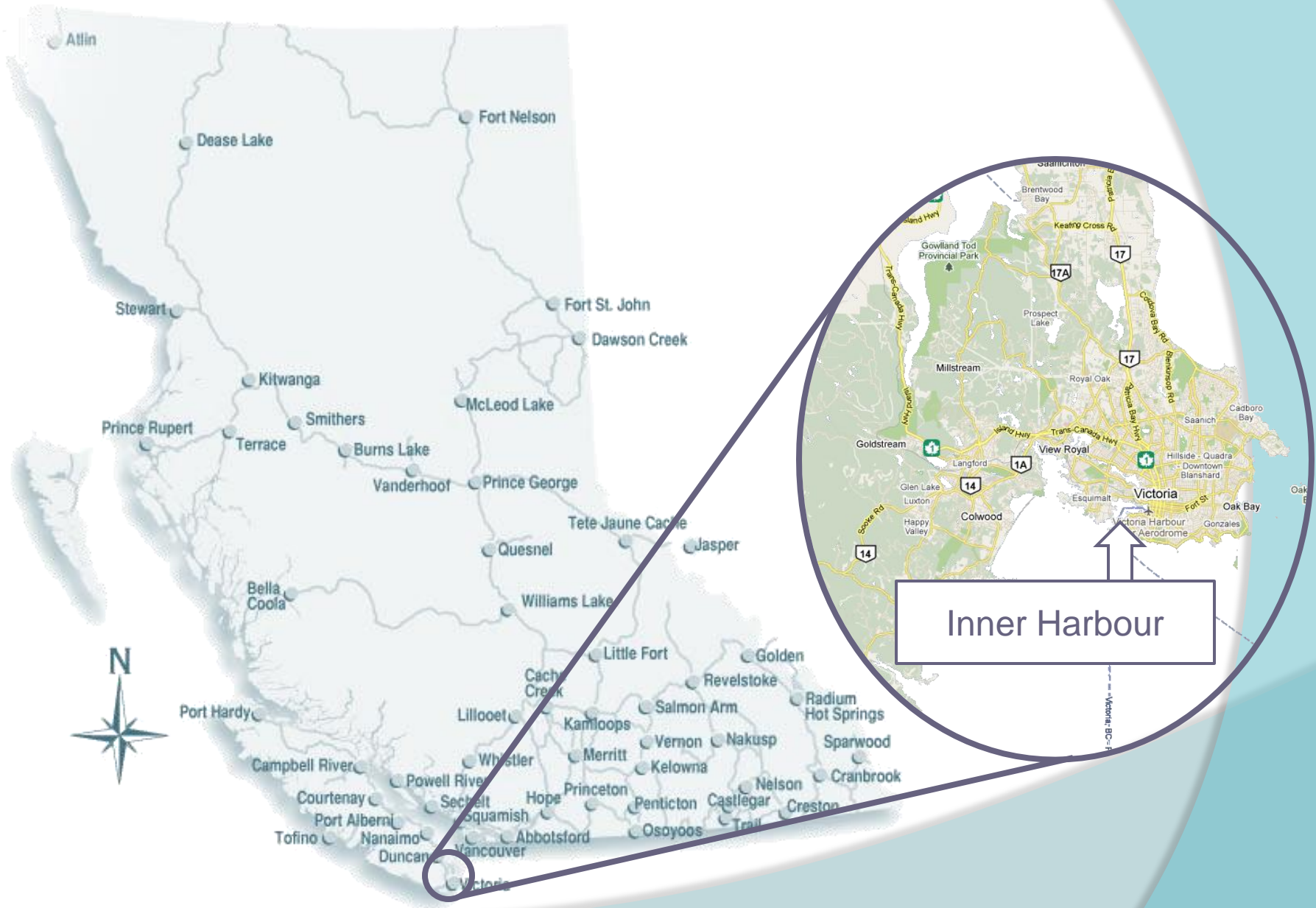


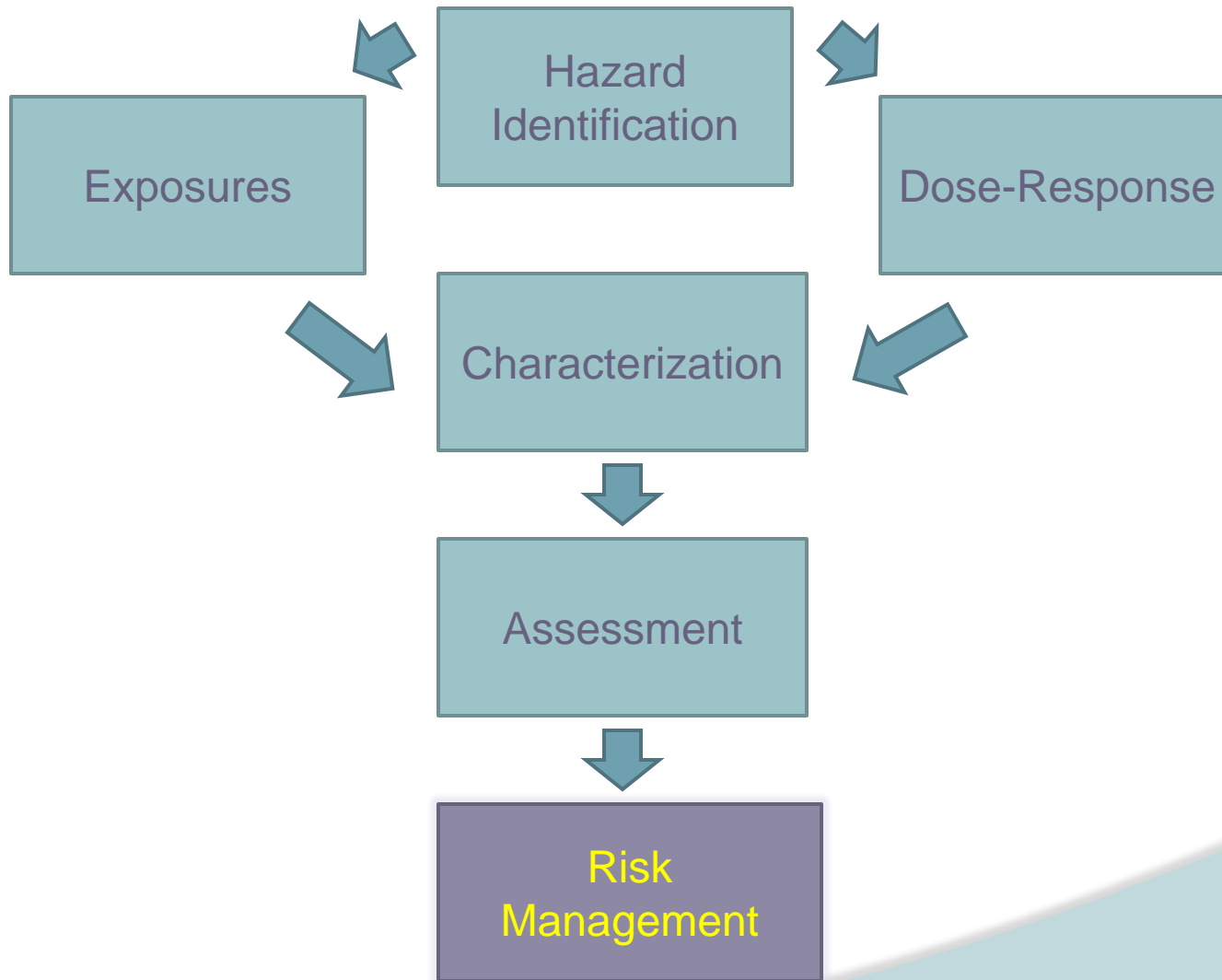
Christine Bender – Vancouver Island Health Authority

HEALTH IMPACT ASSESSMENT TOOL



Inner Harbour

Health Assessment Tool



“We are forced to close all our windows throughout the day until midnight when the cruise ships finally leave (very loudly). It is evident- the amount of pollution they are pumping out.”

