Assessing Urban Air Quality

MINNESOTA POLLUTION CONTROL AGENCY

Monika Vadali, Ph.D | Environmental Research Scientist

Why are we doing this?

To better understand small-scale differences in urban air quality

Availability of newer sensor technology to monitor air quality

The Minnesota Legislature provided funding*

Cost-saving in the long run

LCCMR: Legislative-Citizen Commission on Minnesota's Resources

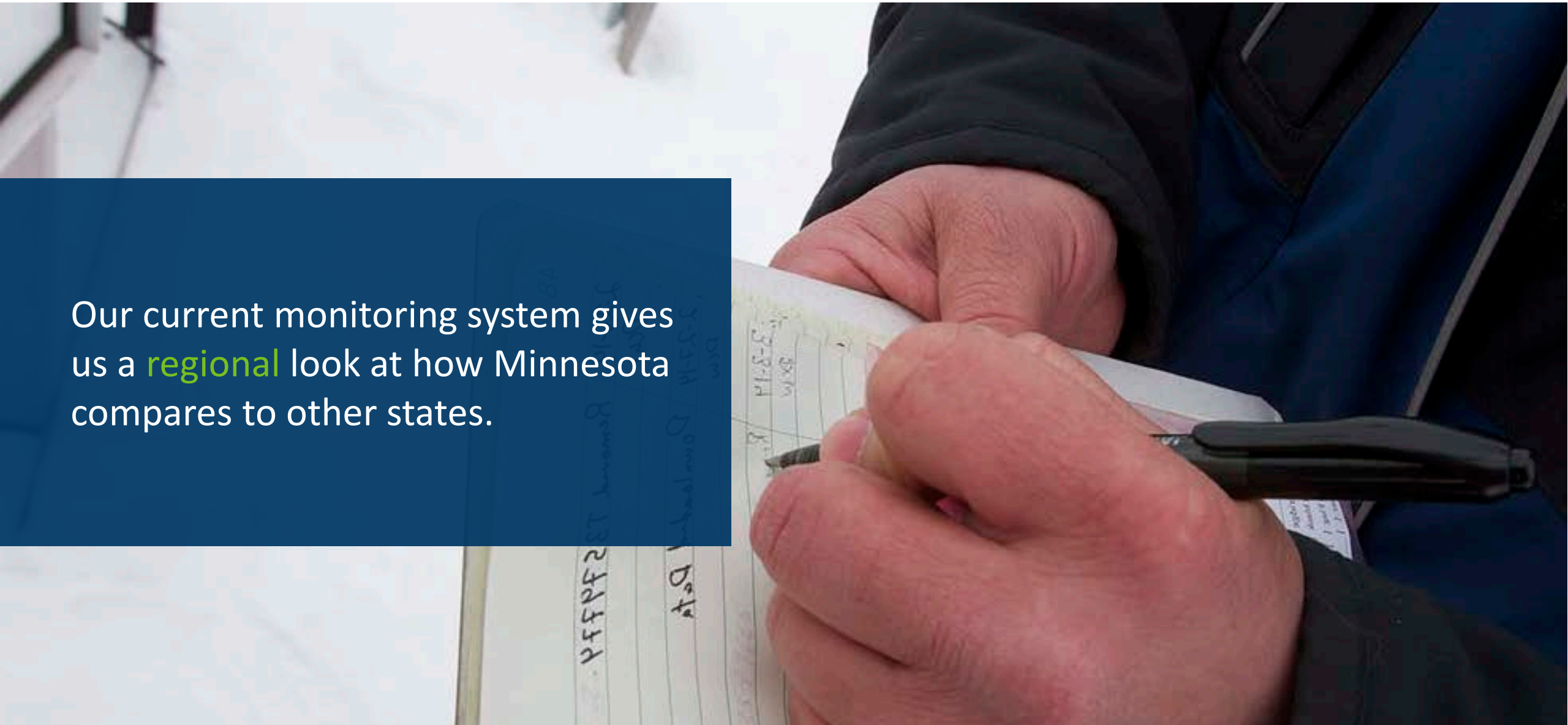
Why Minneapolis and St. Paul?

Disparities in air pollution-related health impacts in the metro area

- Rates of hospitalizations & emergency department visits
- Rates of asthma
- Populations with lower income
- People of color

Asthma rates for children living in the Twin Cities metro are 67% higher than for children living in Greater Minnesota.

