Mahon Park
Taylor South Hill
Quesnel Sr. Sec.
Richmond - Airport
Pitt Meadows
Squamish
Richmond South
Kamloops
Kitimat Whitesail
Nanaimo
Langley
Burnaby South
Chilliwack
Crofton Escarpment
Kelowna
Abbotsford Mill Lake
Vernon
0
10
20
30
40
50
Concentration (µg/m3)

SO_2 Pollution Rose for Plaza

January 1st to December 31st, 2008



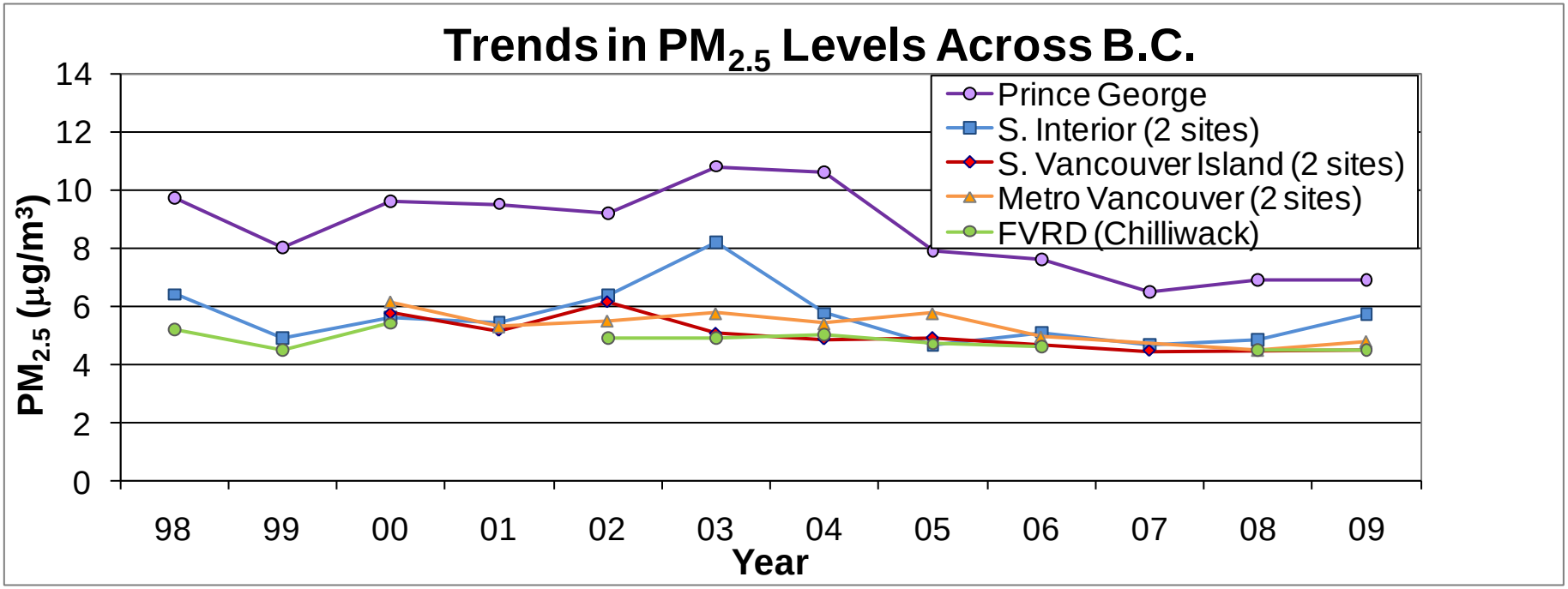
Note : Frequencies indicate direction from which the wind is blowing.