(Montreal St resident: JBNA Quality of Life survey)

“The increase in cruise ship traffic is congested and environmentally polluting our space!”

(San Jose Ave. resident)

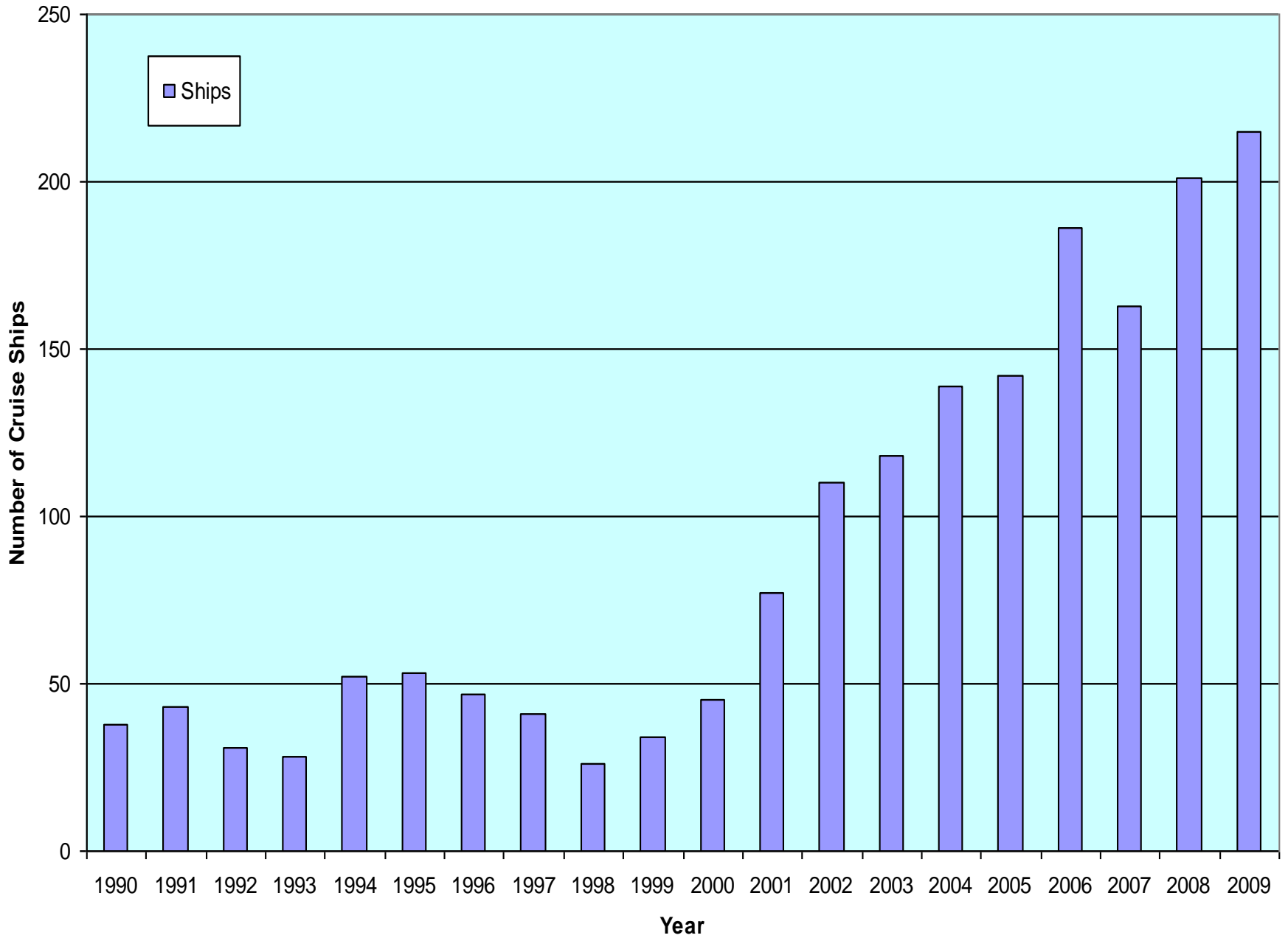
“No. 1 problem is air pollution. It is so bad that metal ornaments etc. get tarnished about 3 times as quickly as anywhere else we have lived & I’ve reason to believe it has also affected the health of one of us.”

(Dallas Rd resident – over 75 yrs old)

“The cruise ships stink and after it’s dark they really pump out the pollutions so much that it is hard to breathe. Aren’t there any laws against this?”

(Montreal St resident)

Cruise Ships per Year





**“What gets measured – gets
managed !”**

Marg – James Bay Neighborhood Association

James Bay Study Objectives



Air Quality Working Group


Chris Robbins	Capital Regional District
Dr. Eleanor Setton	UVic Geospatial Laboratory
Carla Poplawski	UVic Master's student
Mike Pennock	VIHA Public Health
Christine Bender	VIHA Public Health
Earle Plain	Ministry of Environment
John Deniseger	Ministry of Environment
Steve Sakiyama	Ministry of Healthy Living and Sport
Mark Graham	Ministry of Environment
Matt Dodd	Royal Roads University