Our current monitoring network

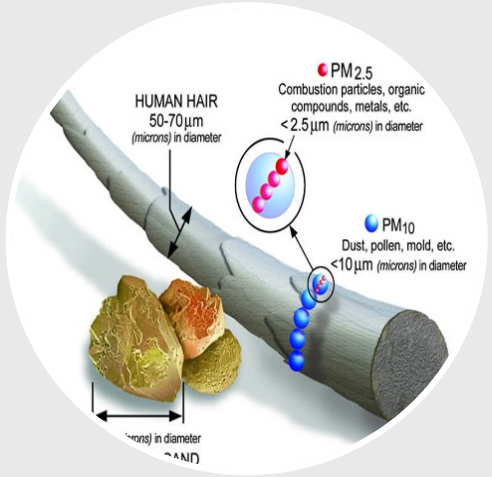


Our current monitoring system gives us a regional look at how Minnesota compares to other states.

The new sensors - AQMESH

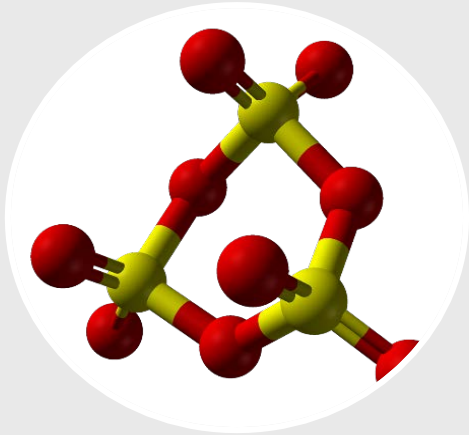
Quick install
Little maintenance
Solar-powered

What are we monitoring?



Fine particles ($PM_{2.5}$)

A mix of solid particles and liquid droplets in the air – 30x smaller than a human hair



- **Nitrogen oxides (NO_x)**
  - **NO2 and NO**
- **Sulfur dioxide (SO_2)**
- **Carbon monoxide (CO)**

