

City of Saskatoon Air Quality Monitoring Survey

May 10, 2017

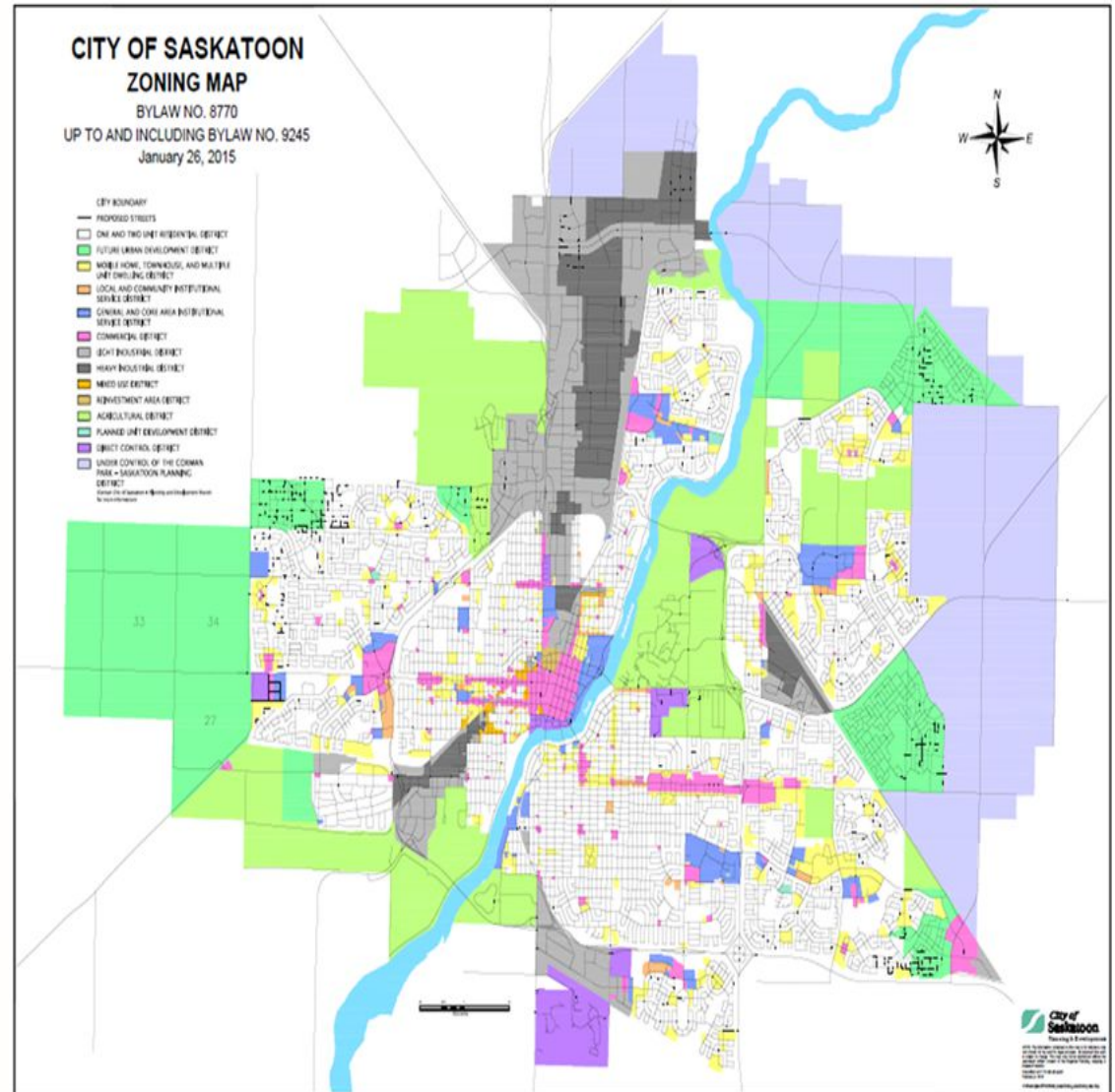
Chris Gray
Environmental Protection Branch
Saskatchewan Ministry of Environment

Background

- Proposal was put forward in May 2014 for Monitoring study in Saskatoon
- Officials met in July 2014 to discuss objectives
- Study Objectives:
 - Obtain information on pollutant levels in a broader range of areas in the city
 - Identify and quantify other air pollutants
 - Establish criterion in which future studies can be compared against
 - Determine if and where additional permanent monitoring stations may be located
- Study was conducted from August 2014 to July 2015

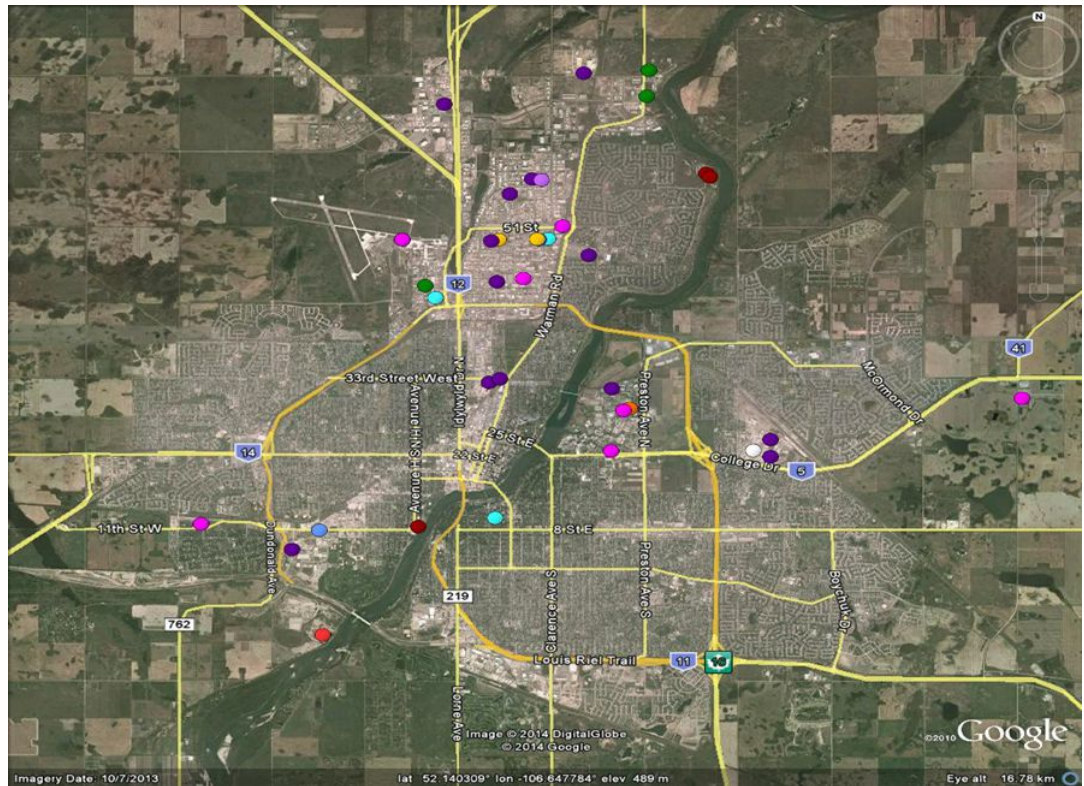
Site Selection

- Zoning map of city was obtained
- Sampling occurred primarily in residential areas (White)
- Additional sampling occurred near industrial areas (light and dark grey) and agricultural areas (light green)



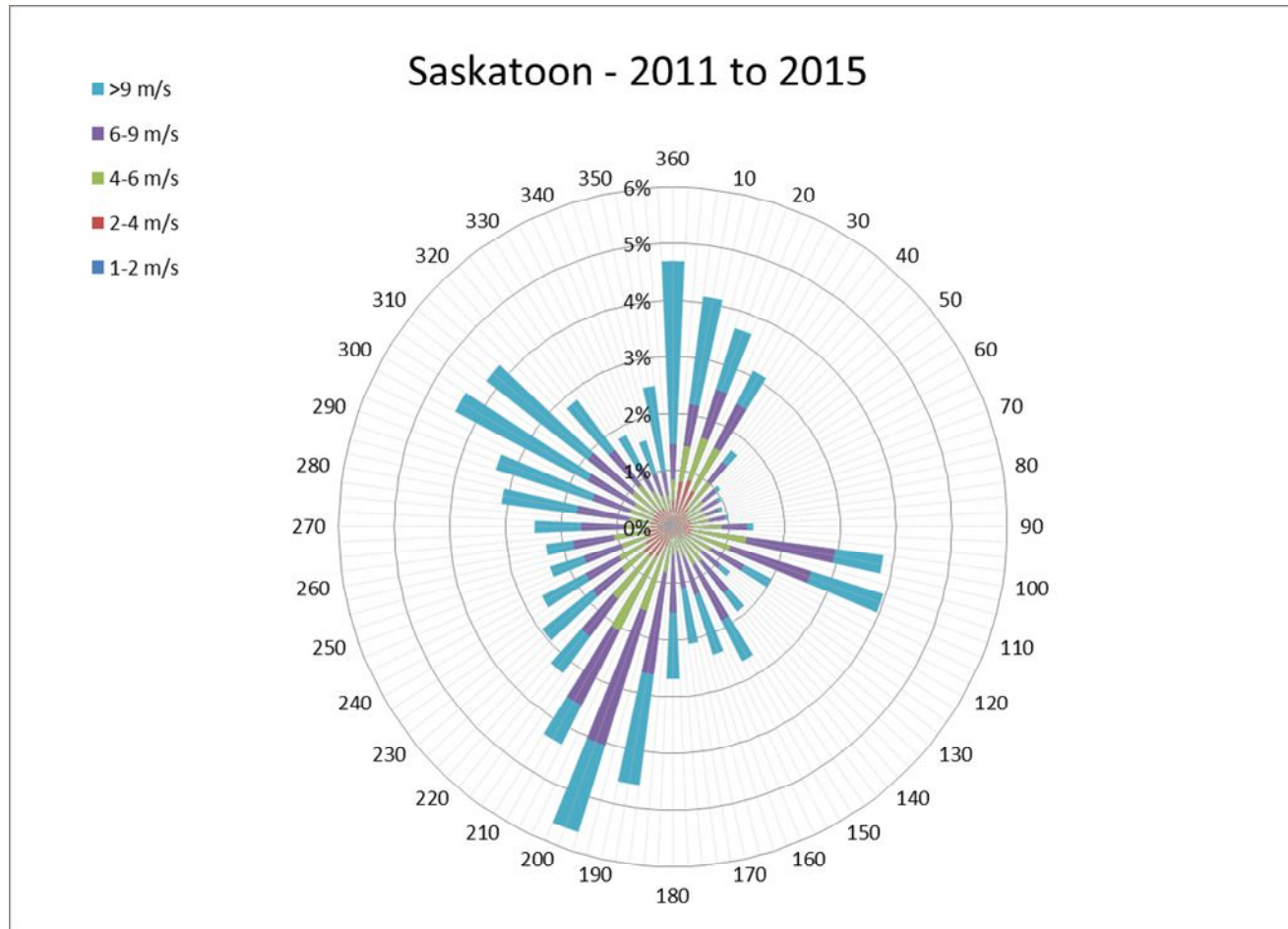
Site Selection

- NPRI data was obtained
- Appropriate sampling locations based on locations of various industries in proximity to residential areas
- Note: Non-industrial and vehicle emissions are not included in NPRI and account for a major source of SO₂, NO₂, VOCs, and PM_{2.5}



Colour Code	Sector (as per the National Pollutant Release Inventory)	SO ₂ tonnes	NO ₂ tonnes	VOC tonnes	PM _{2.5} tonnes
●	Chemicals	0.001	20.293	-	4.644
●	Electricity	503	-	-	3
●	Mining	57.3	-	-	54.8
●	Oil & Gas Pipelines & Storage	-	-	358.588	-
●	Other (Except Manufacturing)	-	61.89	-	2.168
●	Other Manufacturing	0.01	-	4.327	7.202
●	Petroleum and Coal Products Refining and Manufacturing	-	-	-	0.646
●	Plastics and Rubber	-	-	-	41.993
○	Transportation Equipment	-	2	21.589	0.144
●	Waste Treatment and Disposal	-	-	-	-
●	Water and Wastewater Treatment	-	567.85	77.853	3.91
	Non-Industrial Emissions*	20099.3	9007.5	655.5	558.0
	Vehicle Emissions*	27.0	10409.3	3476.0	35194.0
	2014-2015 Total for the Saskatoon Region	560.311	652.033	462.357	118.507

Meteorological Data



Monitoring Locations

- 5 continuous monitoring locations
 - 1 NAPS
 - 4 SAML
- 20 passive monitoring locations
 - 2 background, north and south of city limits