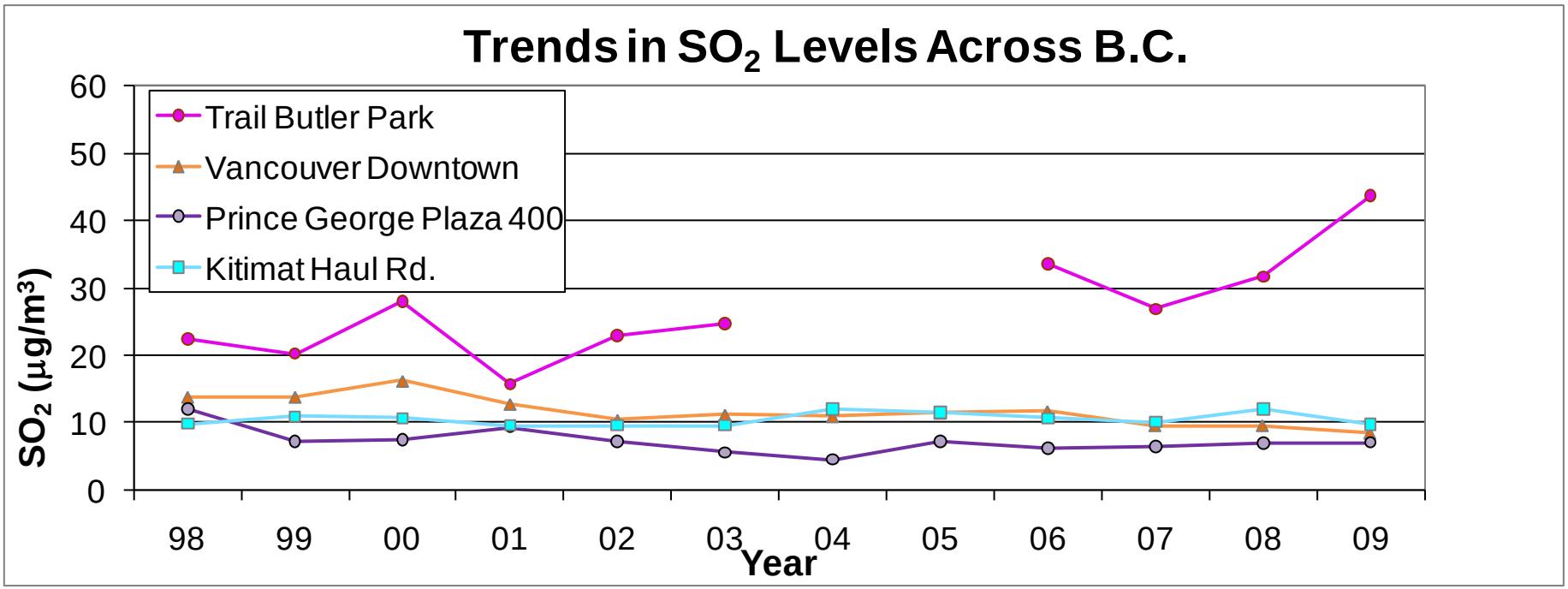
% of SO2 less than detectable was 61.1%

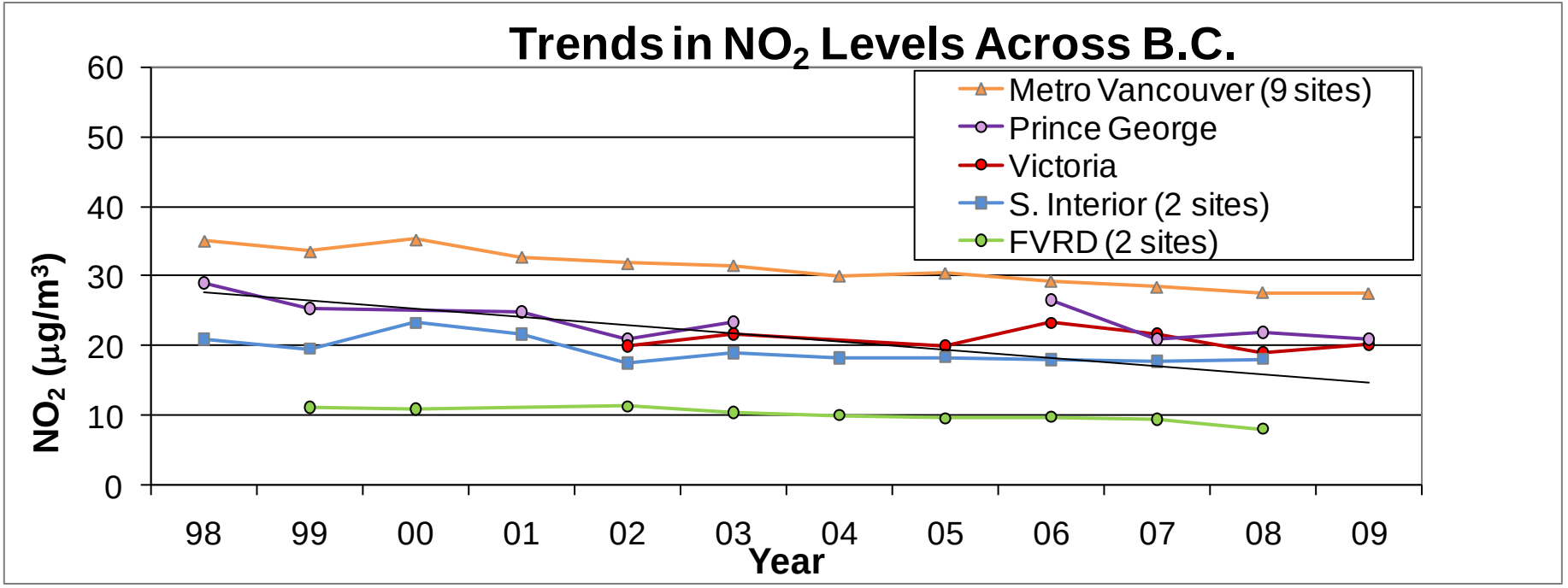
Mean concentration when winds < 1 m/s was 8.4 ug/m3