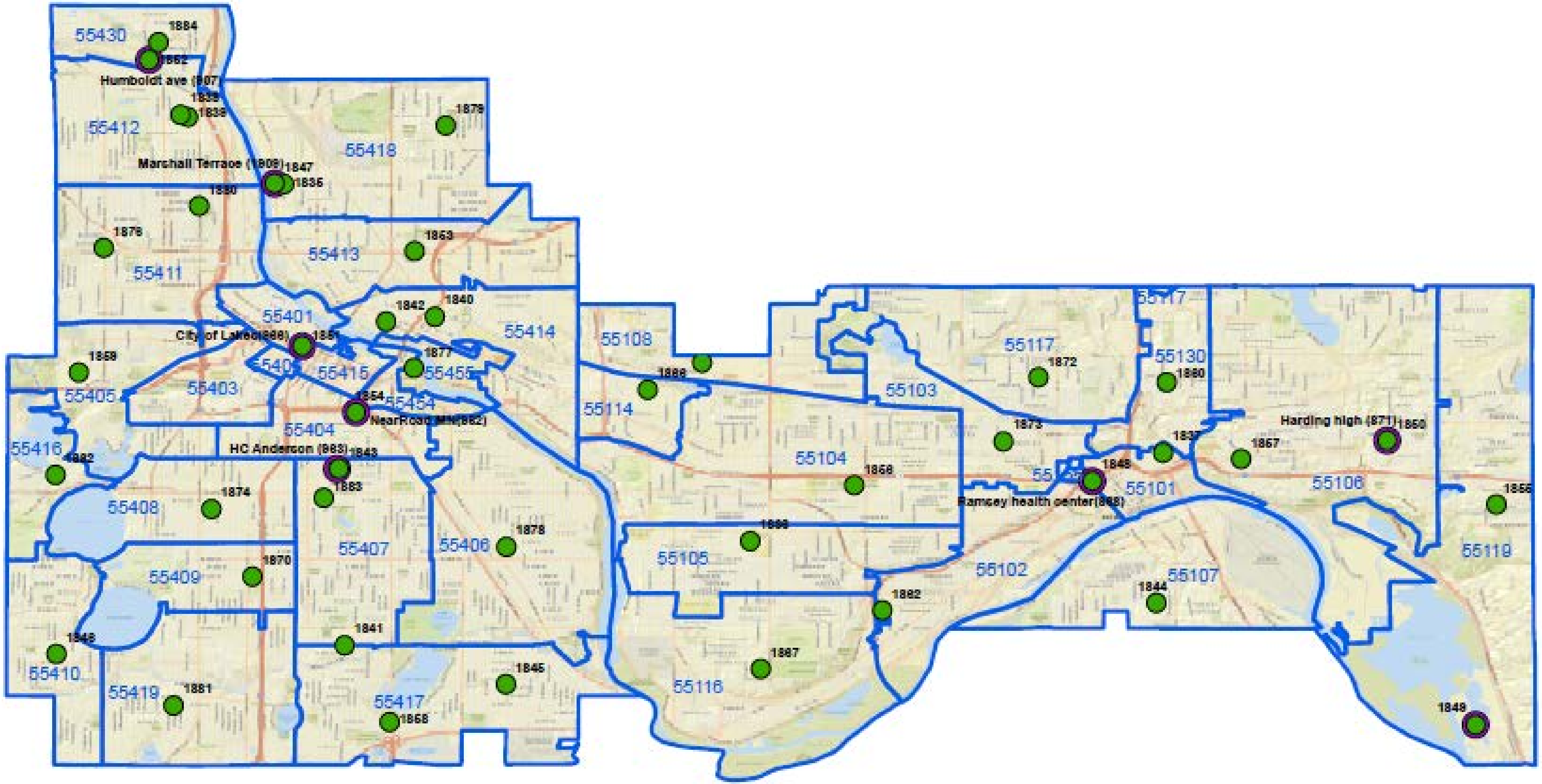
Ground-level Ozone

When chemicals and other pollutants mix with sunlight and heat – aka “smog”

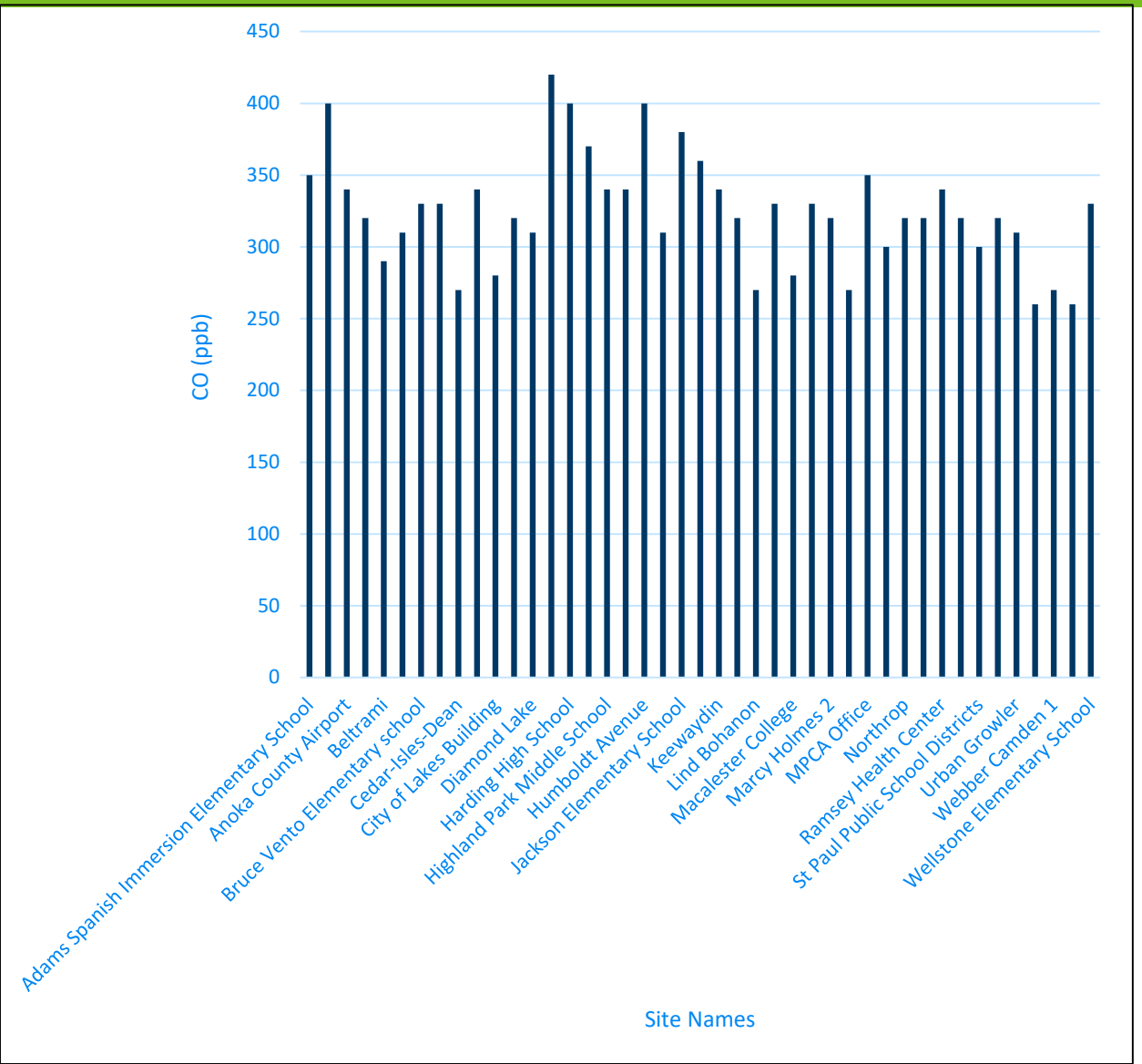
- **Temperature**
- **Relative Humidity**