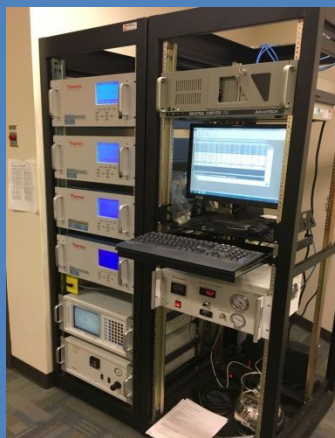


Monitoring Method

Continuous



Continuous



Passive



Mobile Lab (SAML)

NAPS

Passive

Hourly Data

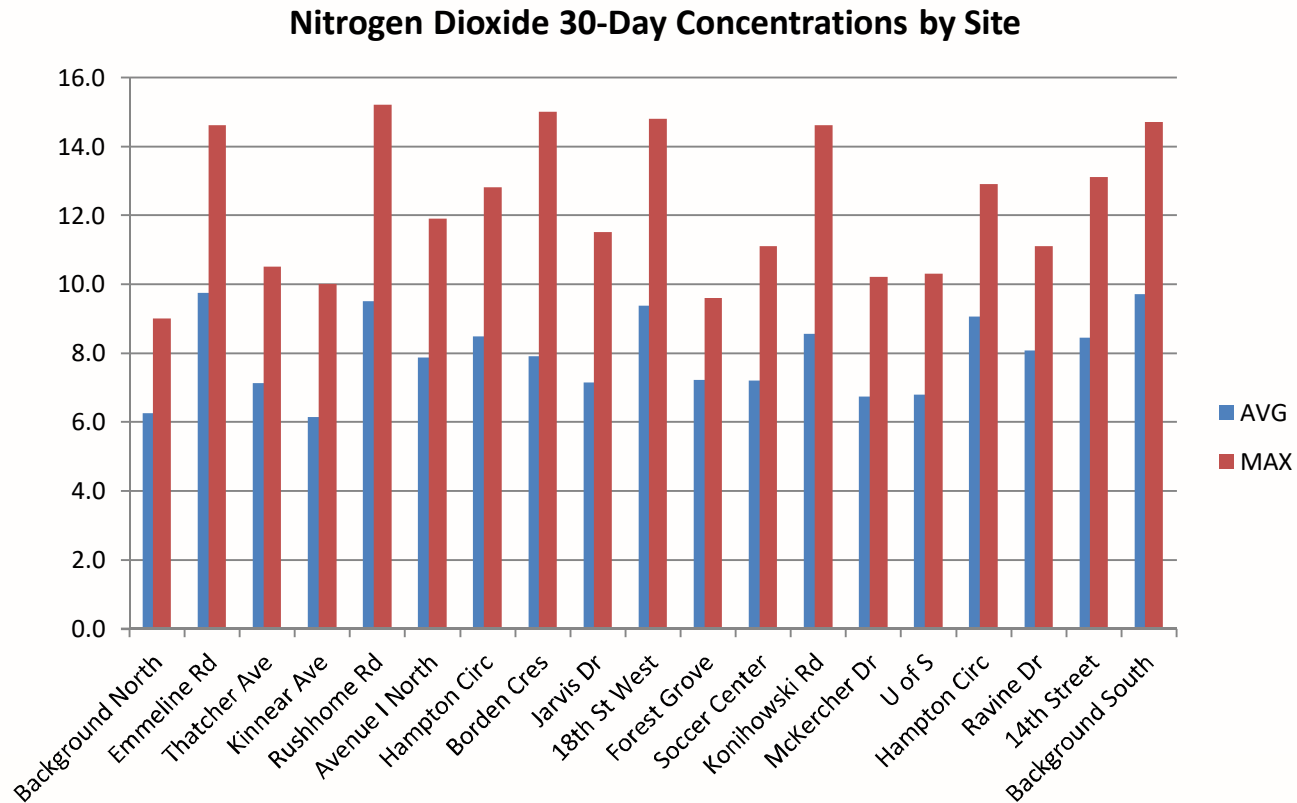
Hourly Data

30-Day Average Data

Pollutants

Continuous	Continuous	Passive
Sulphur Dioxide (SO ₂)	Sulphur Dioxide (SO ₂)	Sulphur Dioxide (SO ₂)
Nitrogen Oxides (NO _x)	Nitrogen Oxides (NO _x)	Nitrogen Dioxide (NO ₂)
Ozone (O ₃)	Ozone (O ₃)	Ozone (O ₃)
Carbon Monoxide (CO)	Carbon Monoxide (CO)	
	Hydrogen Sulphide (H ₂ S)	Hydrogen Sulphide (H ₂ S)
Particulate Matter (PM _{2.5})	Particulate Matter (PM _{2.5})	
		Volatile Organic Compounds (46 VOCs including BTEX)
NAPS	SAML (4 Sites)	20 sites

Passive Data



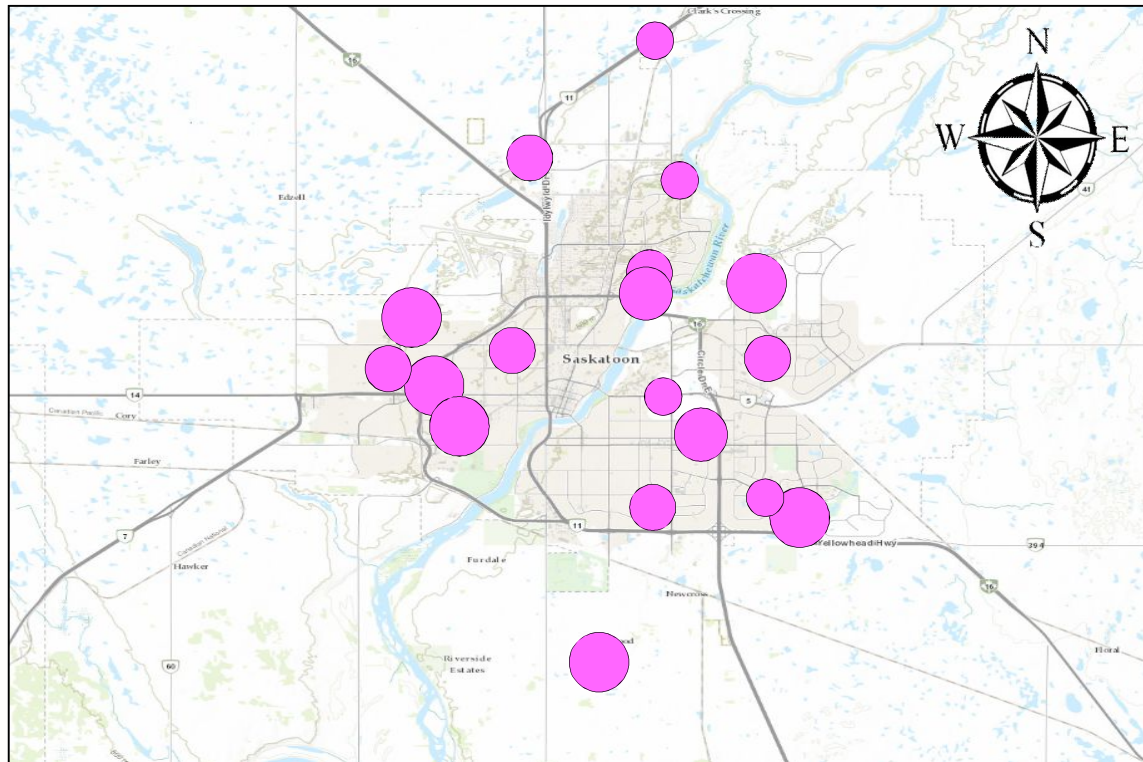
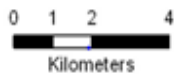
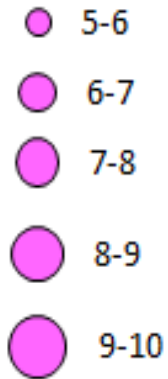
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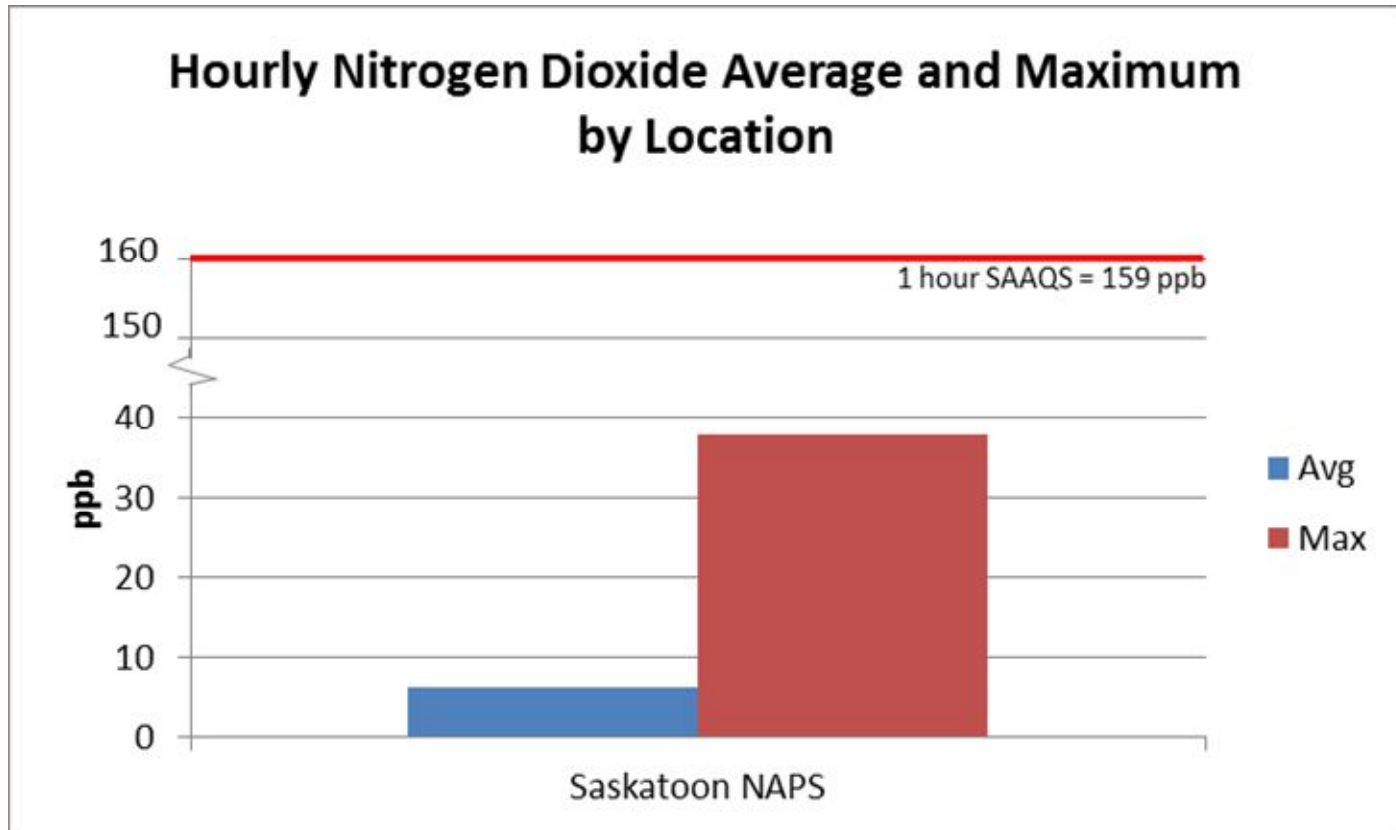
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Nitrogen Dioxide Monthly Average Concentrations (August 2014 - July 2015)

Legend NO₂(ppb)