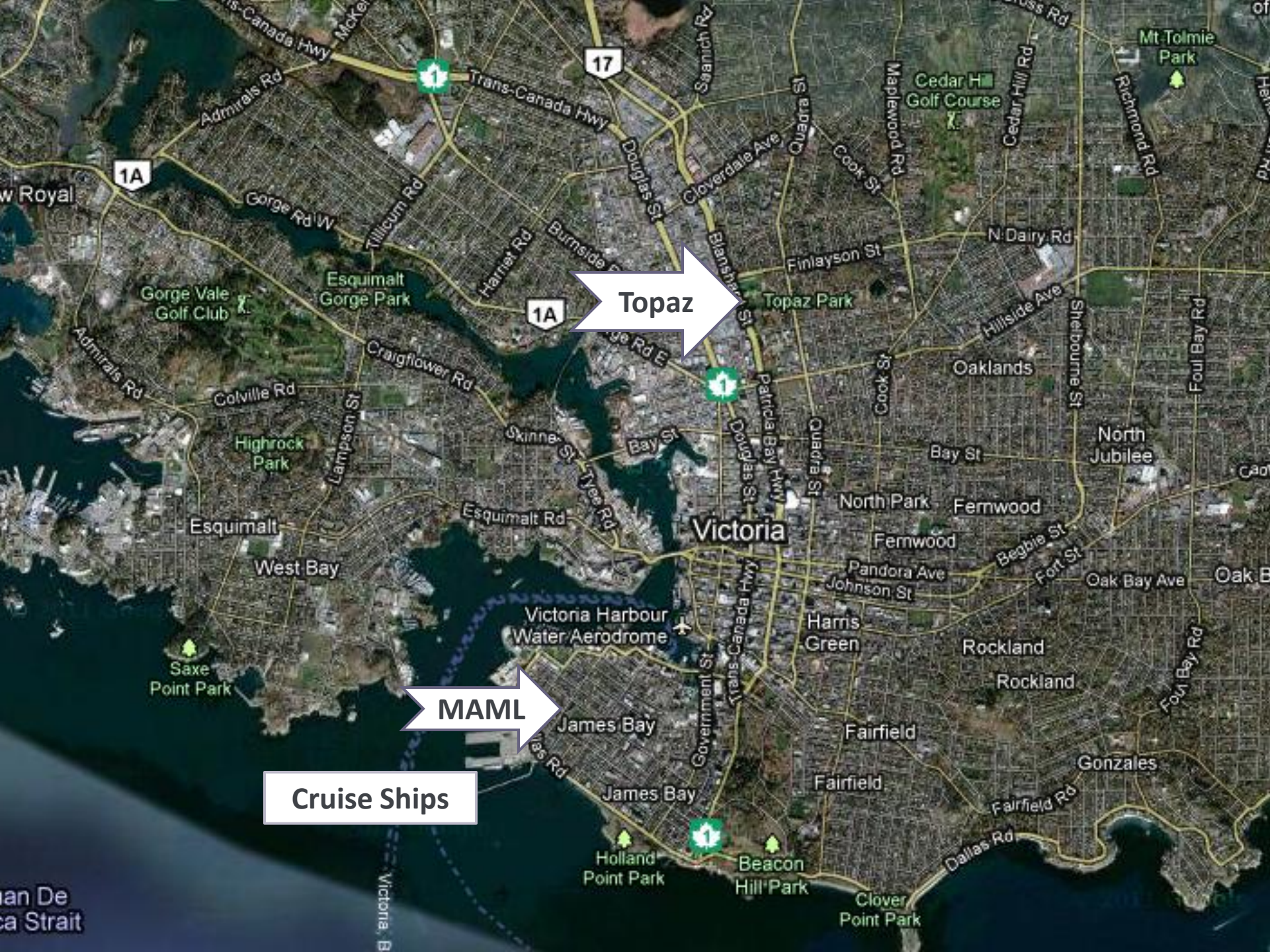
Project Partners

- ❑ BCCDC Health Protection
- ❑ Greater Victoria Harbor Authority
- ❑ City of Victoria
- ❑ James Bay Neighborhood Association
- ❑ Environment Canada

Timeline

VIHA New Core Program in Air Quality

- 
- 2006 -Neighborhood raises concerns with VIHA (AQWG Discussions)
 - 2007 -University of Victoria – Field measurements
 - 2008 -University of Victoria - Dispersion modelling
-BCCDC - Community Presentation
 - 2009 -2008 Topaz Station data analysis
 - 2010 -2009 MAML continuous ambient monitoring cruise season
-ECA adopted in USA and Canada
-EPA Adopts new SO2 Standard
-VIHA health assessment conducted and recommendations made
 - 2011 -3 year SO2 monitoring begins
 - 2012 -Federal legislation limits Sulfur to 1% in fuel August 2012



Topaz

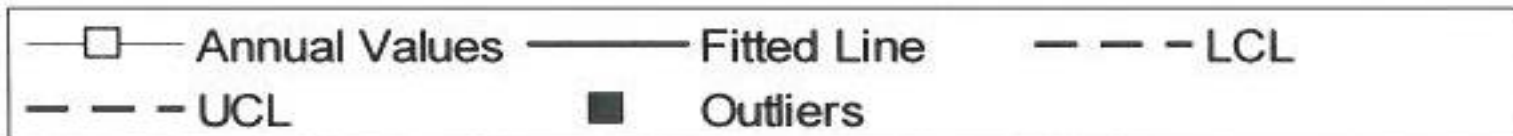
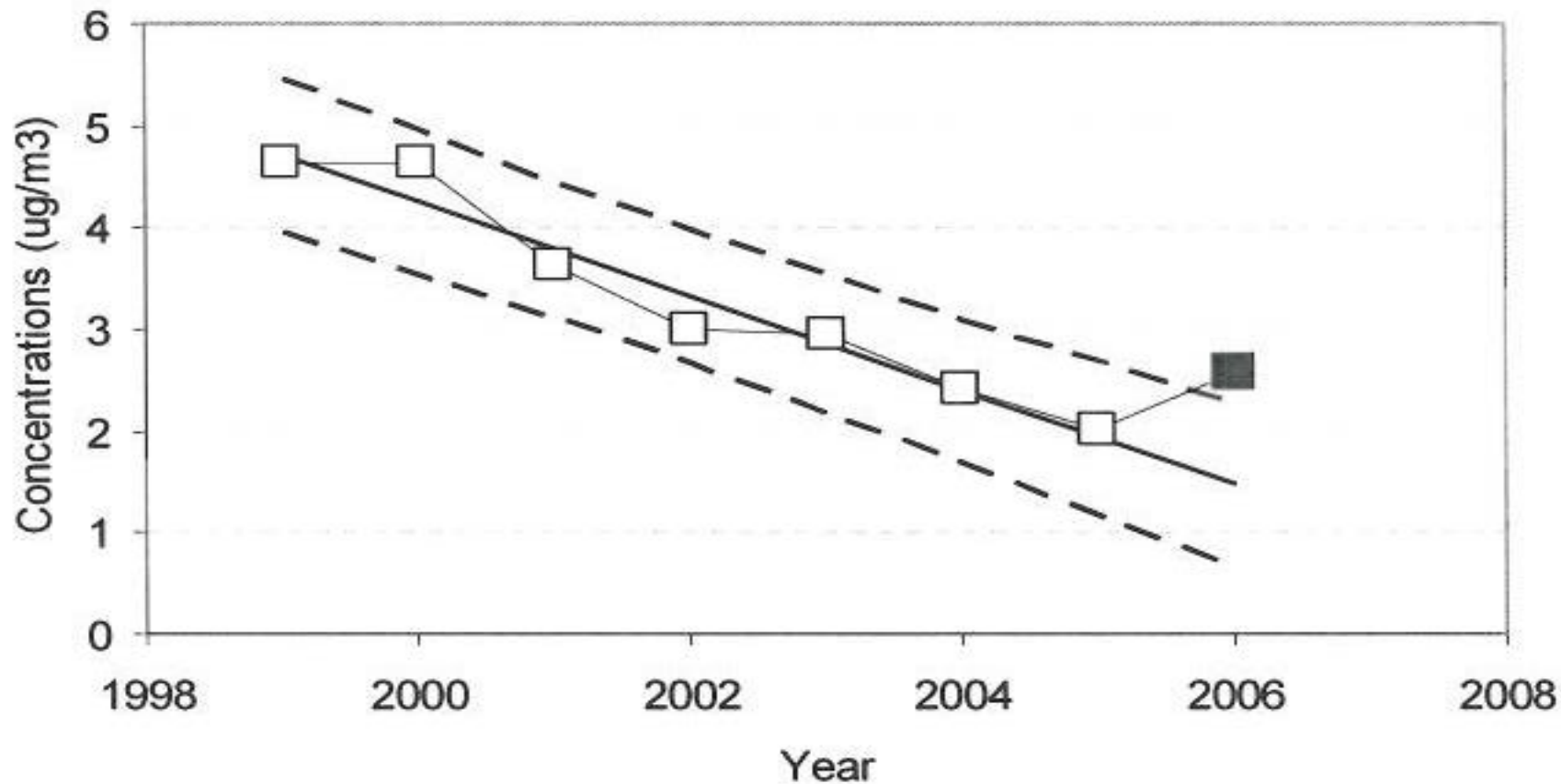
MAML