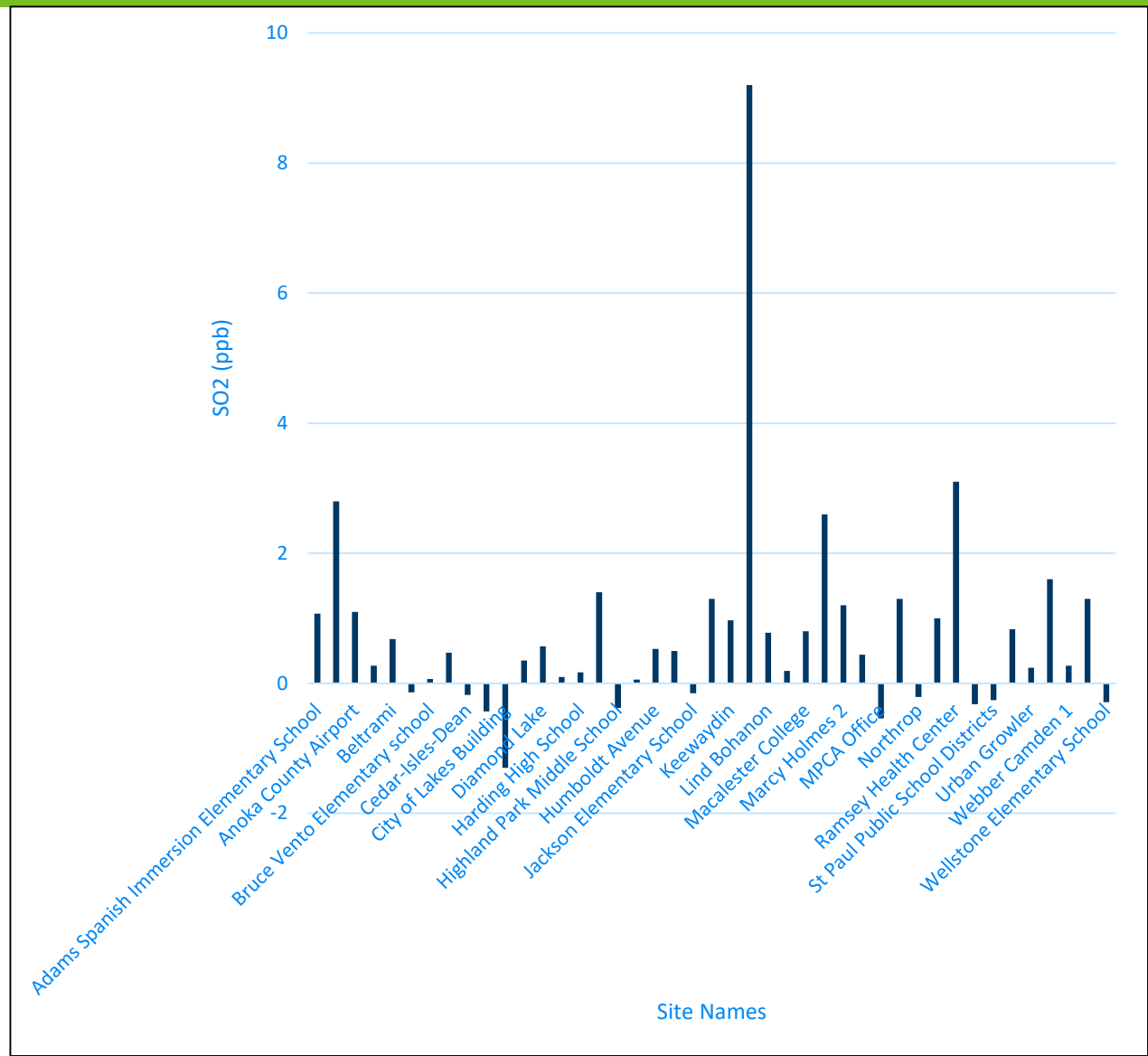
Project Updates

- Phase I collocation all sensors– Fall/Spring 2017-18 – *50 pods*
- Community meetings R1 in study area – Fall 2017
- Finalize locations in St.Paul – Fall 2018
- Finalize locations in Minneapolis - Winter 2019
- All sites deployed – Spring/Summer 2019 – *44 pods, 264 sensors*
- Community meetings R2 in study area – Fall 2019