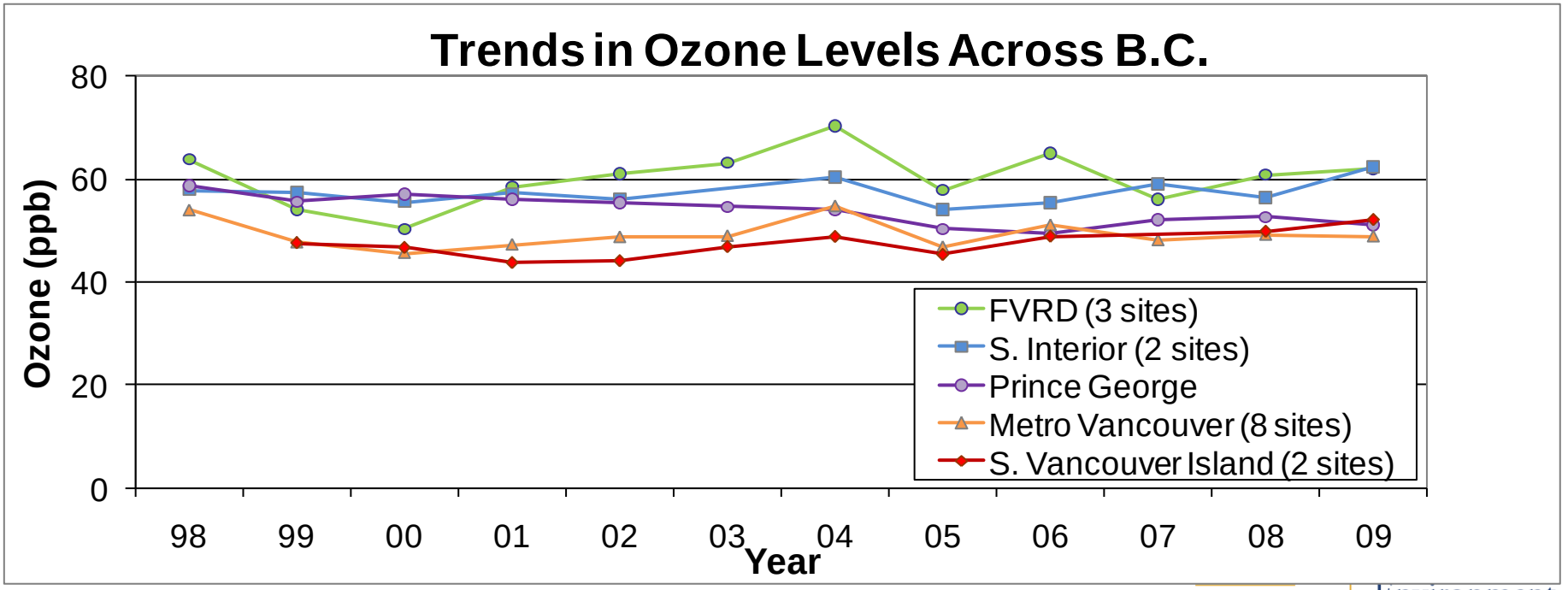
>100
50 - 100
25 - 50
10 - 25
4 - 10
< 4µg/m3

From: D. Fudge, 2008 Annual Air Quality Report for the Prince George Airshed


Trends in PM2.5 Levels Across B.C.
PM2.5 (µg/m³)
0
2
4
6
8
10
12
14
98
99
00
01
02
03
04
05
06
07
08
09
Year
Prince George
S. Interior (2 sites)
S. Vancouver Island (2 sites)
Metro Vancouver (2 sites)
FVRD (Chilliwack)


Trends in SO2 Levels Across B.C.
SO2 (µg/m³)
0
10
20
30
40
50
60
98
99
00
01
02
03
04
05
06
07
08
09
Year
Trail Butler Park
Vancouver Downtown
Prince George Plaza 400
Kitimat Haul Rd.


Trends in NO2 Levels Across B.C.
NO2 (µg/m3)
60
50
40
30
20
10
0
98
99
00
01
02
03
04
05
06
07
08
09
Year
Metro Vancouver (9 sites)
Prince George
Victoria
S. Interior (2 sites)
FVRD (2 sites)


Trends in Ozone Levels Across B.C.
Ozone (ppb)
80
60
40
20
0
98
99
00
01
02
03
04
05
06
07
08
09
Year
FVRD (3 sites)
S. Interior (2 sites)
Prince George
Metro Vancouver (8 sites)
S. Vancouver Island (2 sites)

What (Routine) Monitoring Can't Tell Us?

- Which sources are contributing to local AQ, and how much (need other tools)
- How AQ will change with new emissions
- (With exception of dense monitoring networks) how AQ varies across a community

Other Caveats

- Monitoring and reporting system continues to evolve, especially for $PM_{2.5}$
  - Monitoring technology
  - QA/QC procedures
  - Data archiving and reporting procedures

Summary

- Extensive AQ monitoring network in BC
- Data provide starting point for AQ assessments
- Data limitations – important to understand
- Other tools needed to
  - Fill in spatial gaps
  - Link emissions with ambient impacts
  - Predict the future

Contact Information

Ted Weick

Ted.Weick@gov.bc.ca

Tel: 250-387-6851

Natalie Suzuki

Natalie.Suzuki@gov.bc.ca

Tel: 250-952-2495

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