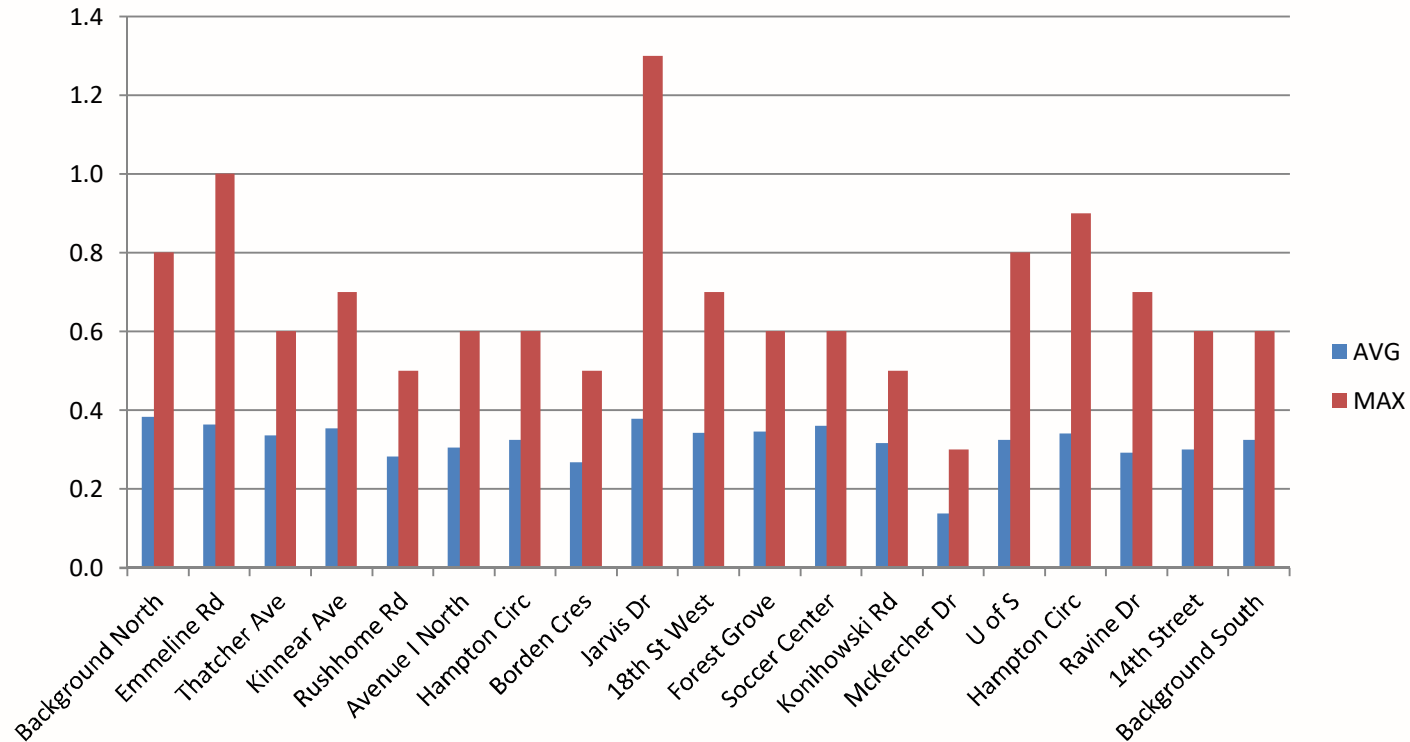


Continuous Data

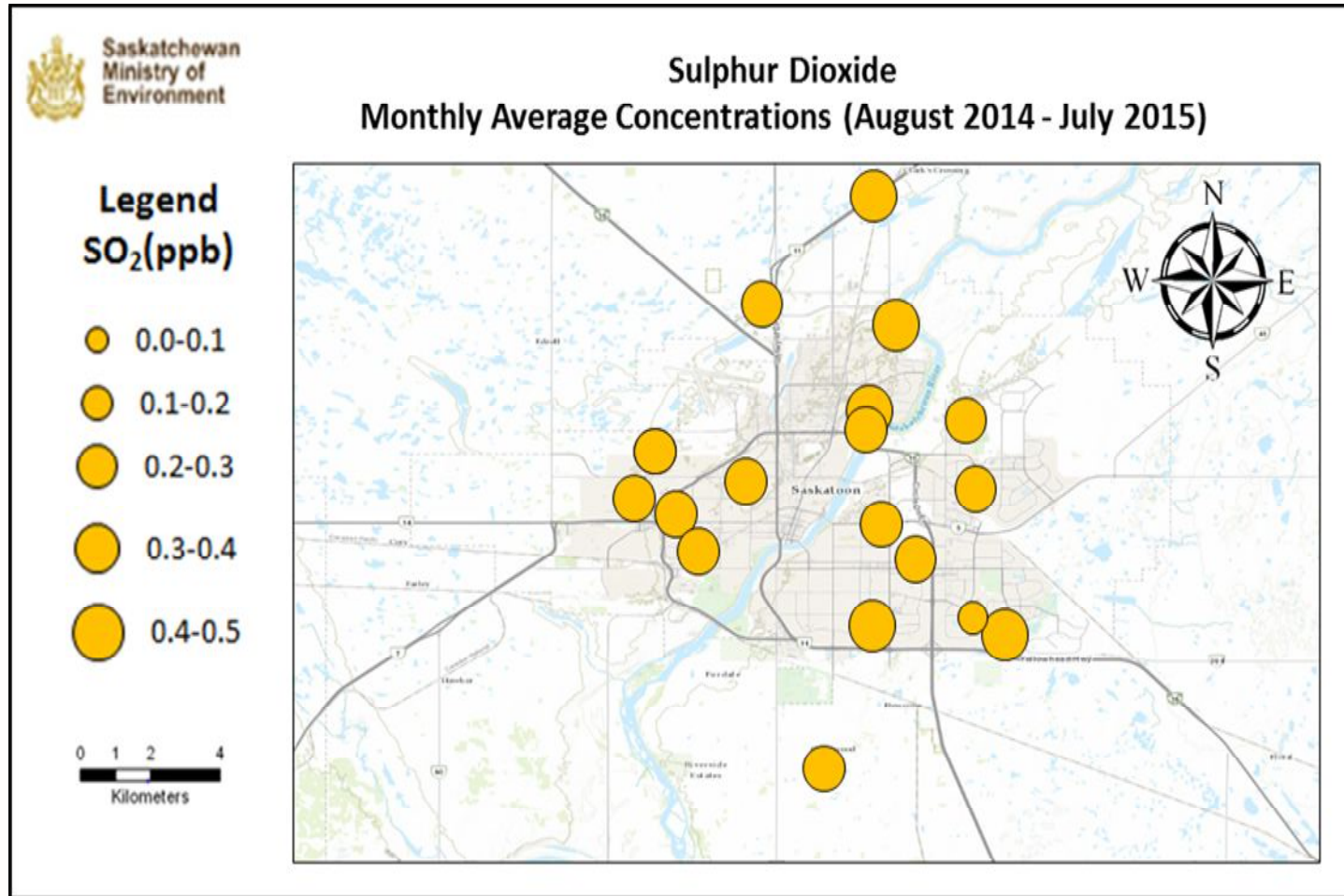


Passive Data

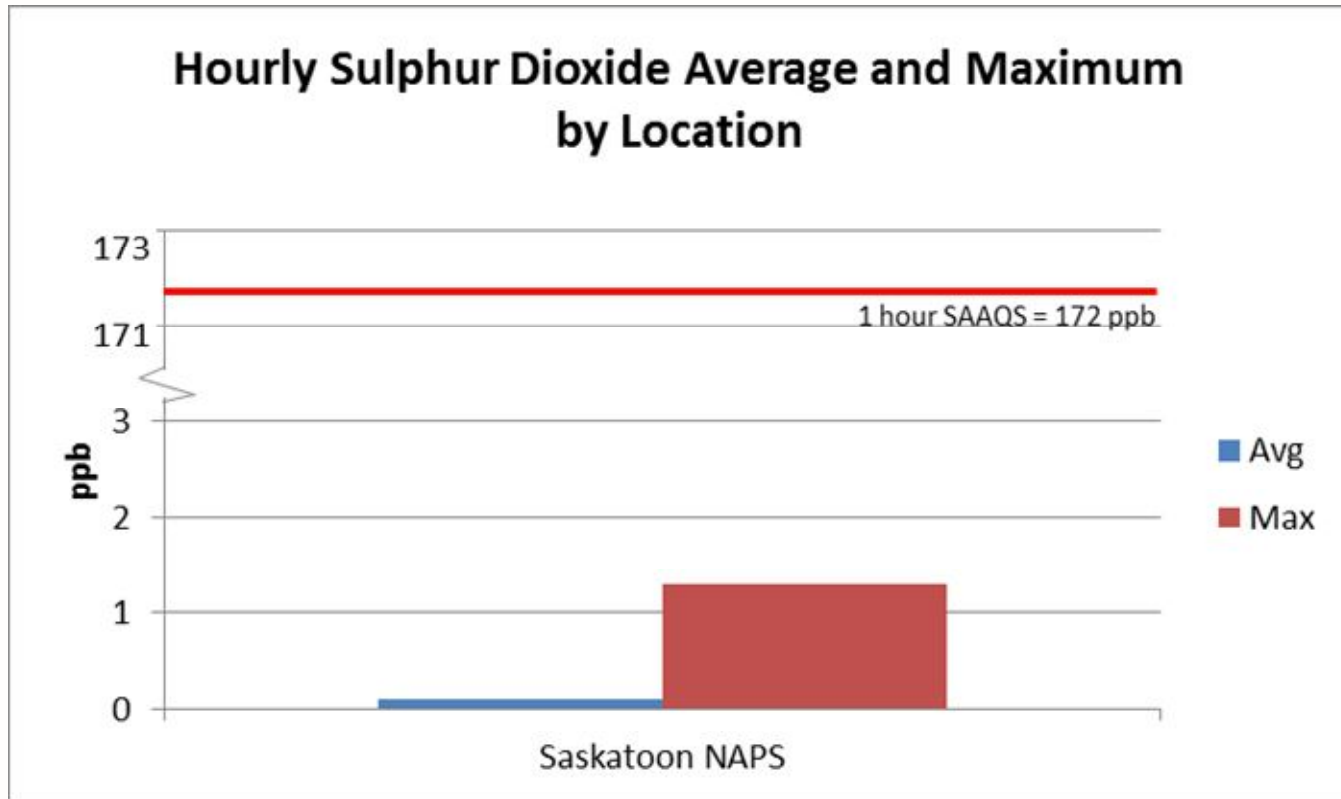
Sulphur Dioxide 30-Day Concentrations by Site