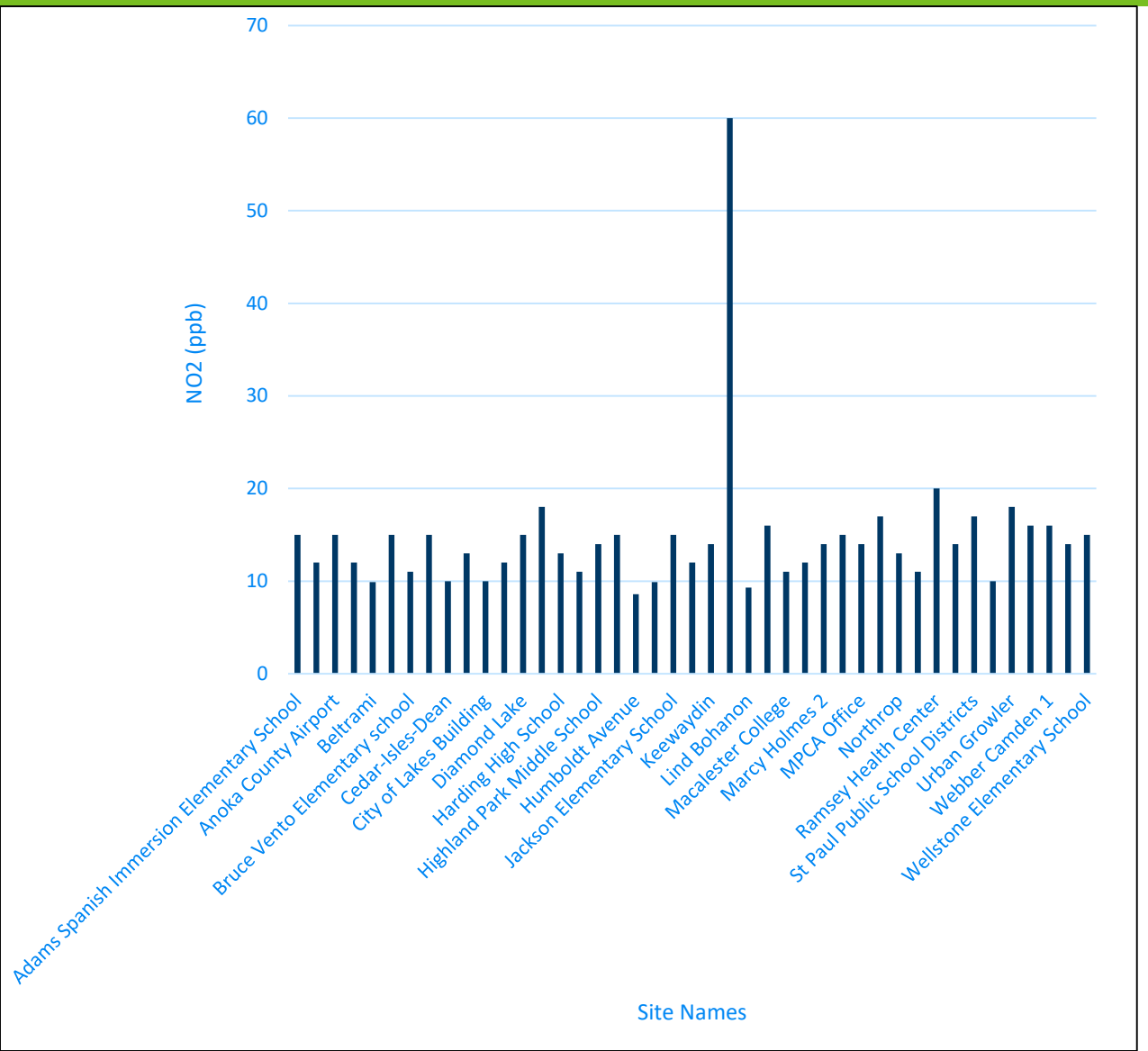

55430
55412
55418
55411
55413
55401
55414
55403
55415
55455
55405
55454
55404
55416
55408
55407
55406
55409
55410
55419
55417
55108
55114
55117
55130