Cruise Ships

Hazard Identification

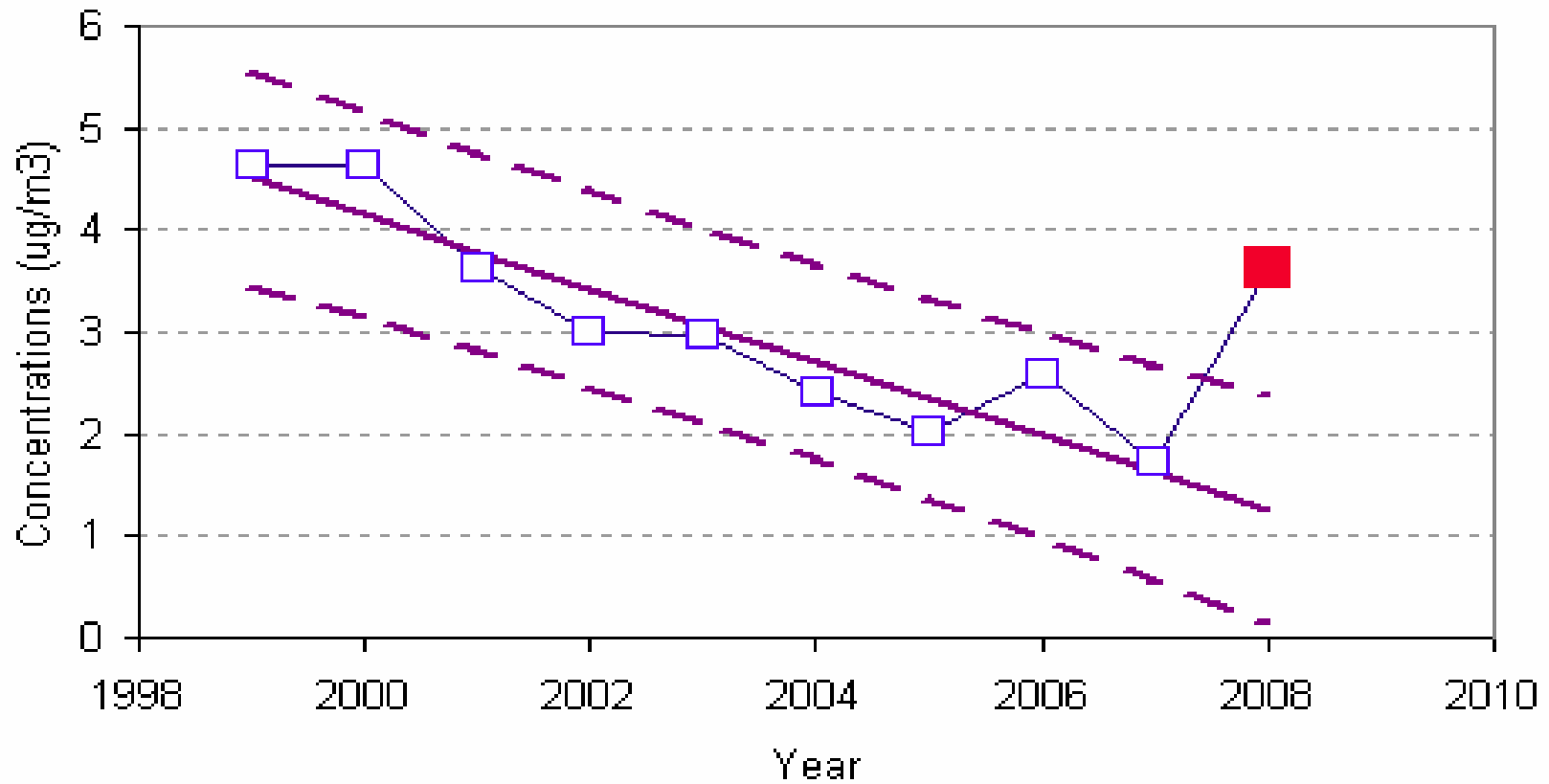
Figure 5.3
SO₂ Trend at Victoria Topaz

Victoria Topaz E231886 - SO₂ - Mean



SO2 Trend at Victoria Topaz

Victoria Topaz E231886 - SO2 - Mean

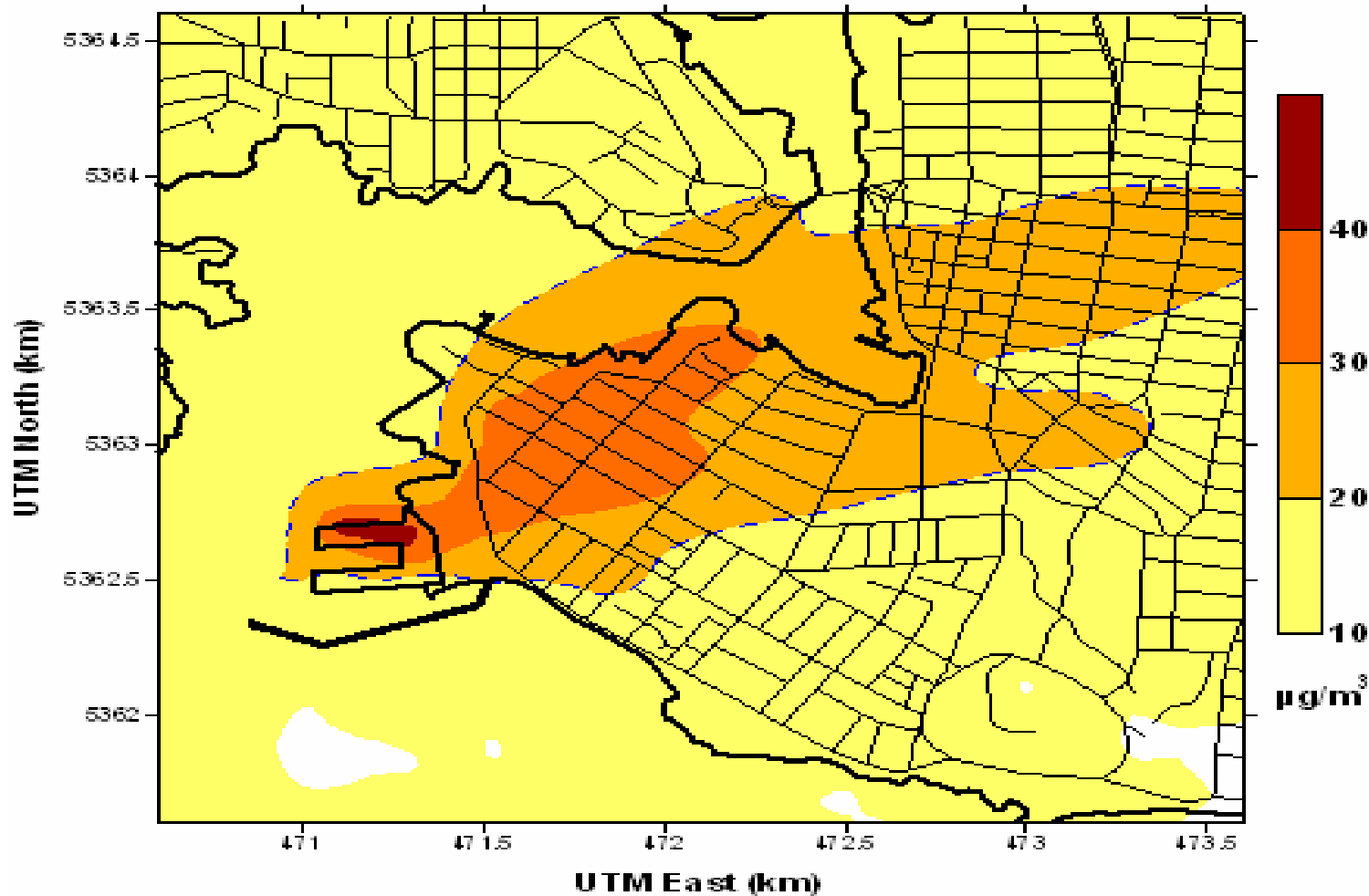


—□— Annual Values — Fitted Line - - - LCL
- - - UCL ■ Outliers

Canadian Cities with the Highest & Lowest Annual Mean SO₂

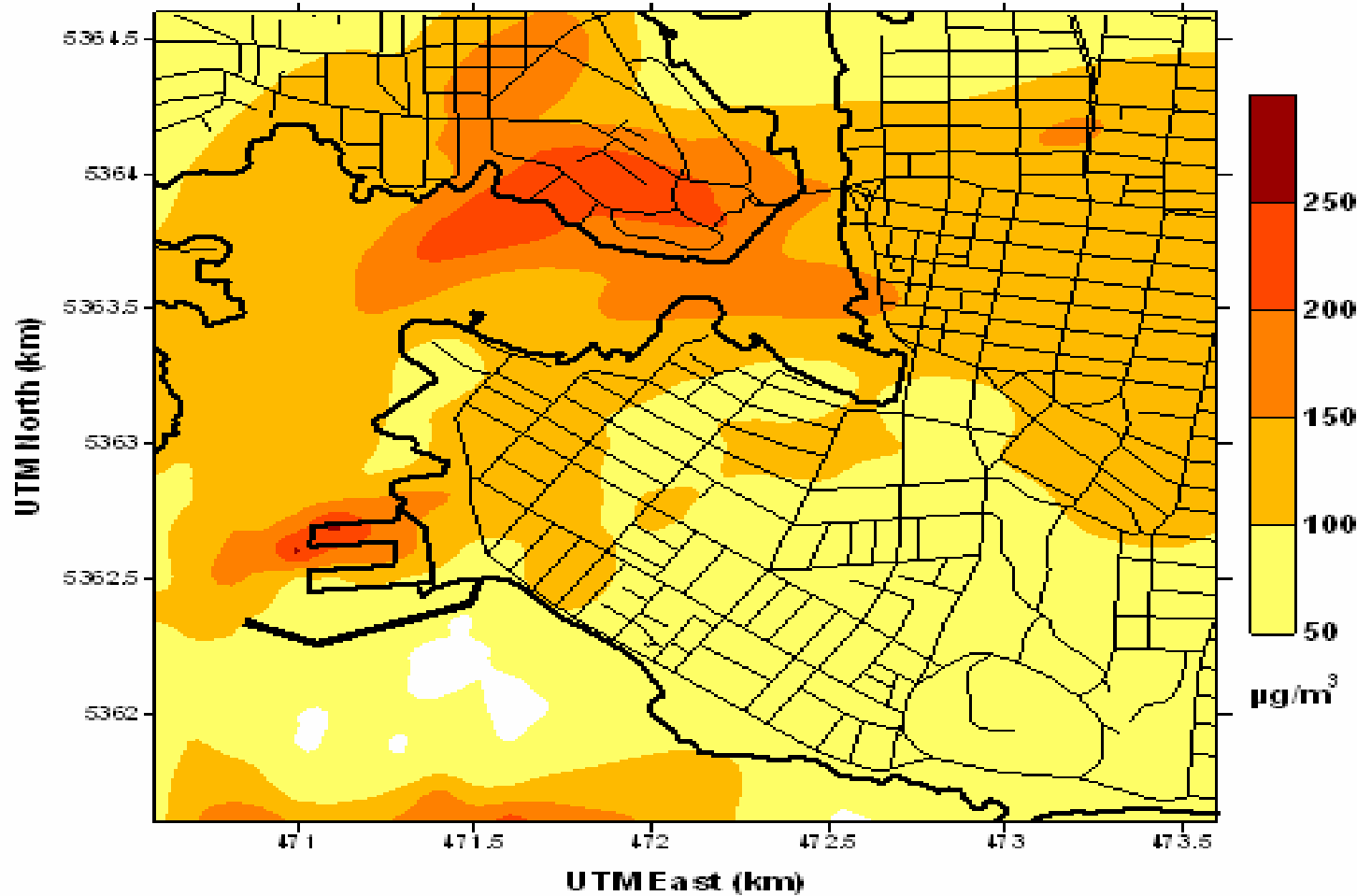