Passive Data

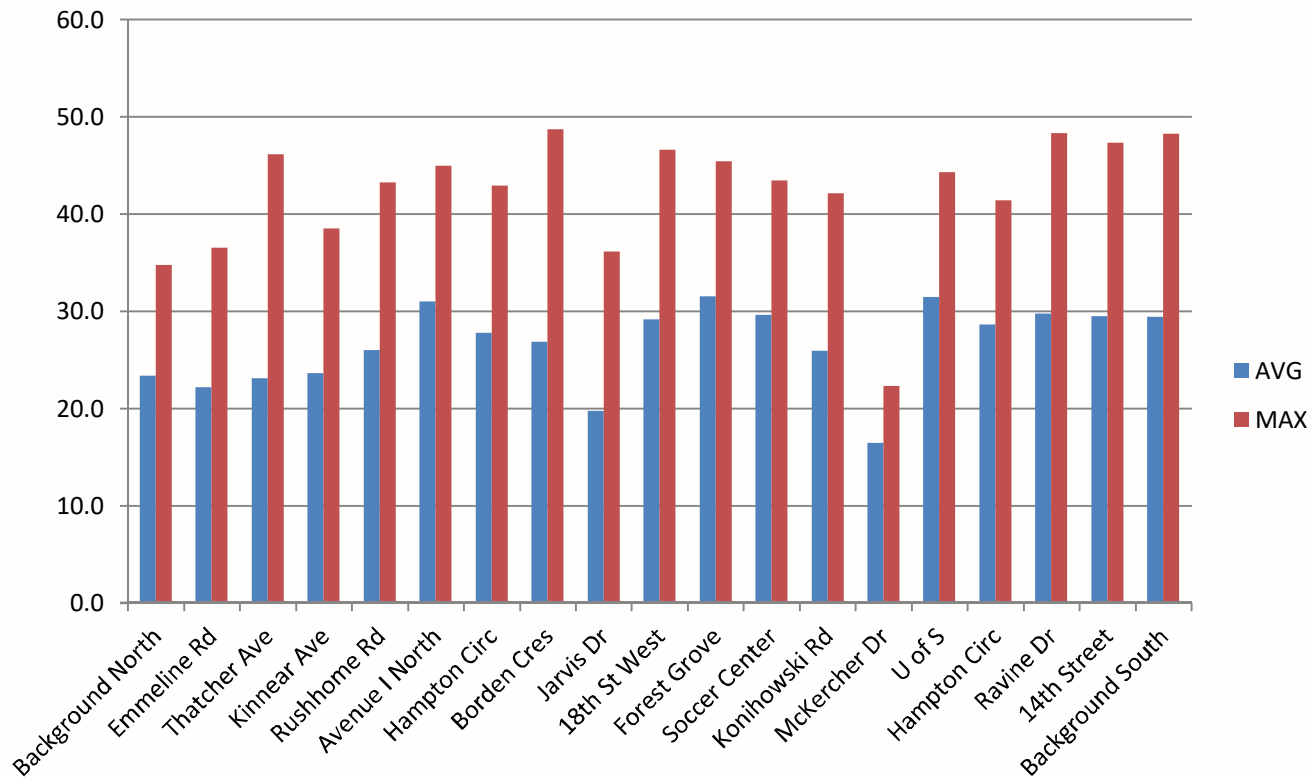


Continuous Data



Passive Data

Ozone 30-Day Concentrations by Site



Passive Data

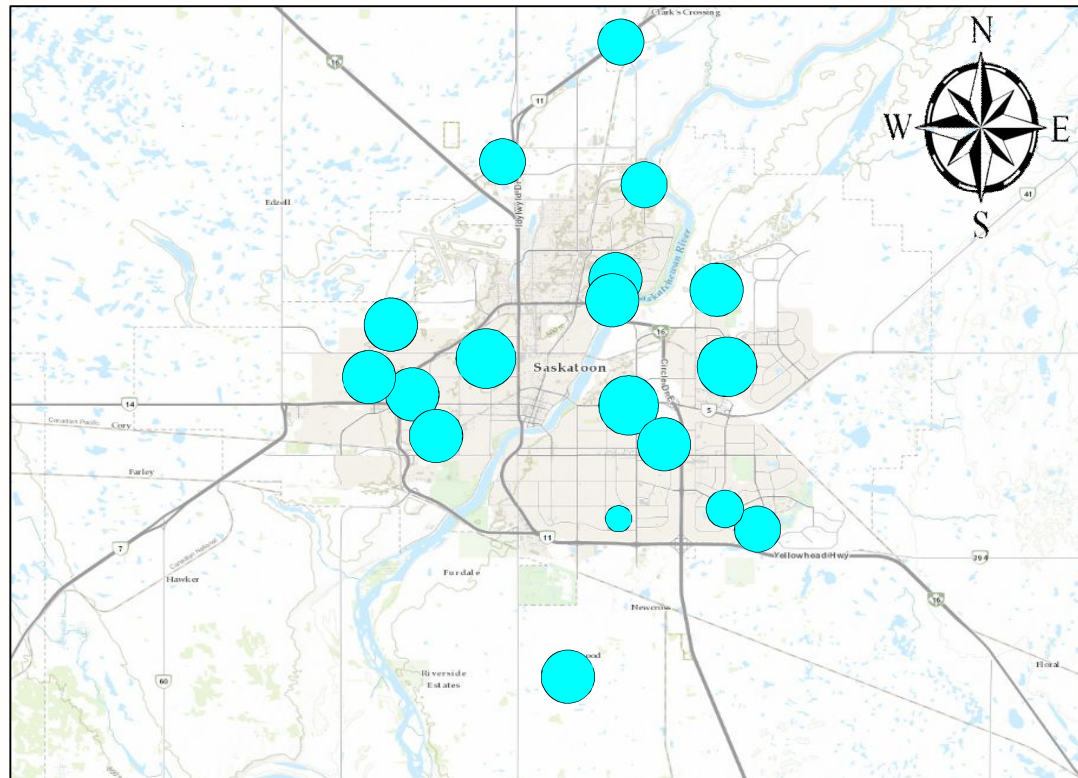
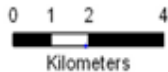


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Ozone

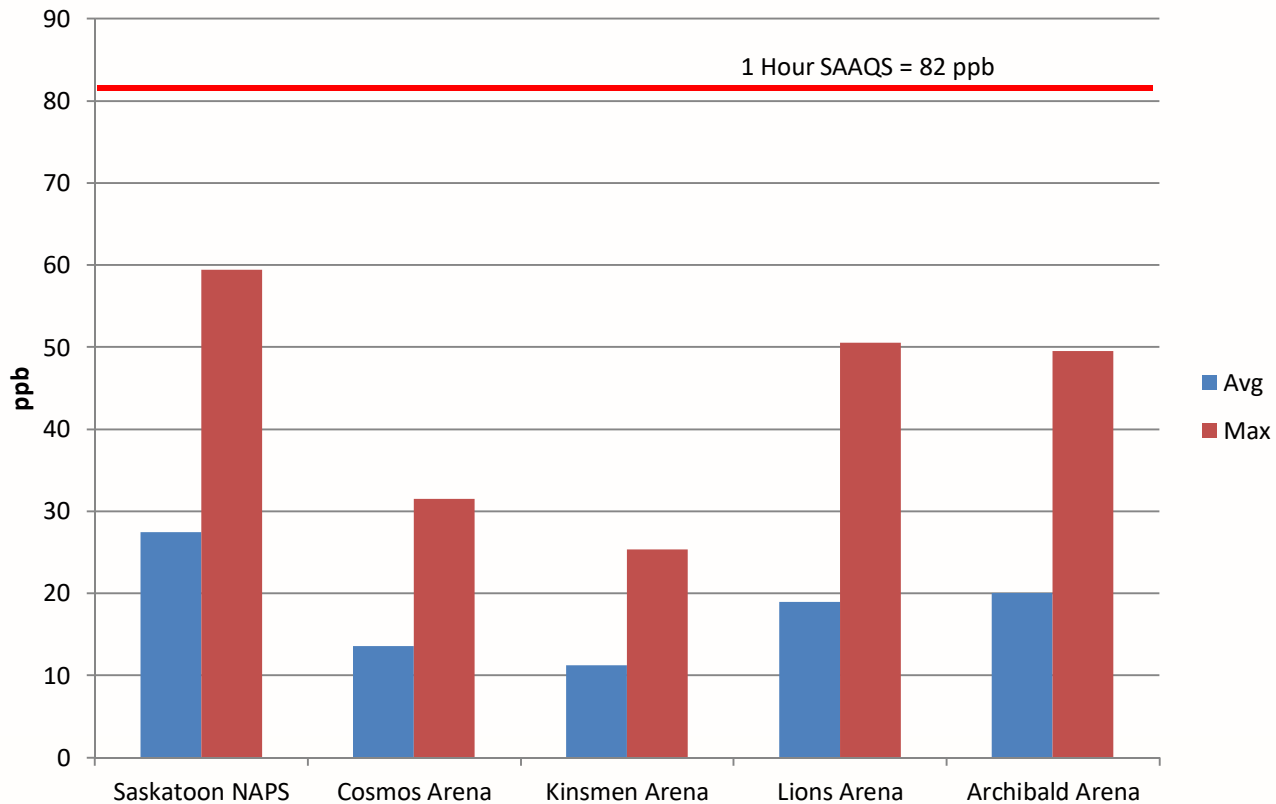
Monthly Average Concentrations (August 2014 - July 2015)

Legend O₃(ppb)