55103
55104
55101
55106
55105
55102
55107
55119
55116
HC Anderson (963)
Harding high (871)
Ramsey health center(868)

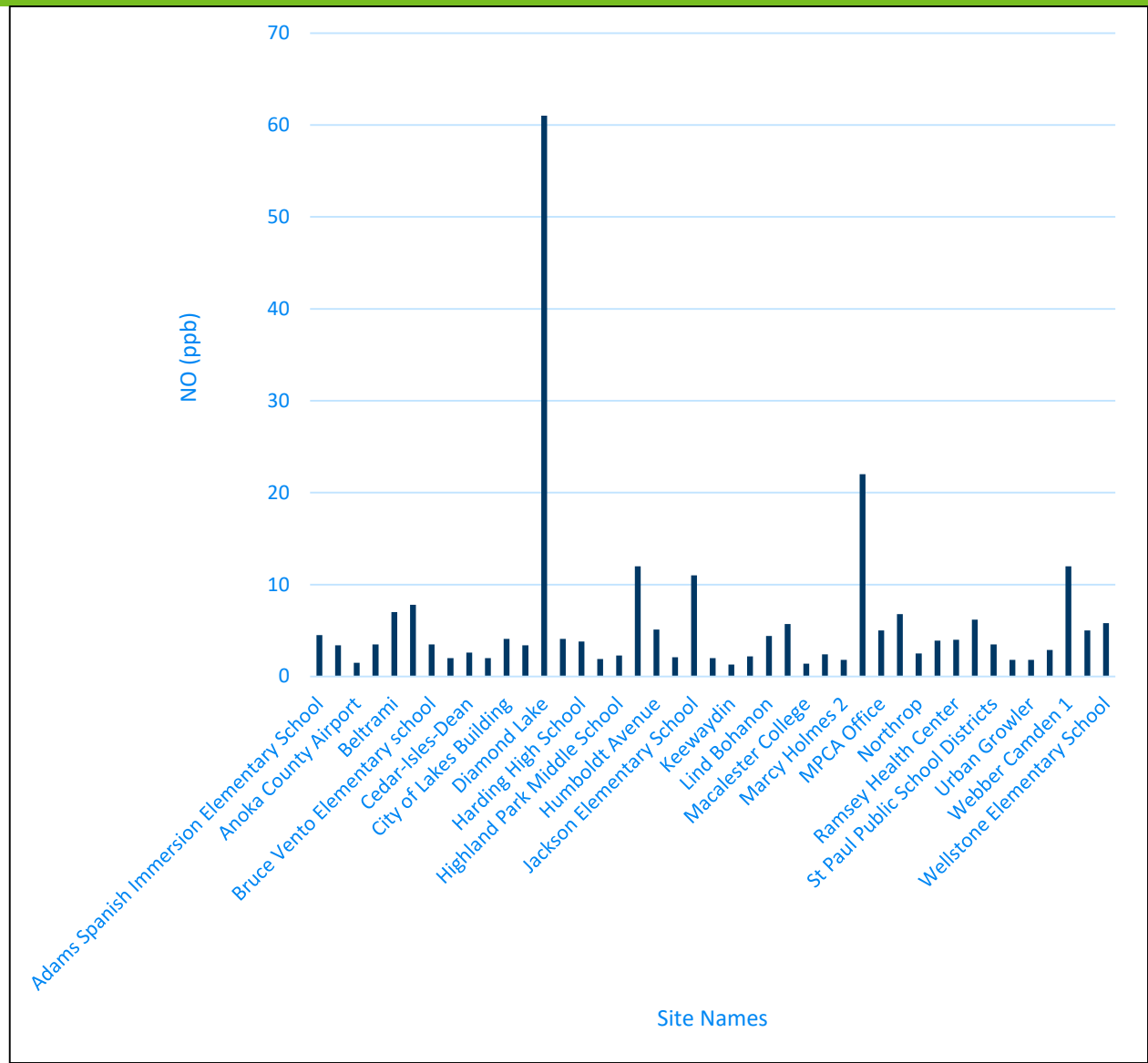
Site averages for CO & SO_2(2019)