Study of 12 Canadian Cities (Burnett et al 2004)	SO ₂ (µg/m ³)
Halifax	25.2
Hamilton	24.6
Edmonton	6.0
Winnipeg	2.4
James Bay – predicted maximum	4

Max 24-hr Concentration of SO₂



James Bay Air Quality Study: Phase II, 2009

Max 1-hour Concentrations of SO₂

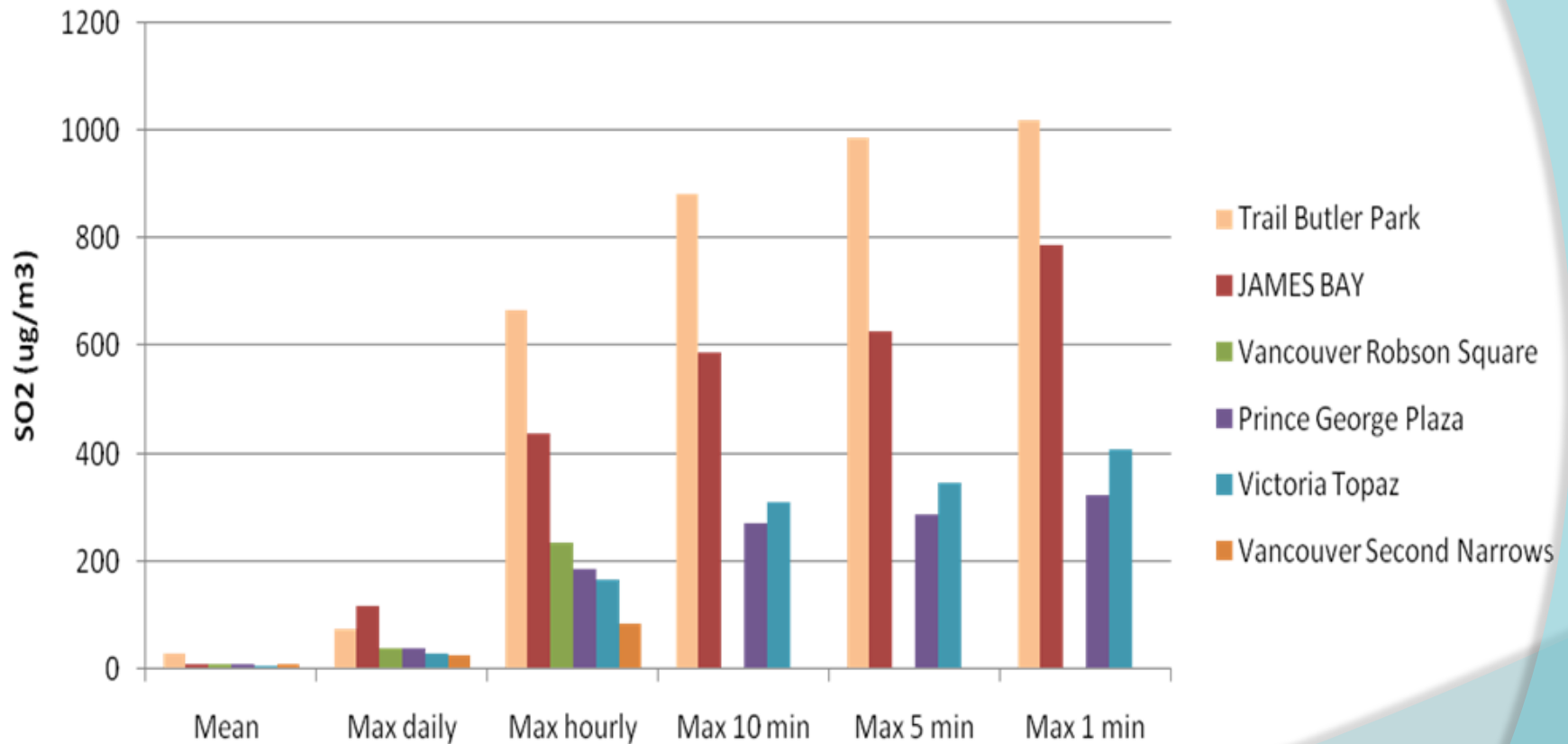


James Bay Air Quality Study: Phase II, 2009

Predicted vs Measured Maximum SO₂ (µg/m³)

	Predicted	Measured	Guidelines or Standards		
			EPA (2010)	WHO (2005)	Canadian (1989)
	James Bay	James Bay			
10 min		599		500	
1 hour	163	448	200		450
24 hour	40	124		20	150

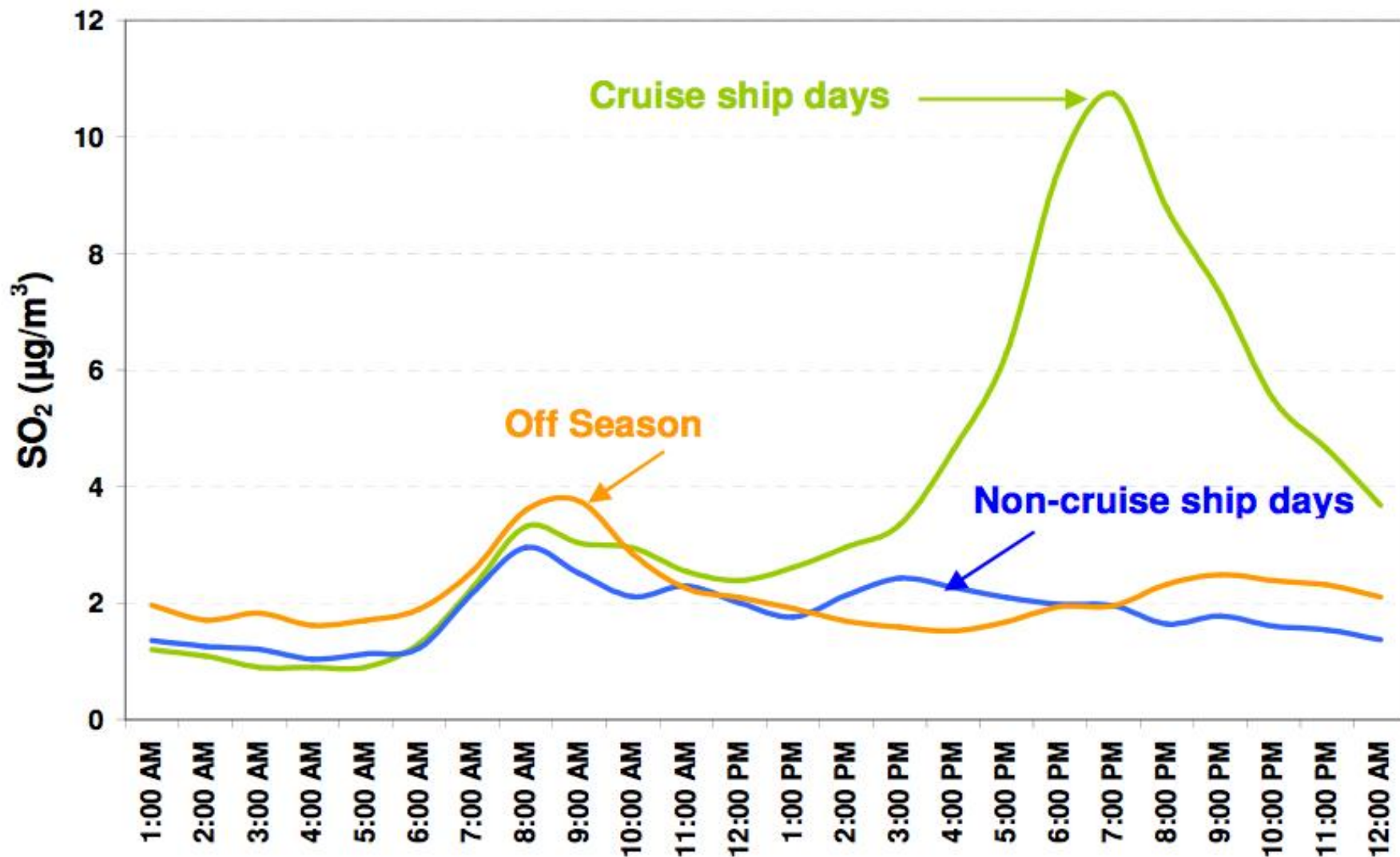
SO₂ Results (June-August 2009)



Exposures



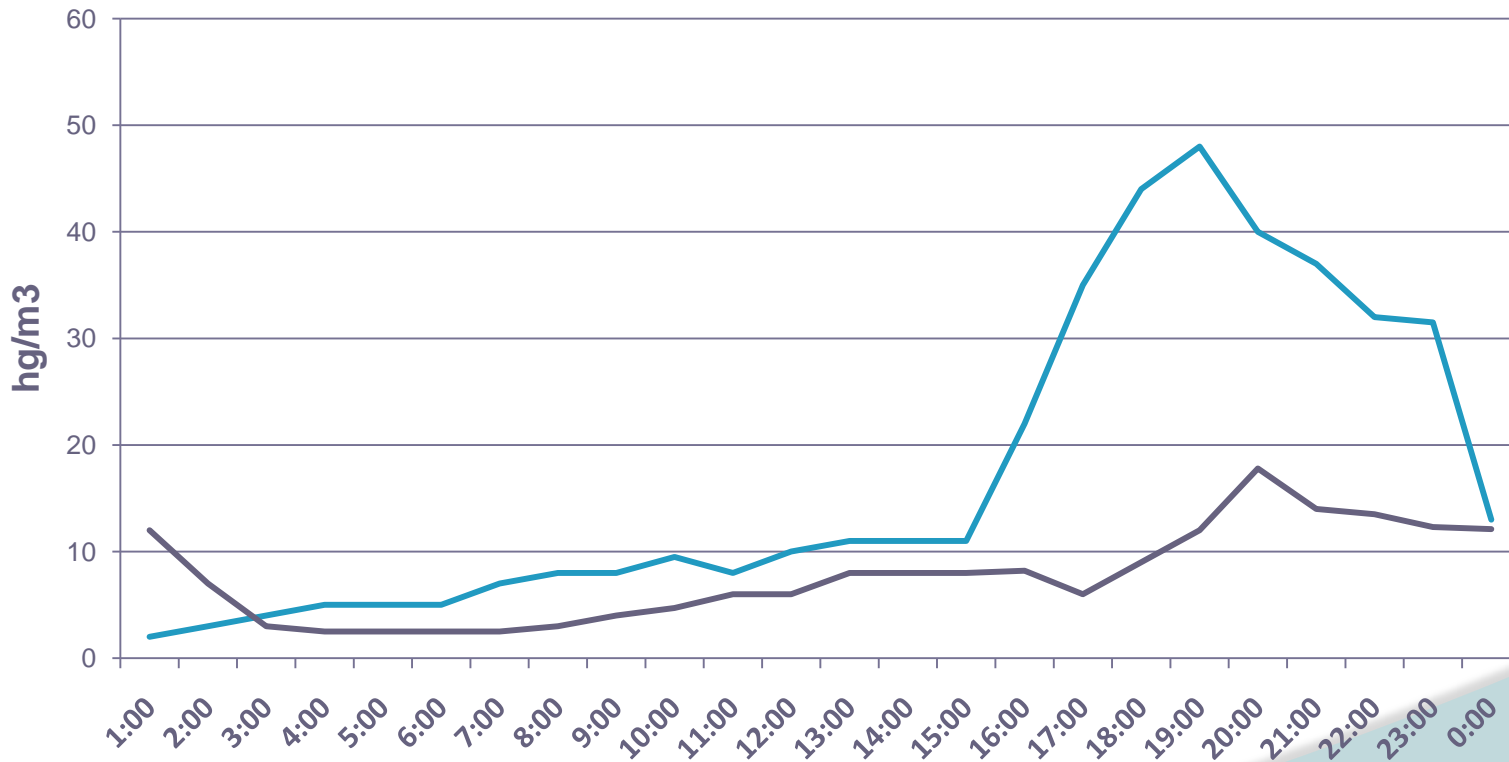
Figure 26. Average diurnal pattern of SO₂ at Topaz Station, 2006 on days with cruise ships, days without, and off season



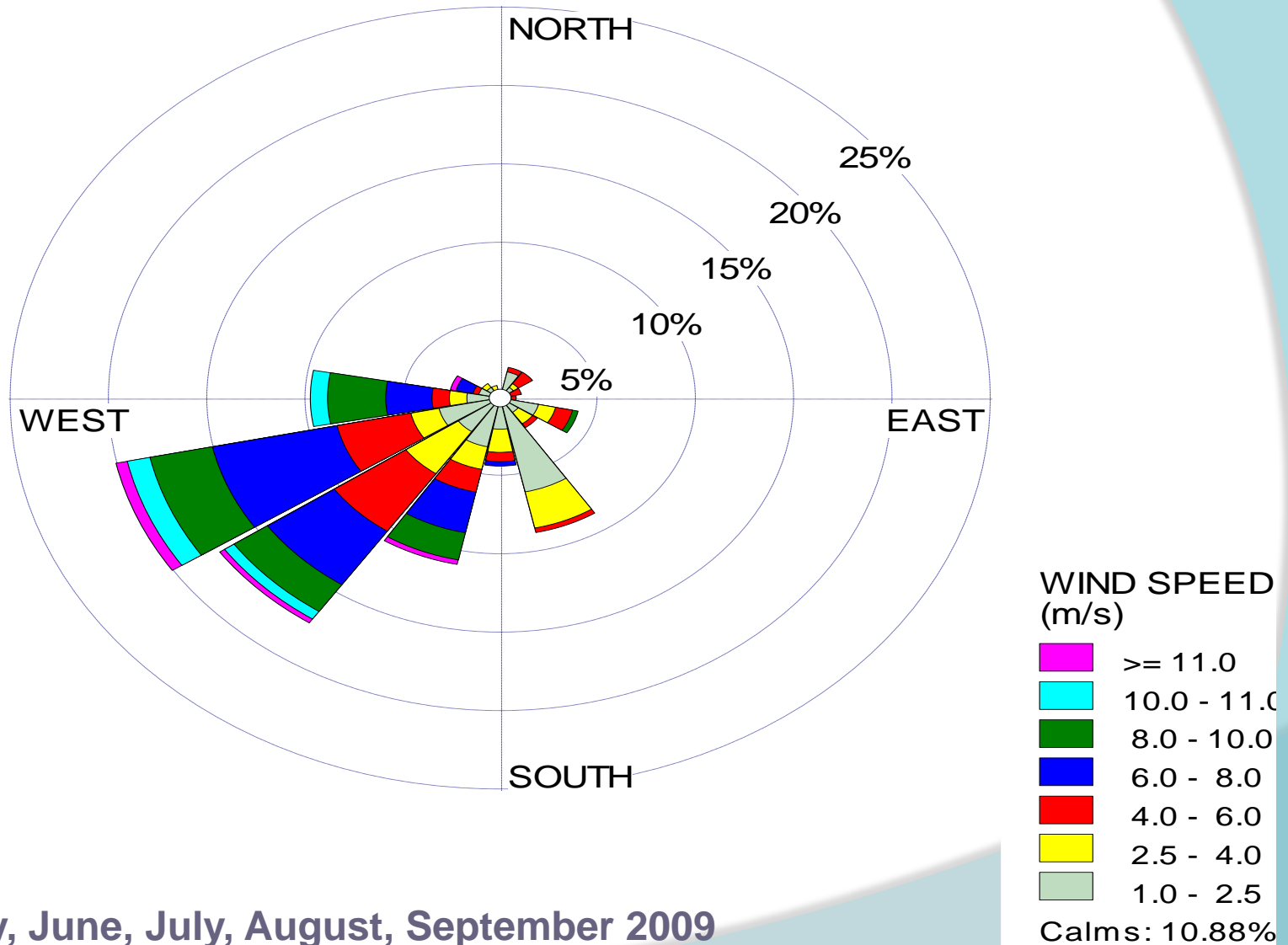
Diurnal Pattern

SO₂ Levels Measured by MAML and Topaz stations
June-August 2009

— MAML — Topaz Station



Wind direction and Meteorology



May, June, July, August, September 2009



Victoria West

Victoria, BC, Canada

James Bay

Victoria-BC-Port-Angeles-WA

Victoria-BC-Seattle-WA

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Image © 2011 DigitalGlobe
© 2011 Google

©2009 Google

48°25'19.34" N 123°22'59.55" W elev 0 m

Eye alt 3.87 km

Dose-response

SO₂: Potential Health Effects

Very Short Term (minutes)

Short term (1 hour)

Medium Term (24 hour)

Long Term (Annual)

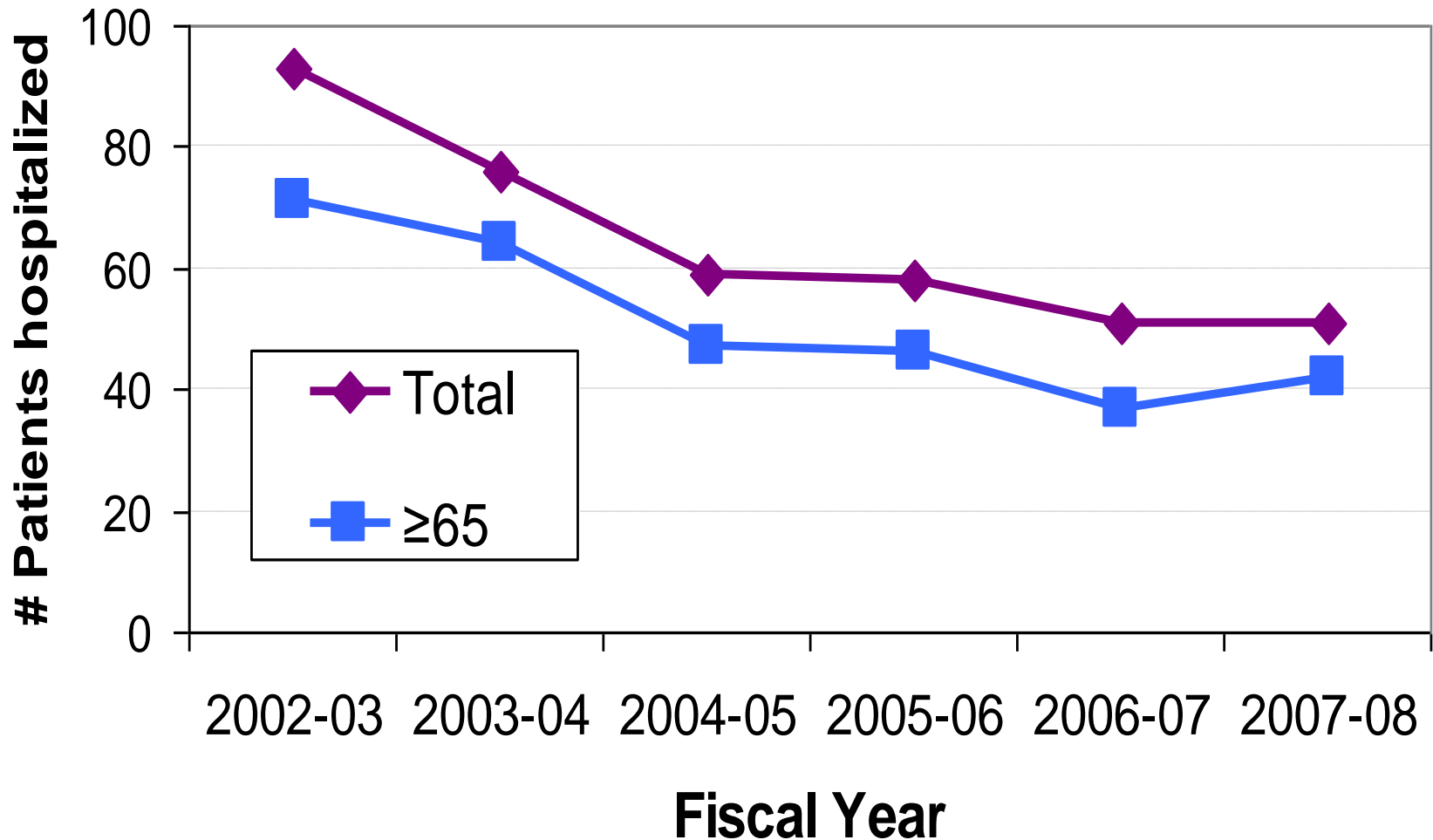
Characterization



Susceptible population with respiratory illness in James Bay

Consultation with a physician for Asthma or Acute & Chronic Obstructive Pulmonary Disease among residents of James Bay			
Diagnosis	Age Group	# Patients	% of Population
Asthma	≤ 15	41	5%
	≥ 65	91	3%
Acute & Chronic Obstructive Pulmonary Disease	≥ 65	259	8%

Hospital Discharges for Asthma & COPD, James Bay 2002-2008



Health

Assessment/Review

Summary

- ❑ Hazard - SO₂ is Pollutant of Concern

- ❑ Exposure - Neighborhood level assessment
 - ❖ Evenings/ weekends/ highest SO₂ conc.

- ❑ Dose-Response - Peaks of high SO₂ affect vulnerable population
 - ❖ Refer to recent EPA/ WHO health-based guidelines

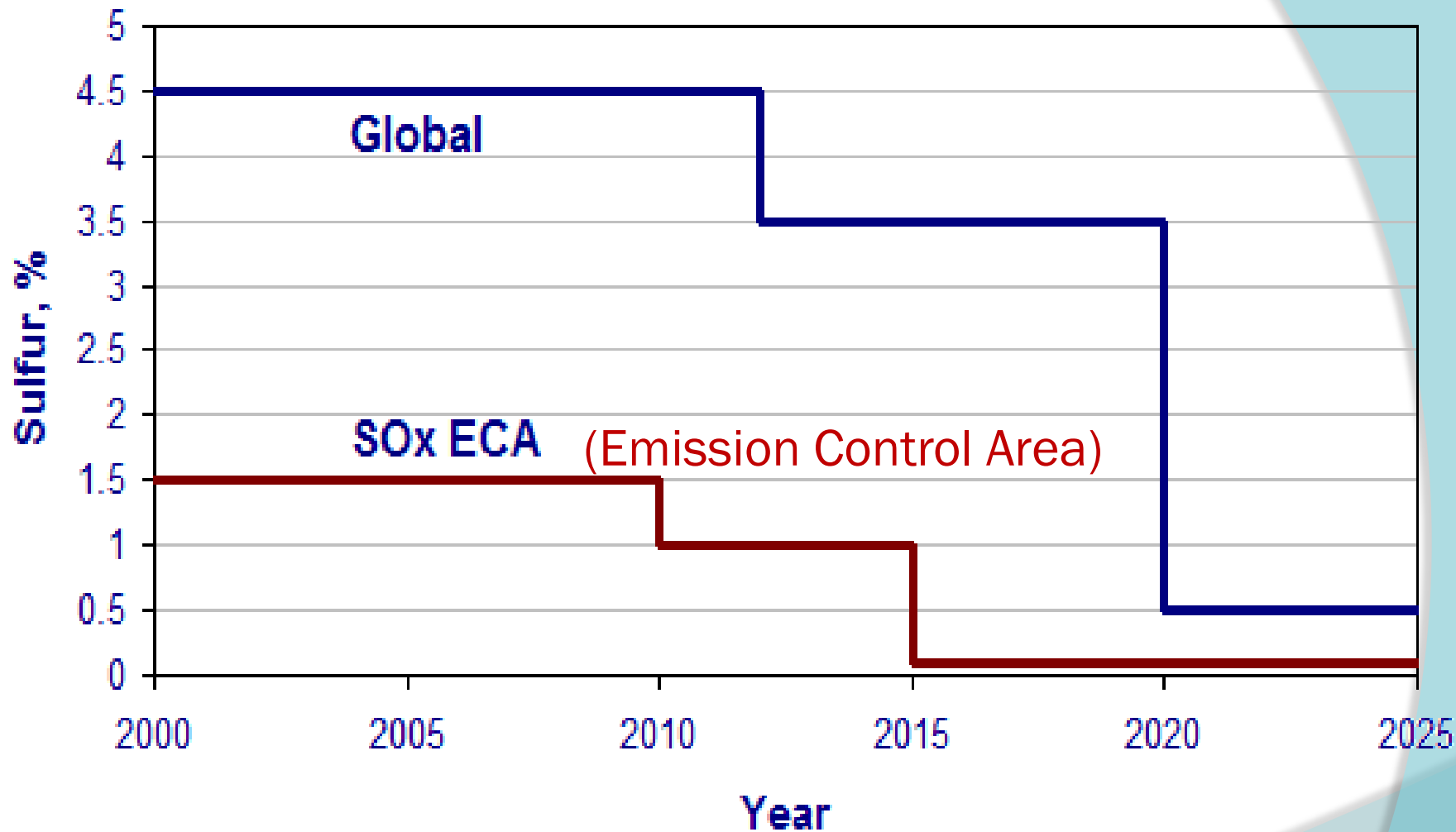
- ❑ Health Assessment - WHO/EPA Risk Assessments/
Epidemiologic literature

Health Assessment/ Review

- ❑ No measurable long term health effects
- ❑ Adverse health effects possible to short term peaks
- ❑ Young and old asthmatics and COPD are most susceptible
- ❑ *Theoretical* range of 0.4 to 1.6 excess deaths at measured levels

Risk Management Recommendations

- ❑ Chronic respiratory conditions require management
- ❑ Staying indoors may be protective
- ❑ Voluntary use of low sulfur fuel by industry
- ❑ Continue SO₂ monitoring and real-time reporting



MARPOL Annex VI Fuel Sulfur Limits Canada

Outcomes 2011-2014

- ❑ Voluntary compliance by Industry - expected
- ❑ Three year continuous monitoring SO₂ - MOU VIHA/MOE
- ❑ VIHA to monitor adverse health outcomes - hospital admissions and report
- ❑ Communication Plan – Web/Media - SO₂ Levels plus Health Risk info

team work *really* helps