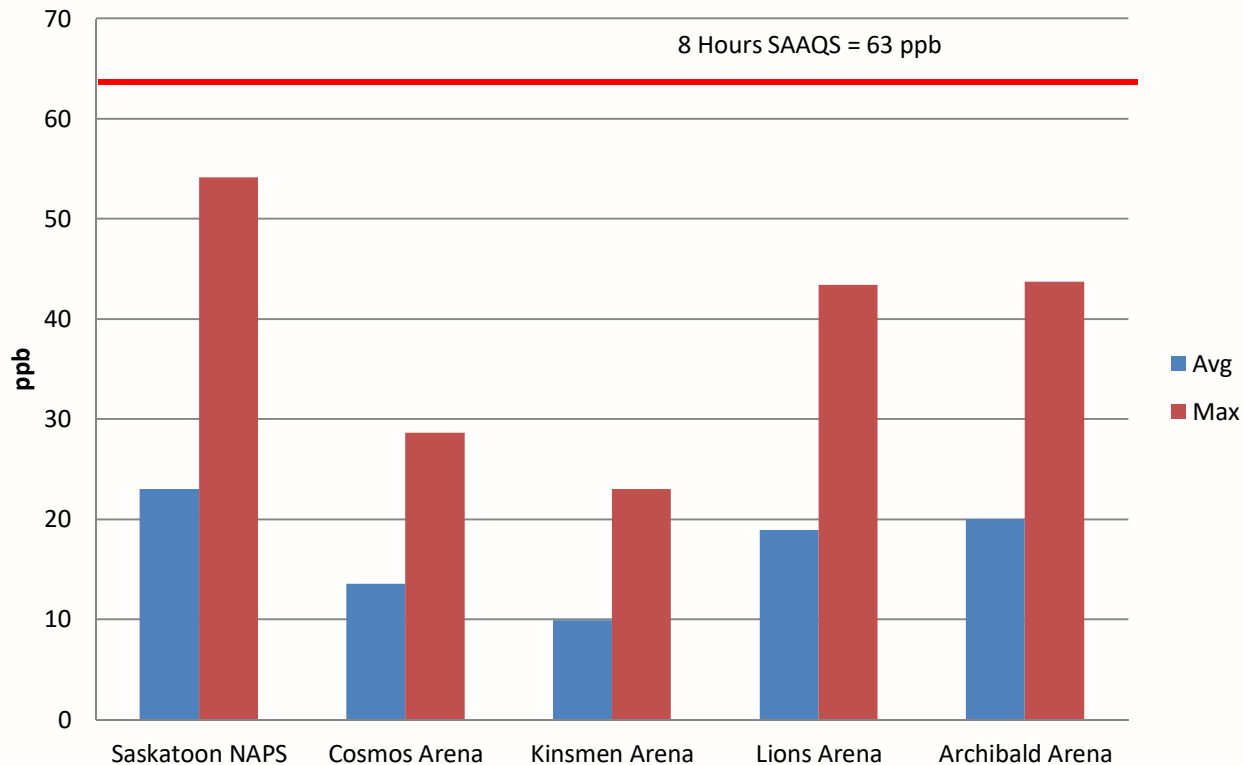
Continuous Data

Hourly Ozone Averages and Maximums by Location



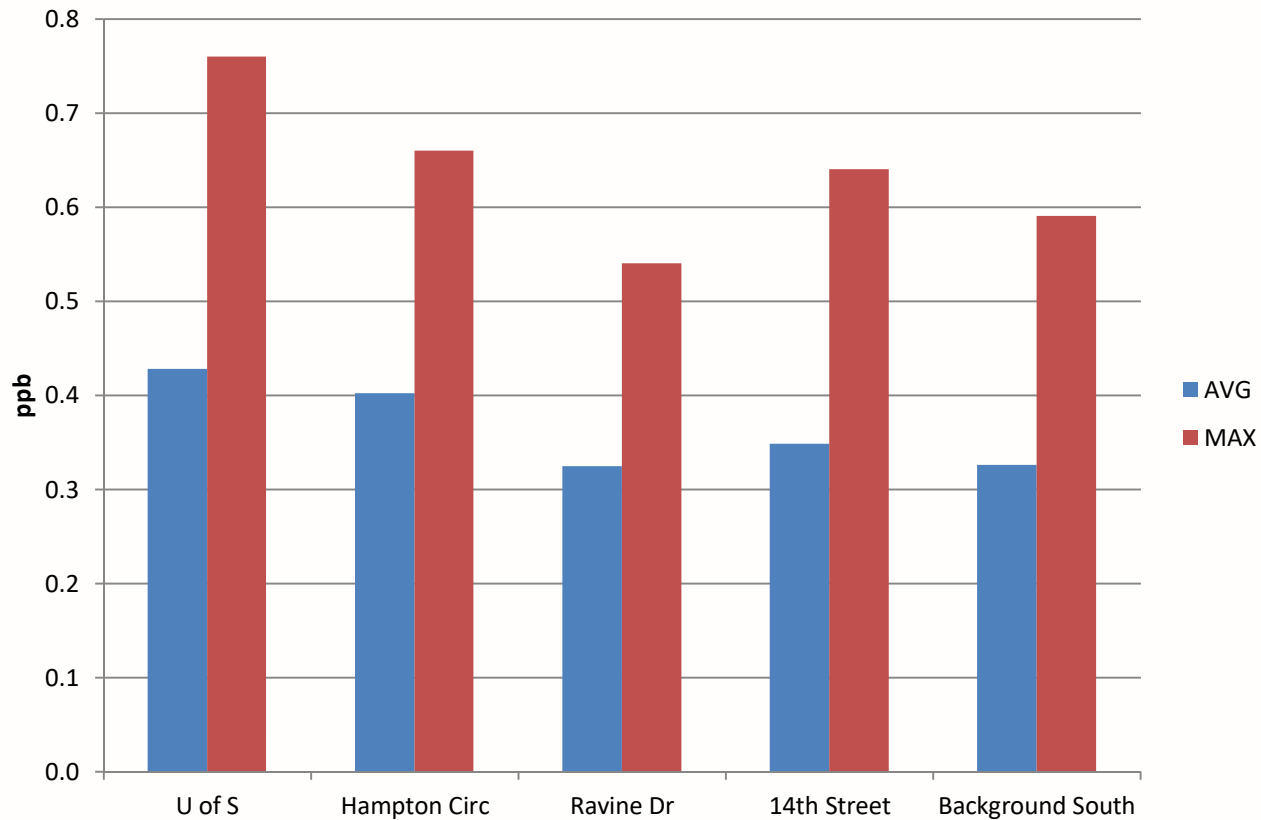
Continuous Data

8 Hour Averages and Maximums by Location

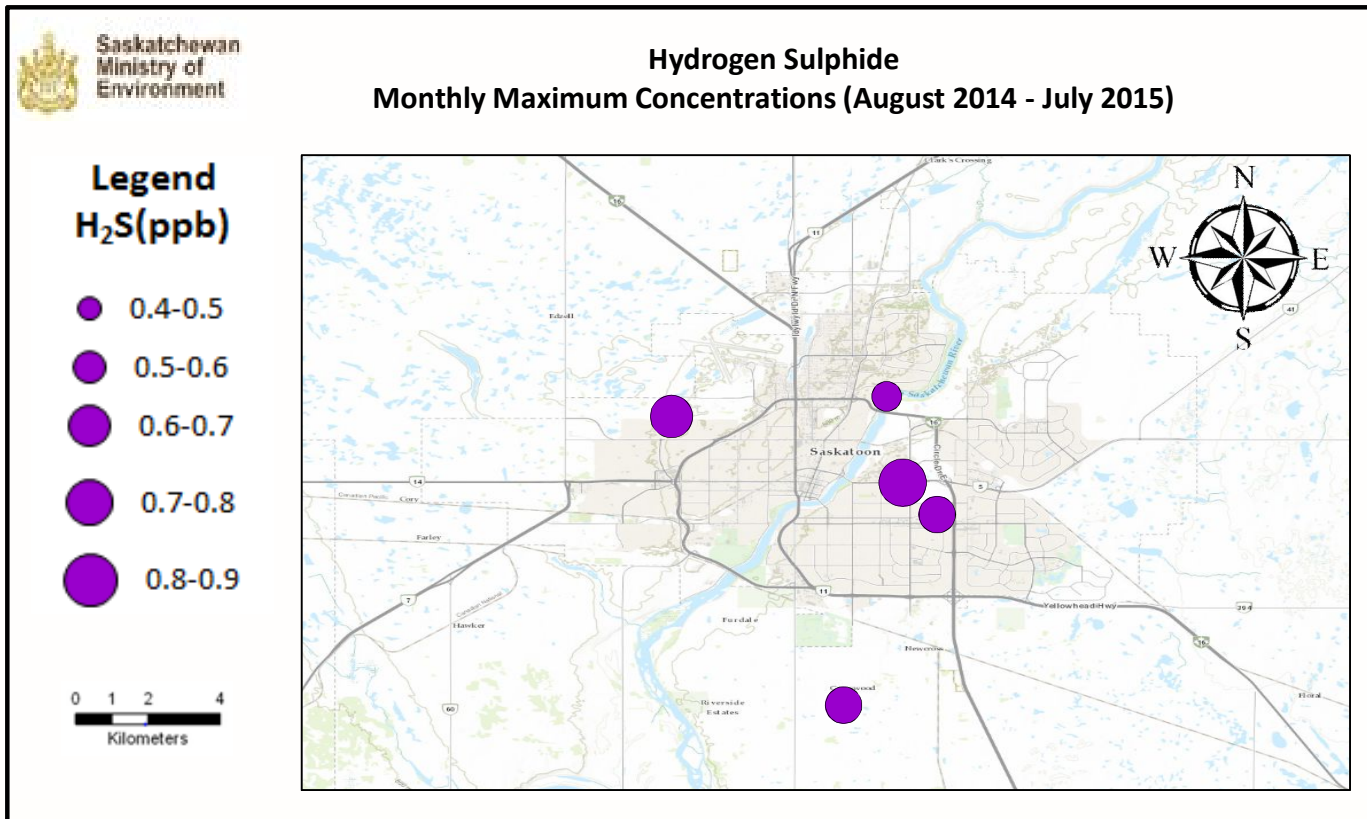


Passive Data

Hydrogen Sulphide 30-Day Concentrations by Site

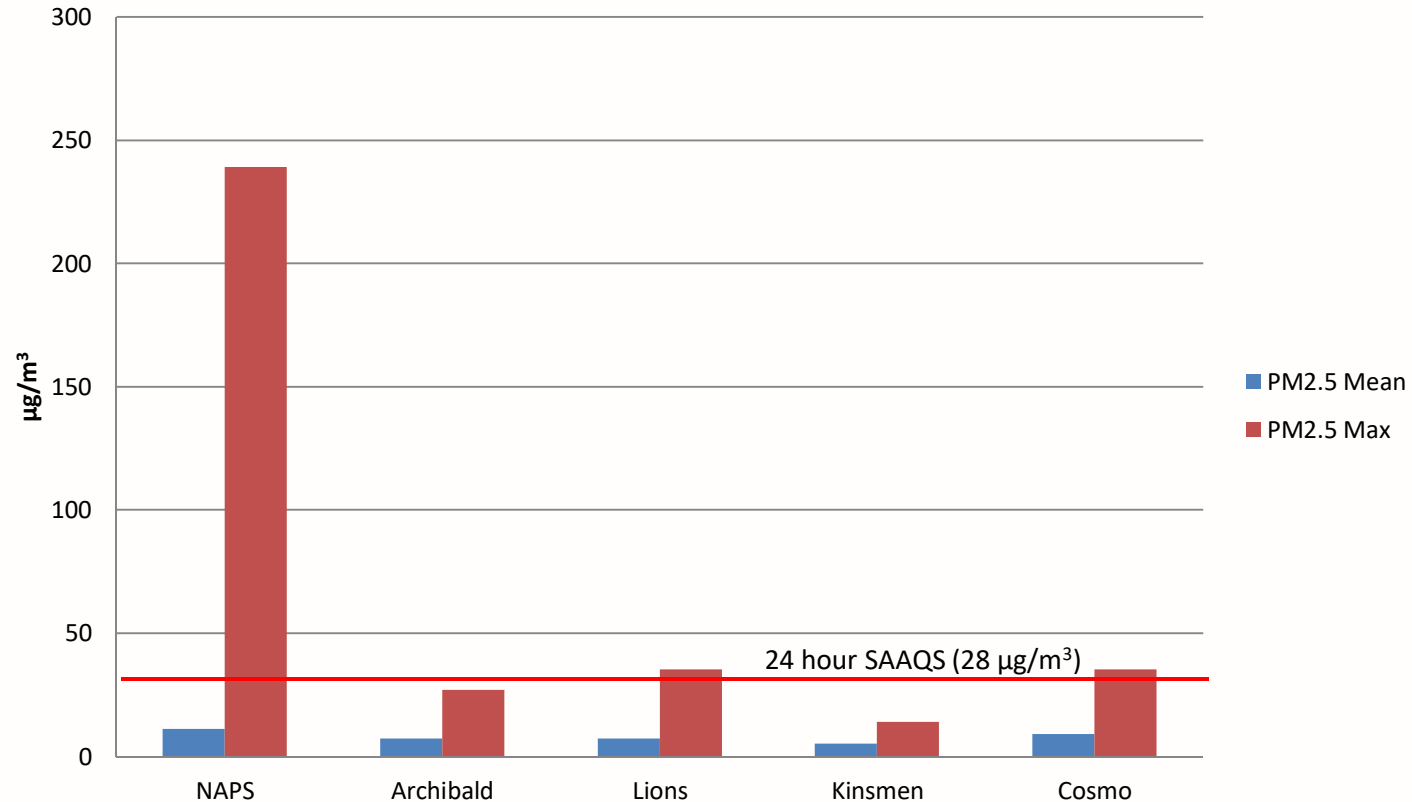


Passive Data