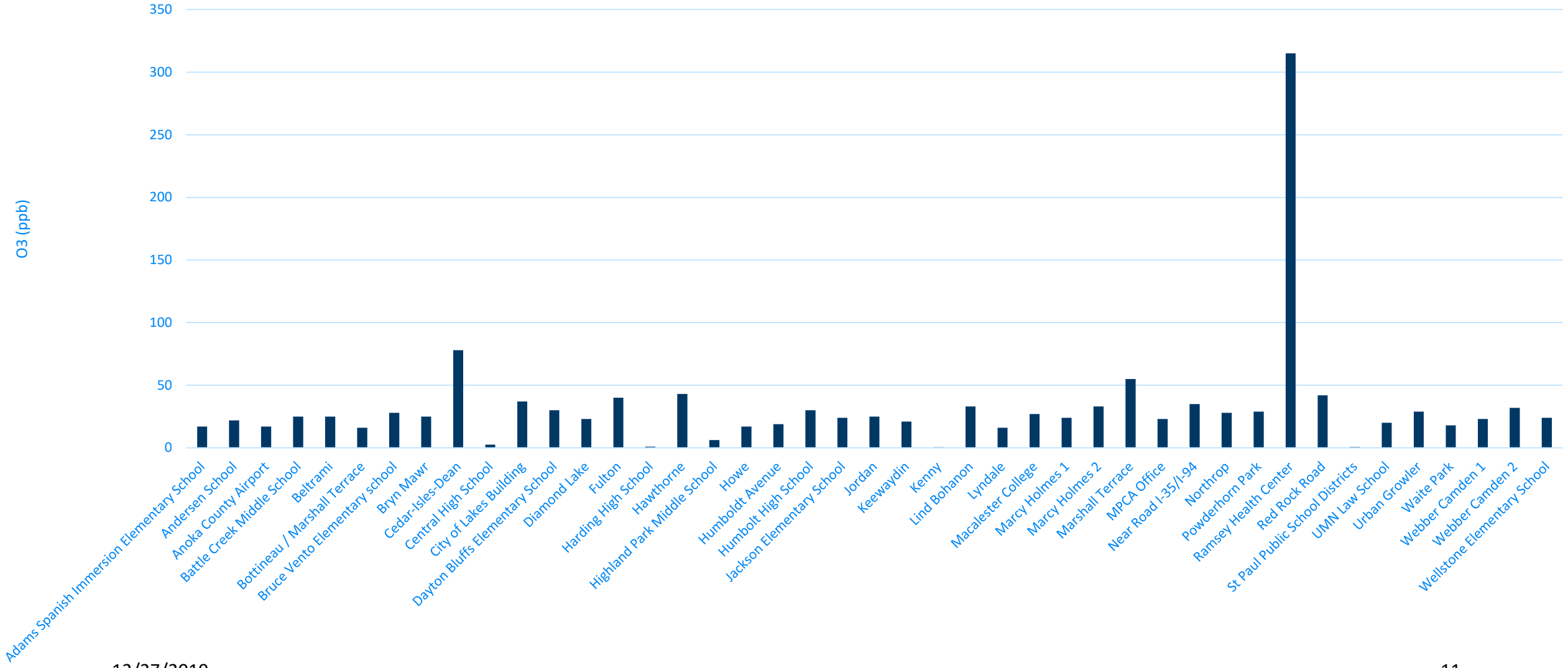


Site averages for NOx(2019)