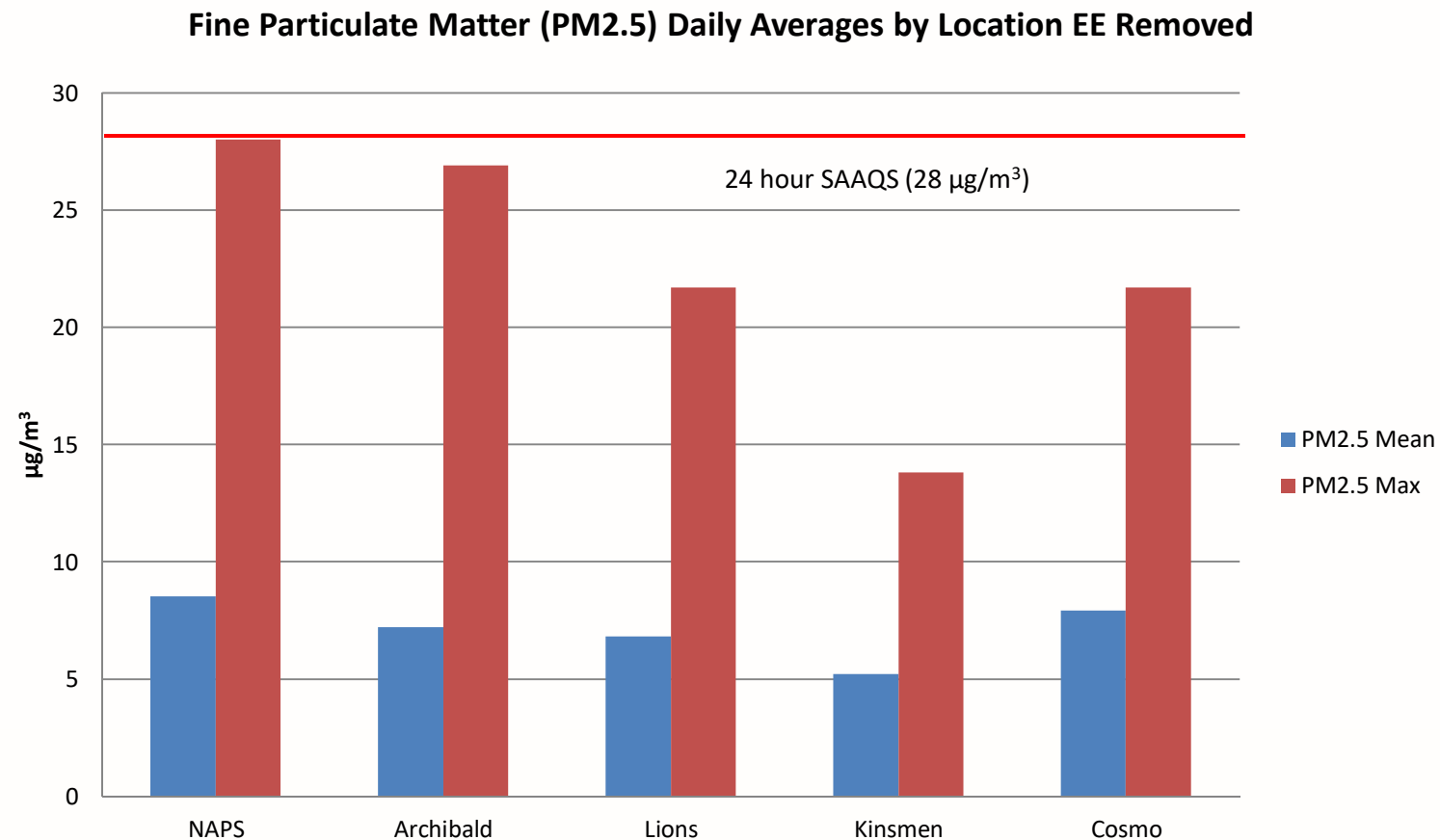


Continuous Data

Fine Particulate Matter (PM2.5) Daily Average by Location

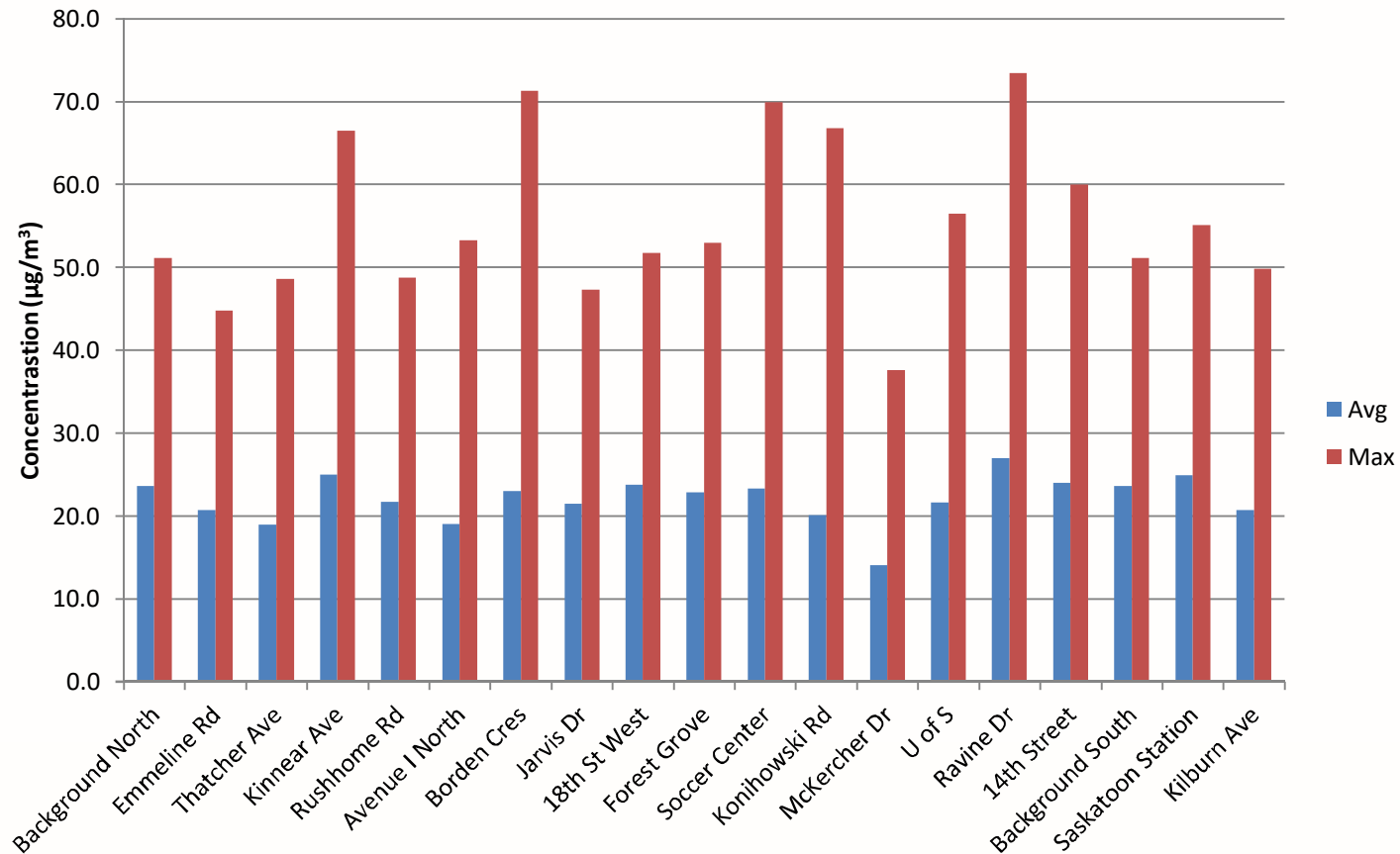


Continuous Data

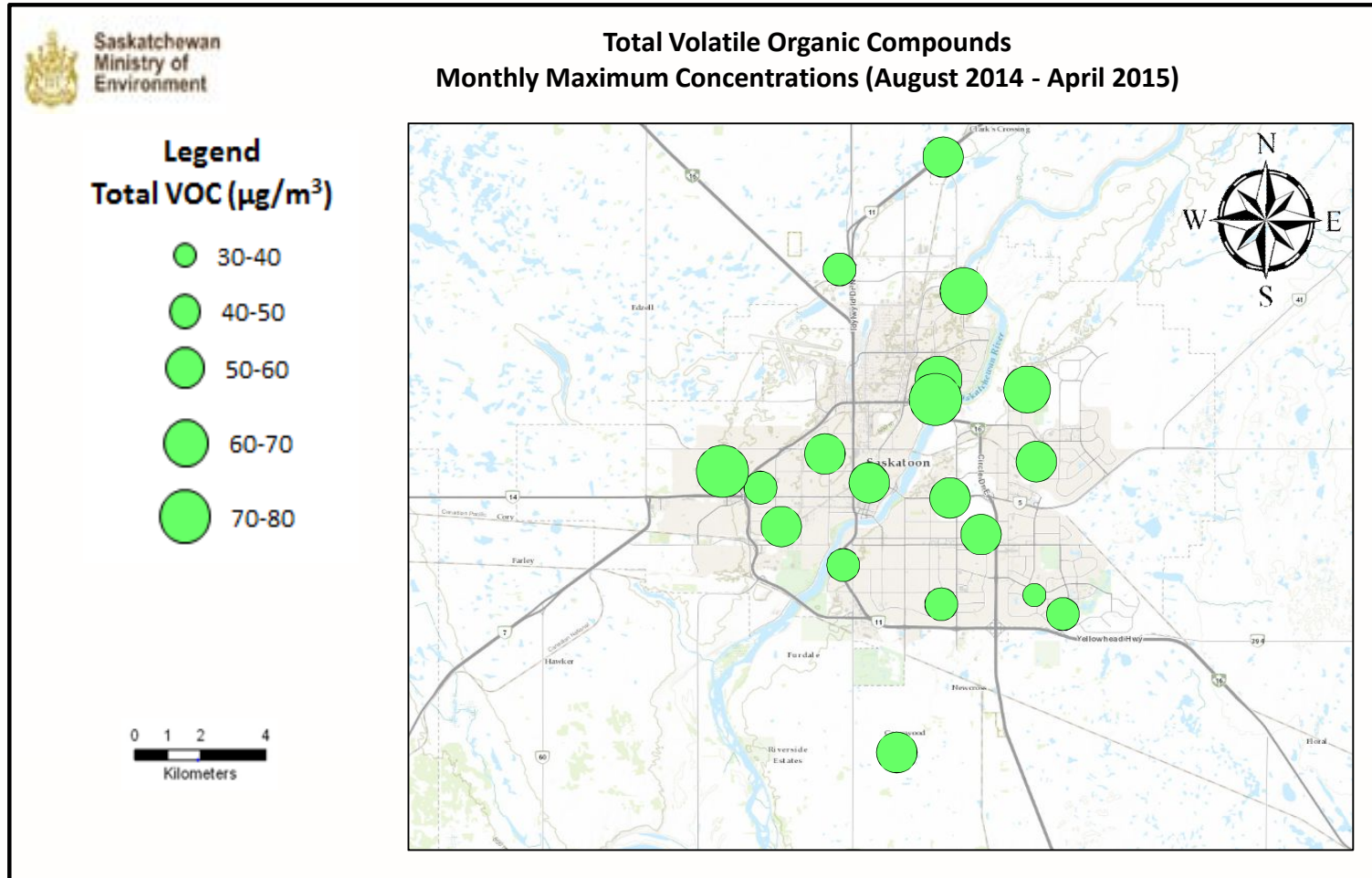


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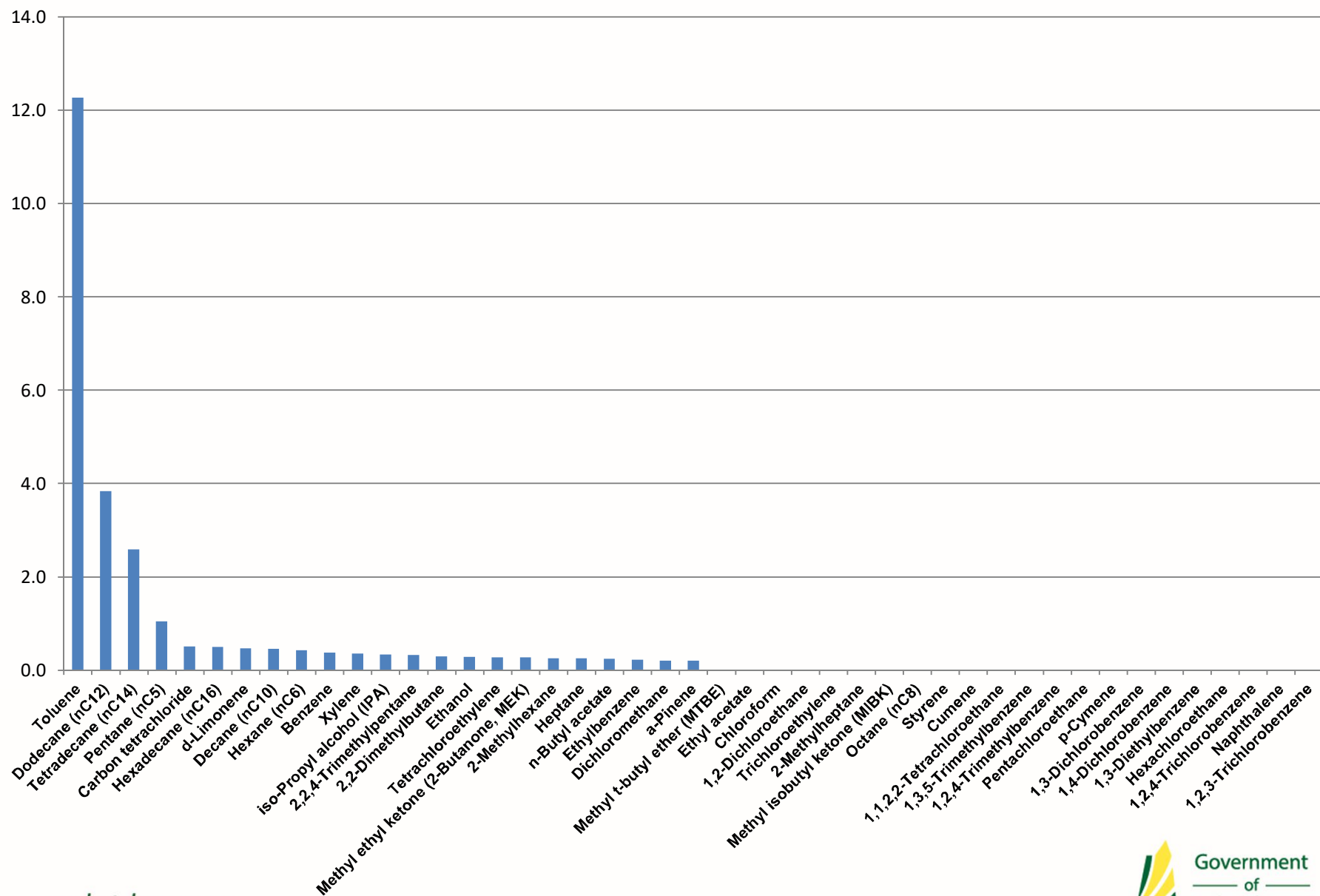
Total VOC 30 Day Concentrations by Site (August 2014 - April 2015)



Passive Data

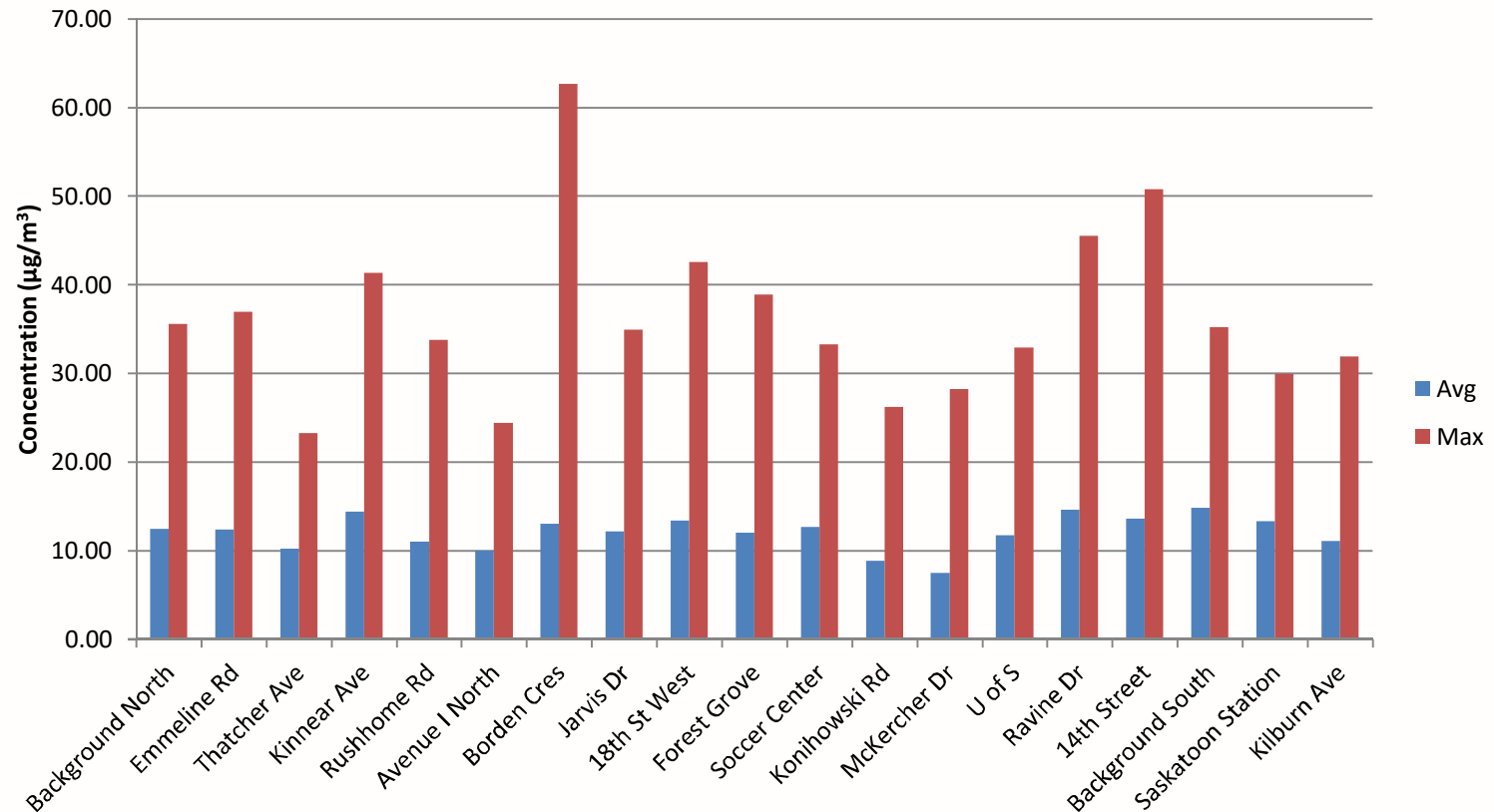


Breakdown of Total VOCs

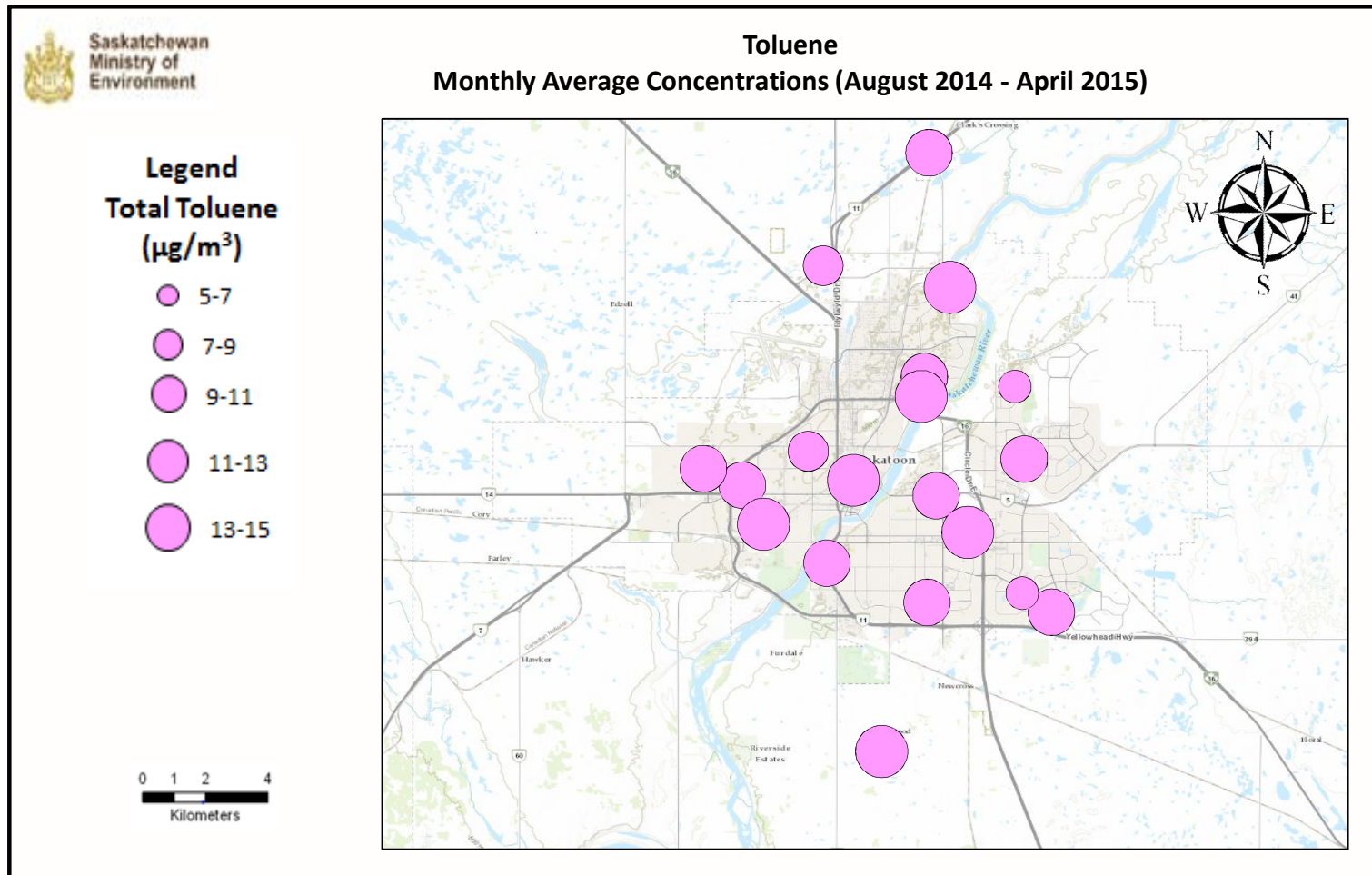


Passive Data

Toluene 30 Day Concentrations by Site (August 2014 - April 2015)

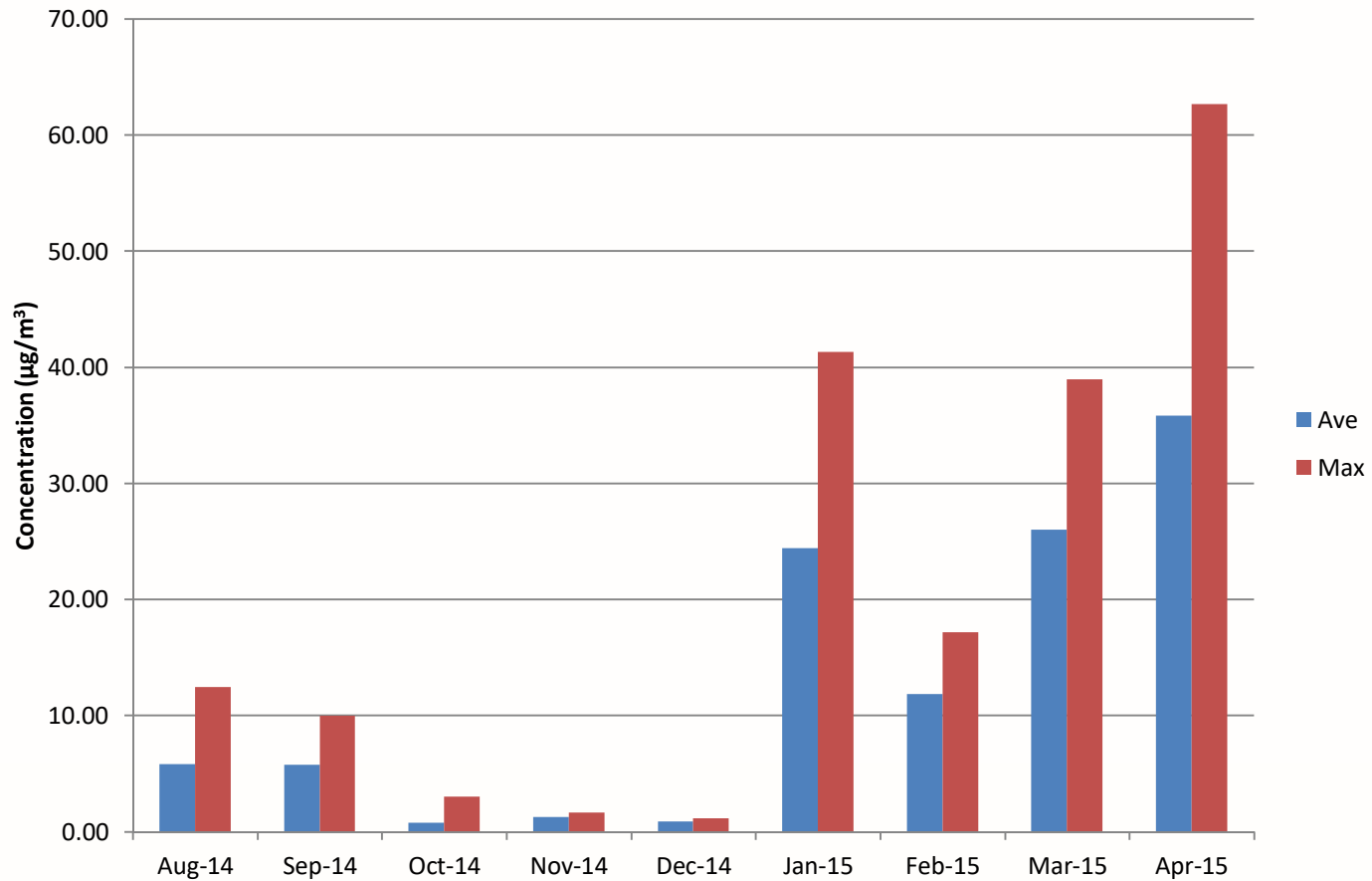


Toluene



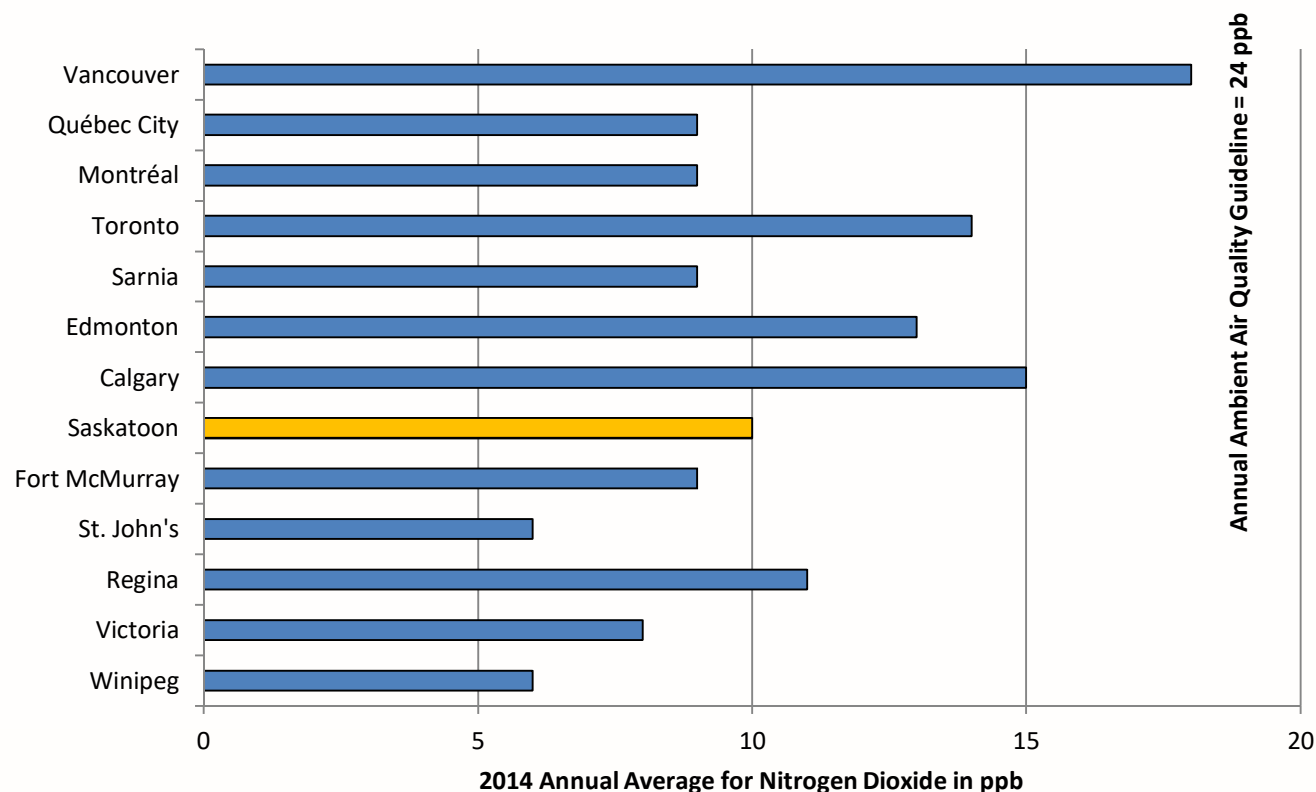
Toluene

Toluene 30 Day Concentrations

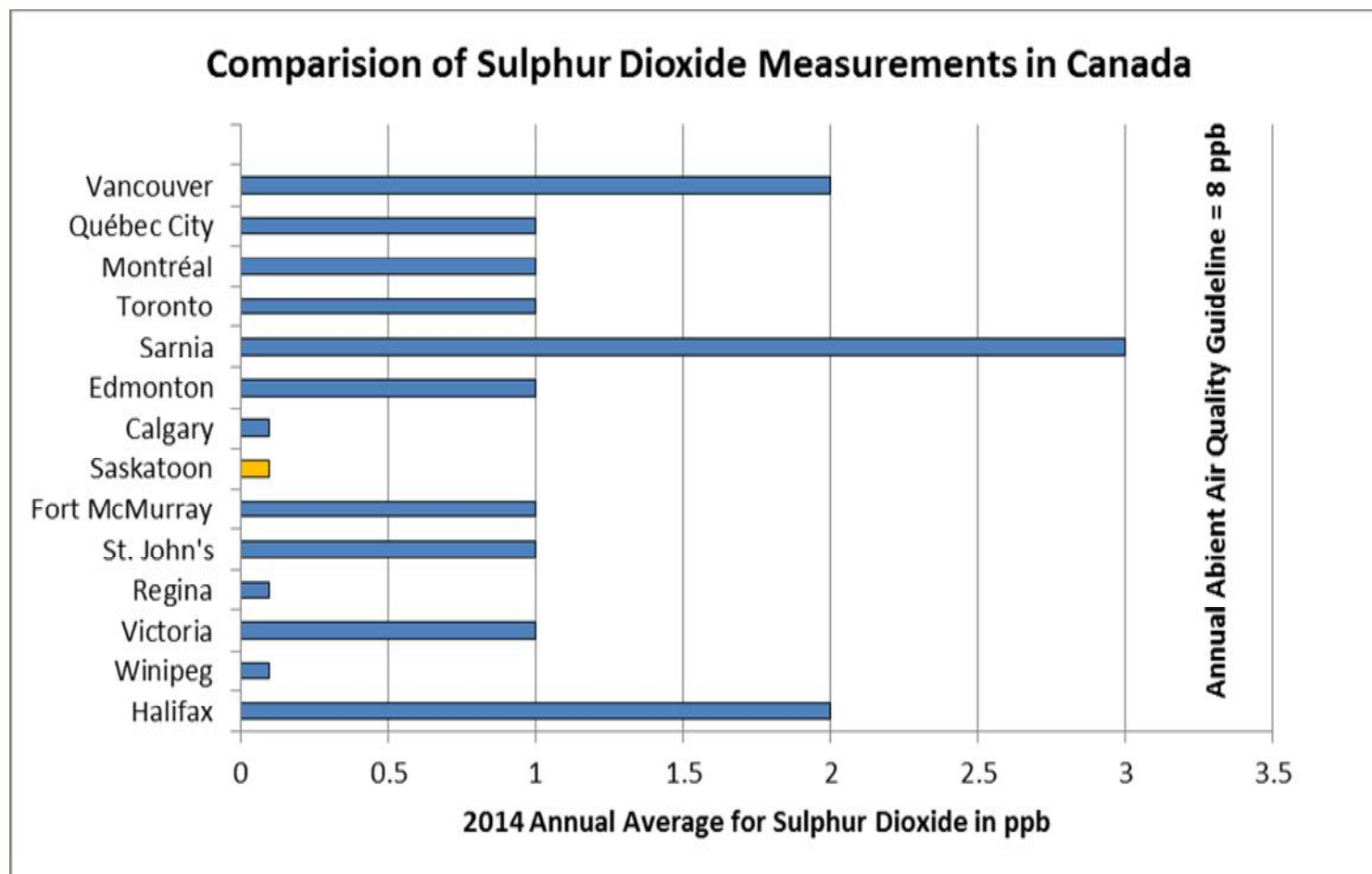


Comparing Regions

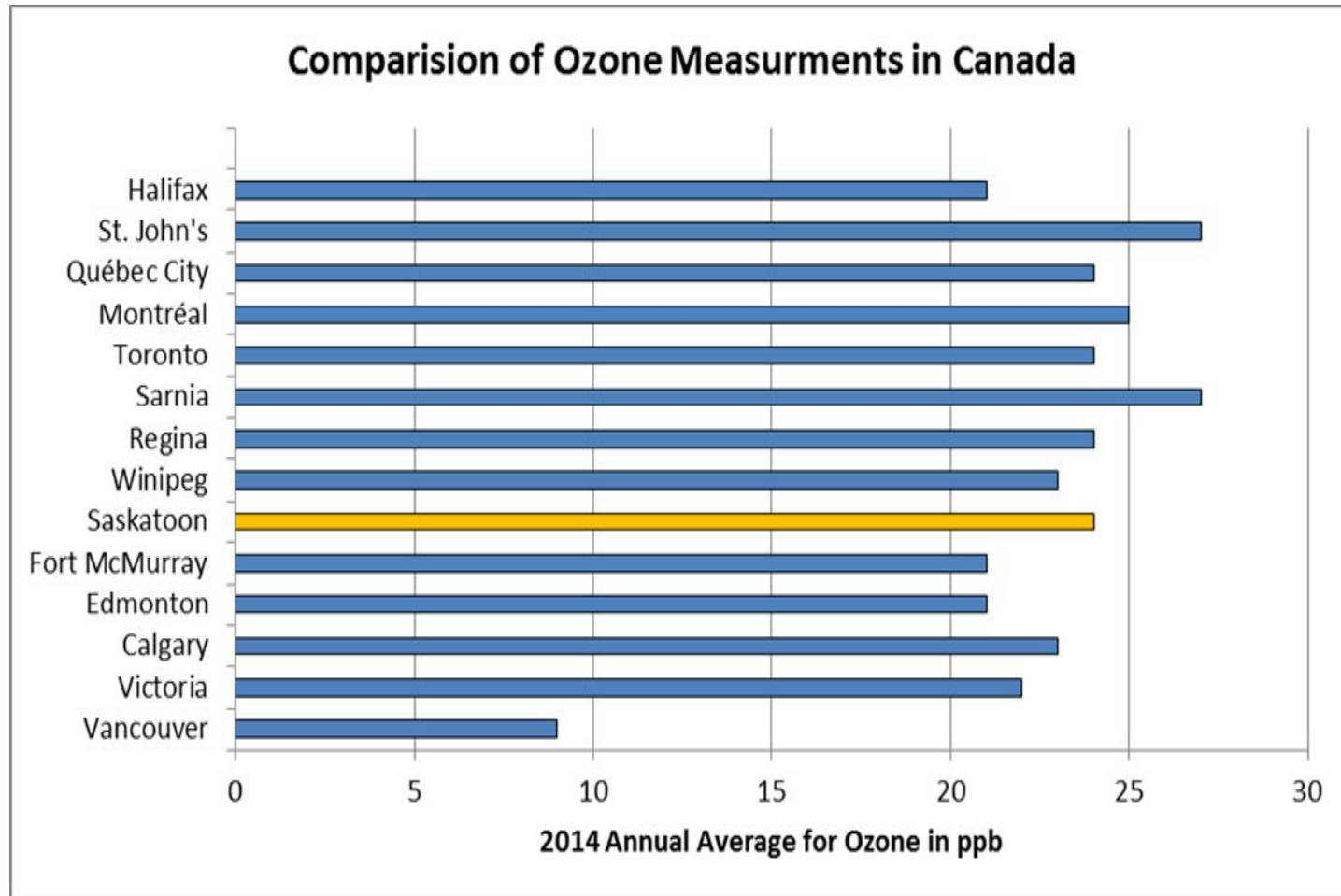
Comparison of Nitrogen Dioxide Measurements in Canada



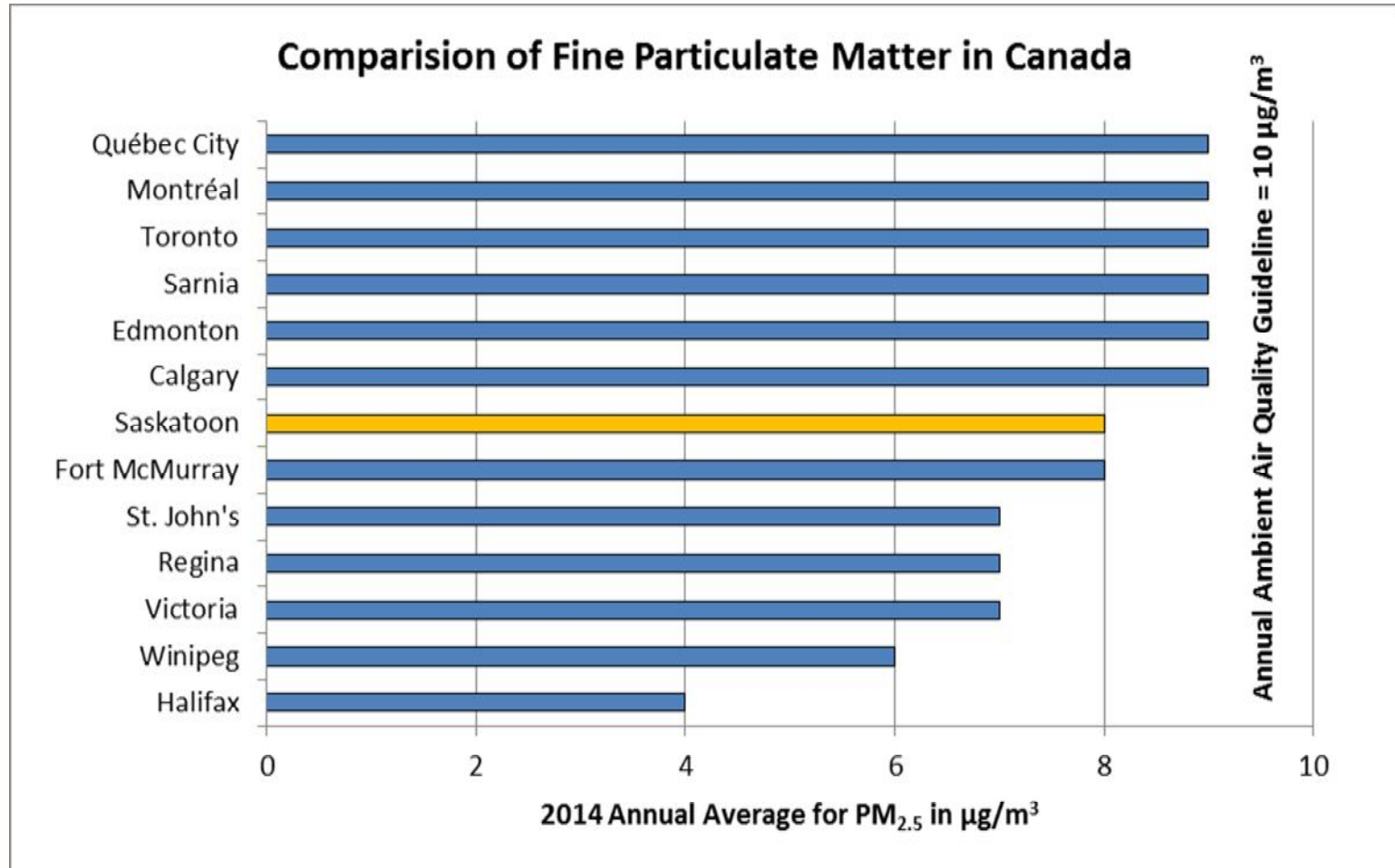
Comparing Regions



Comparing Regions



Comparing Regions



Summary

- NO₂ and O₃ levels varied slightly between locations, due to the proximity to major roads and industrial/commercial activity. There were no exceedances of the ambient standards.
- SO₂ and H₂S levels varied slightly between locations, but for the most part were less than 1 ppb.
- PM_{2.5} exceeded the SAAQS on a few occasions. These exceedances were due to forest fire smoke and do not reflect typical PM_{2.5} levels.
- On average, VOC levels were fairly consistent throughout the city. Toluene was the major constituent of the total VOC concentration.

Conclusion

- Currently, PM_{2.5} and Ozone are below the ambient standards, but by 2020 the CAAQS will decrease. With potential growth of the City and increasing trends of O₃ and PM_{2.5}, achievement of the CAAQS may not be possible.
- The results indicate that the downtown NAPS station serves as a good representation of the air quality of the City of Saskatoon.

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