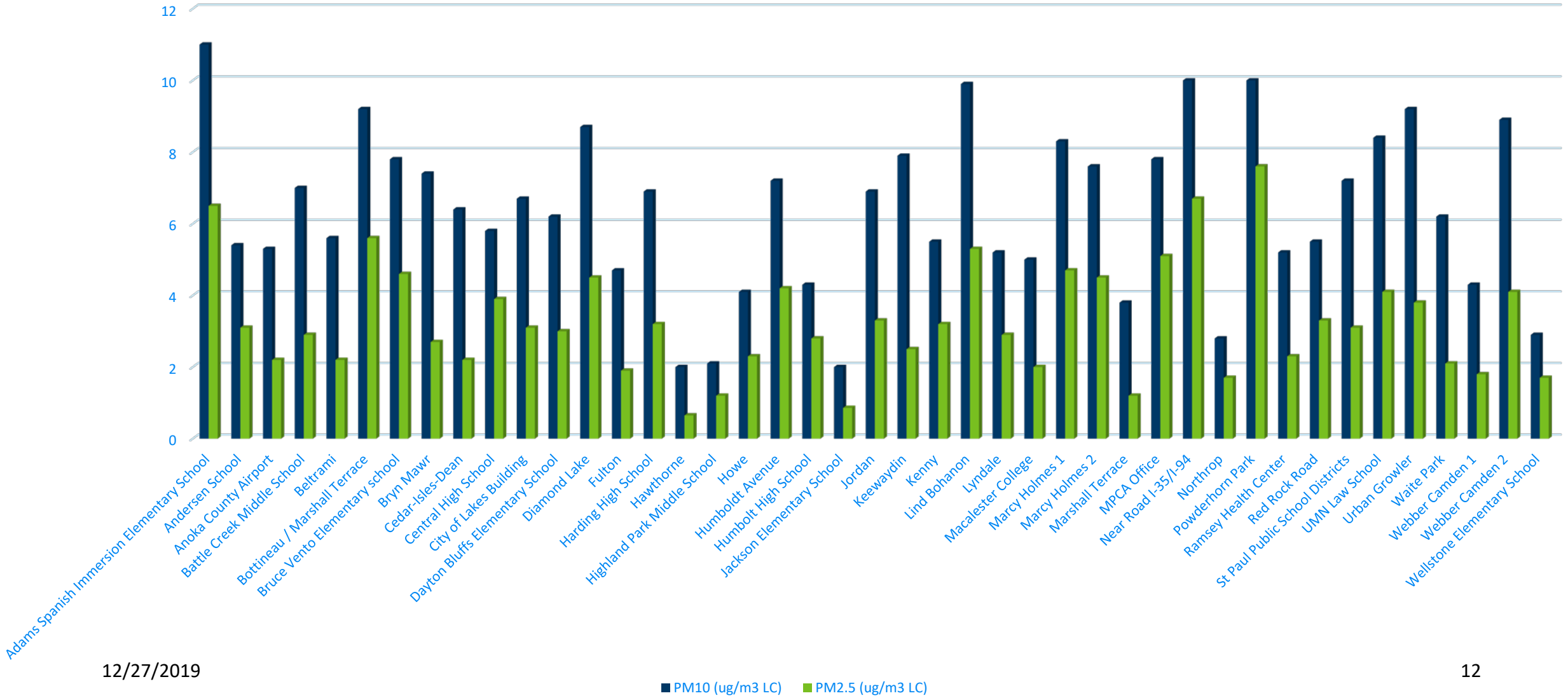




Site averages for ozone concentrations (2019)



Site averages for Particulate matter(2019)



Summary

Pollutant	Minimum	Maximum
CO (ppb)	260	420
NO (ppb)	1.3	61
NO_2 (ppb)	8.6	60
O_3 (ppb)	0.5	315
SO_2 (ppb)	-1.3	9.2
$PM_{2.5}$ (µg/m^3)	0.6	7.6
PM_{10} (µg/m^3)	2	11

Pollutant	NAAQS Standard
CO (ppb)	35,000 (1 Hr)
NO (ppb)	----
NO_2 (ppb)	100 (1Hr)
O_3 (ppb)	70 (8Hr)
SO_2	75 (1 Hr)
$PM_{2.5}$ (µg/m^3)	35 (24 Hr)
PM_{10} (µg/m^3)	150 (24 Hr)

Data will inform air quality concerns

Partners and Collaborators

- City of Minneapolis
- Saint Paul School District
- Minnesota State University, Mankato
- Xcel Energy
- AQMESH
- Minnesota Department of Health
- LCCMR

Thank you!

Monika Vadali, Ph.D

Monika.Vadali@state.mn.us

www.pca.state.mn.us/urbanair

MINNESOTA POLLUTION CONTROL AGENCY

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND