

ADEC's Community-Based Air Sensor Network

1st Quarterly Call
October 16, 2023
10:00 AM AKST

Taylor Borgfeldt, taylor.borgfeldt@alaska.gov
Corey James, corey.james@alaska.gov
Lydia Johnson, lydia.johnson@alaska.gov

Housekeeping Items

- Mute – Please mute yourself for presentations.
- Please use chat during presentation as you have questions/comments.
 - 20-30 minutes of planned discussion time at end
- Mark your calendar for next call! January 16, 2024 at 10 am AK time



Agenda

Welcome!

Air quality in Alaska (crash course)

Sensor network overview and progress

Data findings and lessons learned

Next steps

Questions and discussion



Focus of this call

- ▶ First quarterly call
 - ▶ Next is January 16th at 10 am
 - ▶ 3-year project
- ▶ Share DEC updates
- ▶ Get input
- ▶ Workgroup style – discussion is encouraged!

Share Alaskan-based expertise

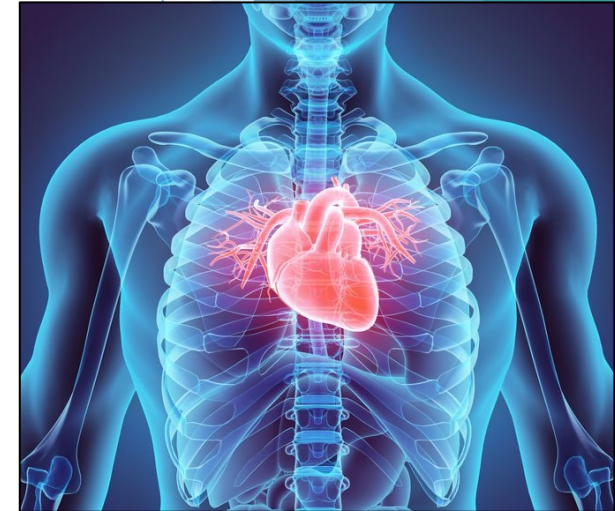
Environmental Impacts

- ▶ Reduce visibility – dust, smoke
- ▶ Damage plants – NO_2 , SO_2 , O_3
- ▶ Harm wildlife
- ▶ Acid rain – NO_2 , SO_2
- ▶ Impact fish drying
- ▶ Cover berries



Health Impacts

- ▶ Respiratory
 - ▶ Adverse effects
 - ▶ Hindered lung development
 - ▶ Limited breathing capacity for lifetime
 - ▶ Indicators of increased risk
 - ▶ Allergies
 - ▶ Asthma
- ▶ Cardiovascular
 - ▶ Adverse effects
 - ▶ Constriction of blood vessels
 - ▶ Increase in blood pressure
 - ▶ Heart attacks
 - ▶ Indicators of increased risk
 - ▶ Increased heart rate or variability in heart rate
 - ▶ Changes in blood chemistry





Combustion

- ▶ Natural sources
 - ▶ Wildland fires
- ▶ Man made sources:
 - ▶ Smoke from wood stoves
 - ▶ Power plant exhaust
 - ▶ Vehicle exhaust
 - ▶ Solid waste burning
 - ▶ Trash
 - ▶ Hazardous Air Pollutants

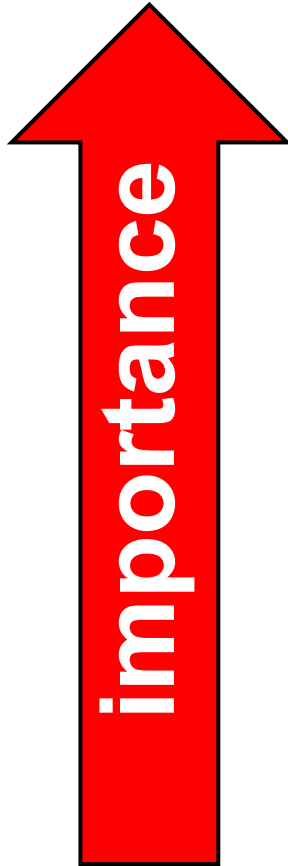
Particulates

- ▶ Natural sources
 - ▶ Wind blown dust
 - ▶ Pollen
 - ▶ Volcanic eruptions
 - ▶ Glacial silt
- ▶ Man made sources:
 - ▶ Road dust
 - ▶ Unpaved roads
 - ▶ Dust from runways



Pollutants of Concern in Alaska

Criteria Pollutants

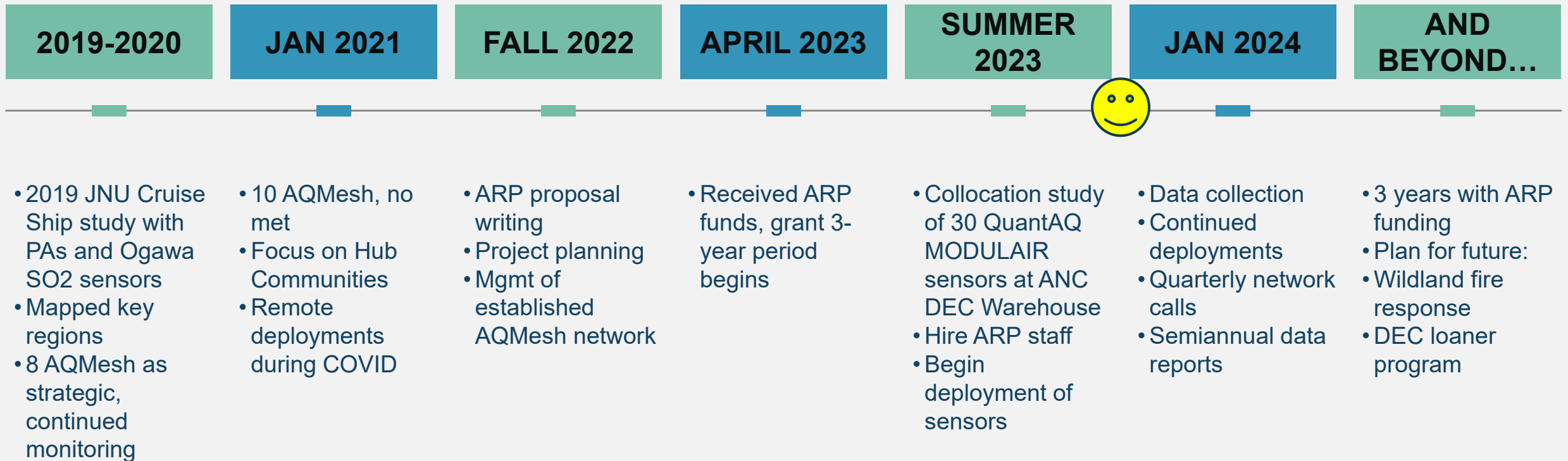


- $PM_{2.5}$
 - PM_{10}
- Particulate Matter

- Carbon monoxide (CO)
 - Lead
 - Sulfur dioxide (SO_2)
 - Nitrogen dioxide (NO_2)
 - Ozone (O_3)
- Gaseous constituents

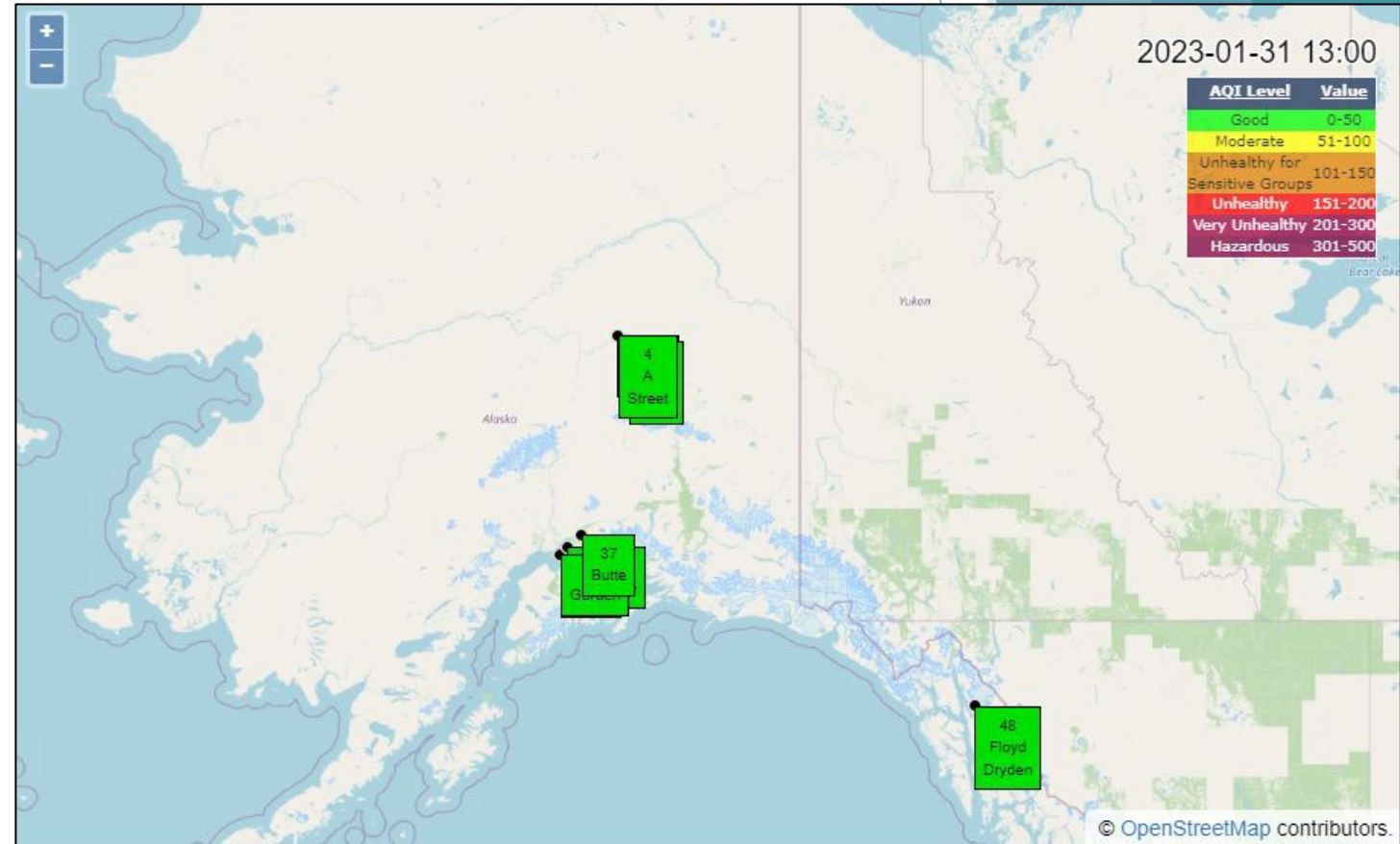


Timeline of DEC Sensor Network



DEC's Regulatory Network

- ▶ Regulatory stations in 3 Metropolitan Statistical Areas (MSA)
 - ▶ Anchorage / Mat-Su (4 sites)
 - ▶ Fairbanks (3 sites)
 - ▶ Juneau (1 site)
- ▶ Monitor criteria pollutants:
 - ▶ Particulate matter (PM_{2.5} and PM₁₀)
 - ▶ Gases:
 - ▶ Carbon monoxide (CO)
 - ▶ Nitric oxide (NO)
 - ▶ Ozone (O₃)
 - ▶ Sulfur dioxide (SO₂)

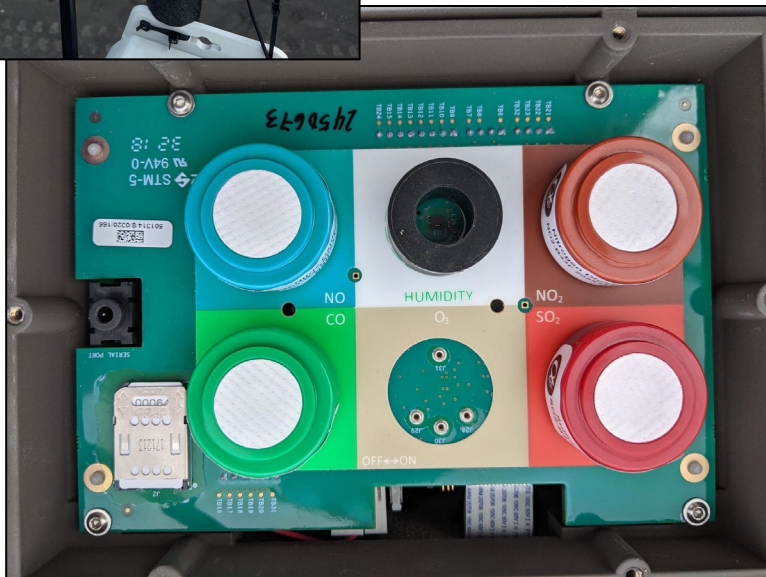




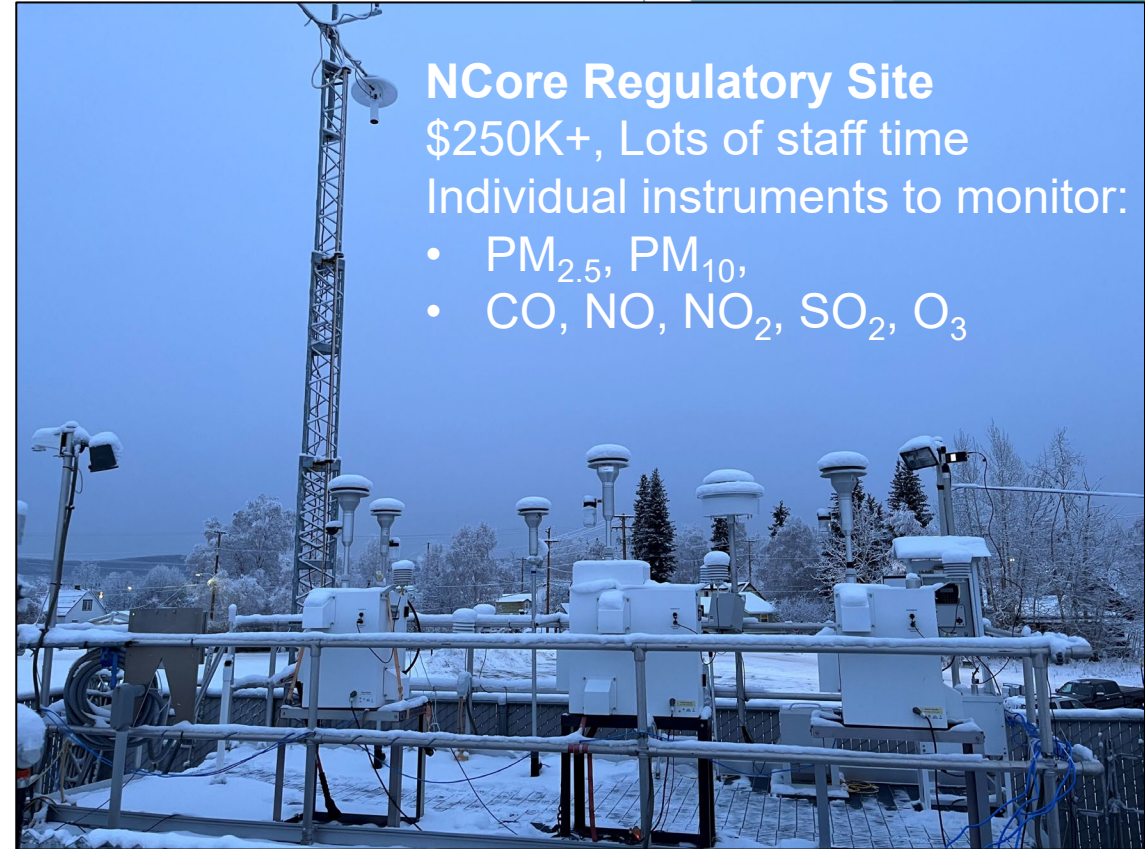
Low-cost sensor option

Monitors:

- PM_{1} , $PM_{2.5}$, PM_{4} , PM_{10} ,
- CO , NO , NO_{2} , SO_{2} , O_{3}
(optional configurations)



VS



NCore Regulatory Site

\$250K+, Lots of staff time

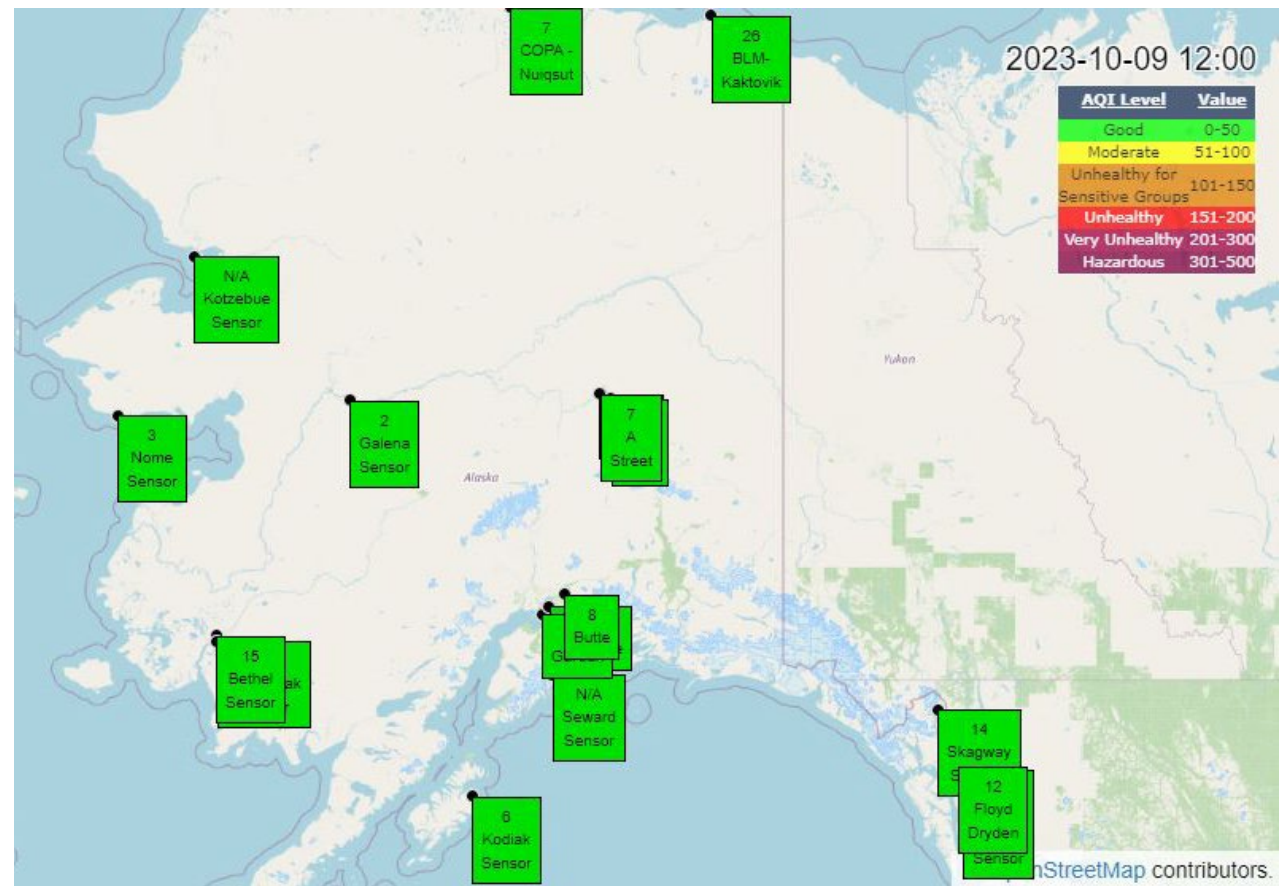
Individual instruments to monitor:

- $PM_{2.5}$, PM_{10} ,
- CO , NO , NO_{2} , SO_{2} , O_{3}



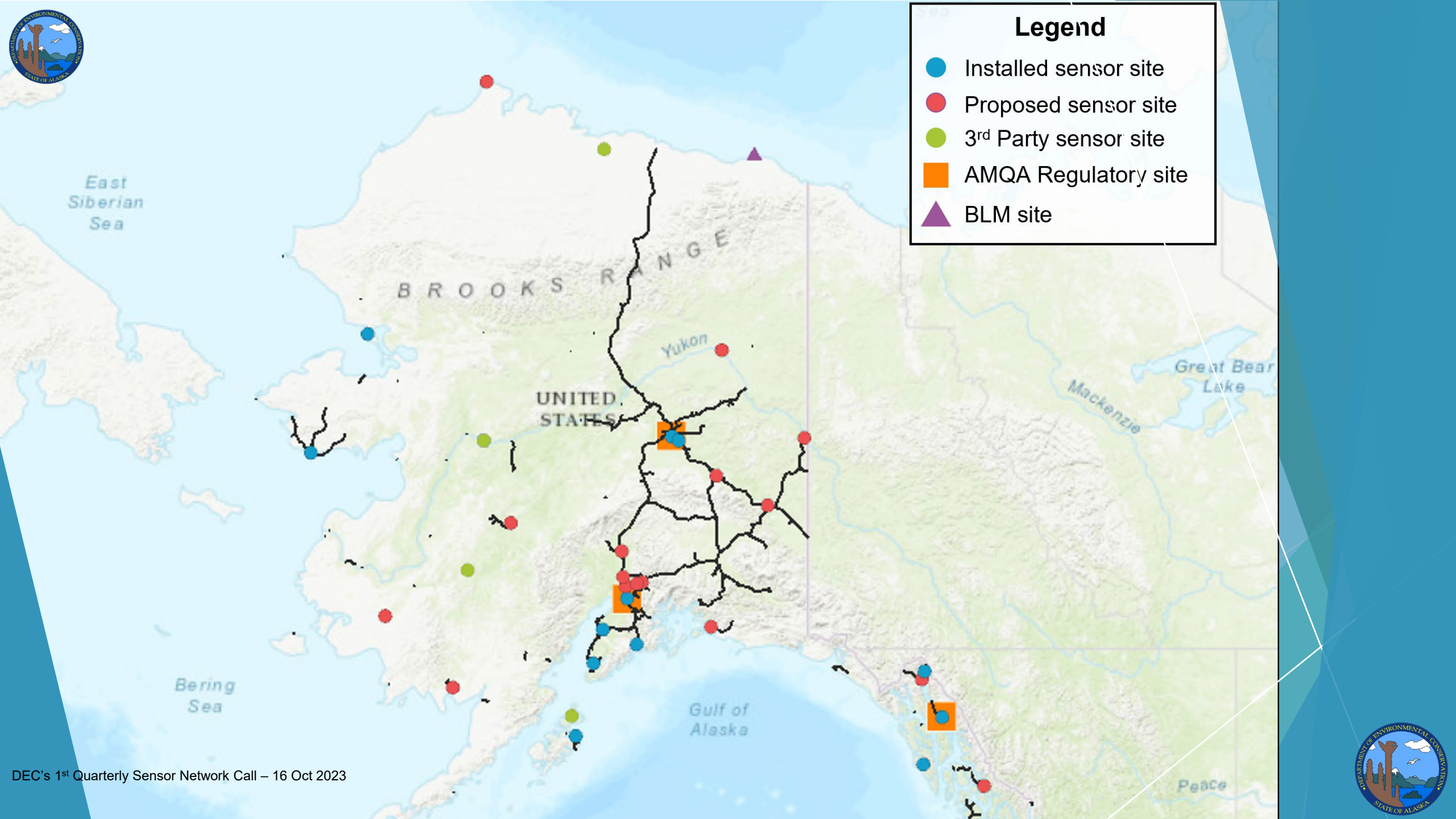
But we're growing!

- ▶ Map as of 10/9/2023
- ▶ Continued expansion as we...
 - ▶ Deploy more sensors
 - ▶ Collaborate with communities doing their own studies and display their data
 - ▶ Add PurpleAirs from across the state



dec.alaska.gov/air/air-monitoring/alaska-air-quality-real-time-data





Legend

- Installed sensor site
- Proposed sensor site
- 3rd Party sensor site
- AMQA Regulatory site
- ▲ BLM site



Lessons Learned for Sensors in Alaska

▶ Data communications

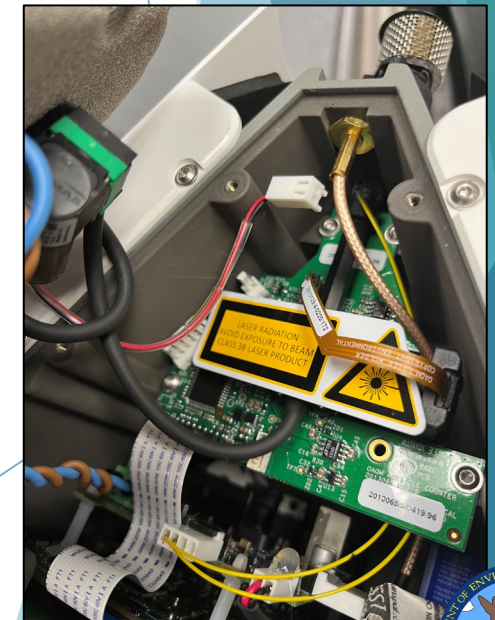
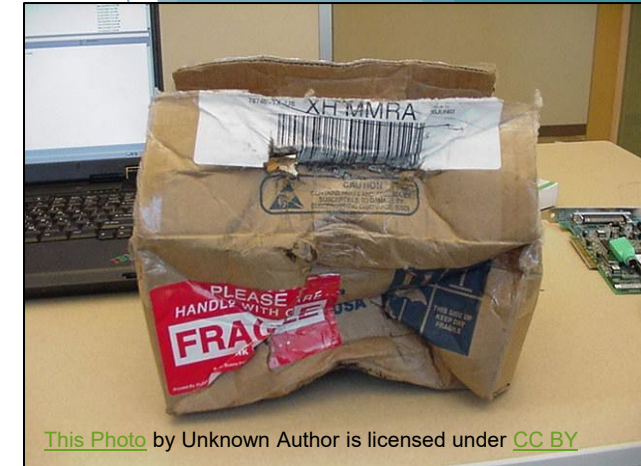
- ▶ **Cellular is most reliable**, but still experiences outages that require equipment restarts
- ▶ **GCI does NOT work** with cell-based sensor pods
- ▶ Wifi is commodity and unreliable, likely to have device removed from network, outages

▶ Power options

- ▶ **AC Power**
- ▶ **Solar is not a feasible option.** Unsuccessful in SE AK during summer. Potentially an option in summer in some areas of the state but likely not worth the added cost

▶ **Operational temperature range is important**

- ▶ Availability of **tech support**
- ▶ Troubleshooting tools
- ▶ **Robust equipment and packing materials for shipping are a must**
- ▶ Equipment is more delicate than anticipated
- ▶ Upfront equipment cost + long-term **data subscription costs**
- ▶ Wildlife (e.g. large birds perching on sensor)





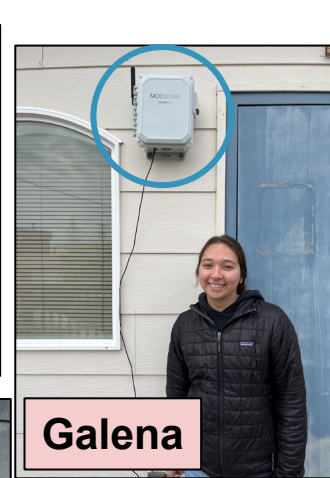
Skagway



Sitka



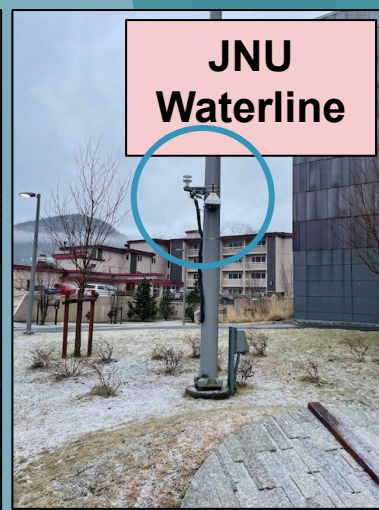
Kodiak



Galena



JNU Highlands



JNU Waterline



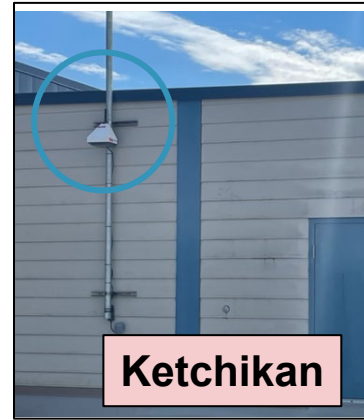
Kotzebue



Soldotna



Bethel



Ketchikan



Homer



Kotzebue



Seward

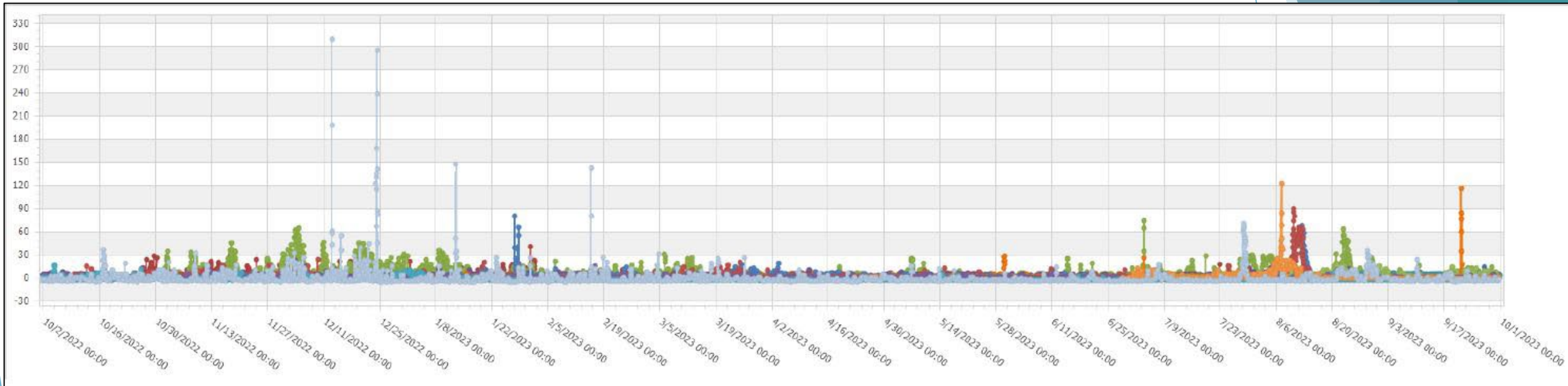


Napaskiak

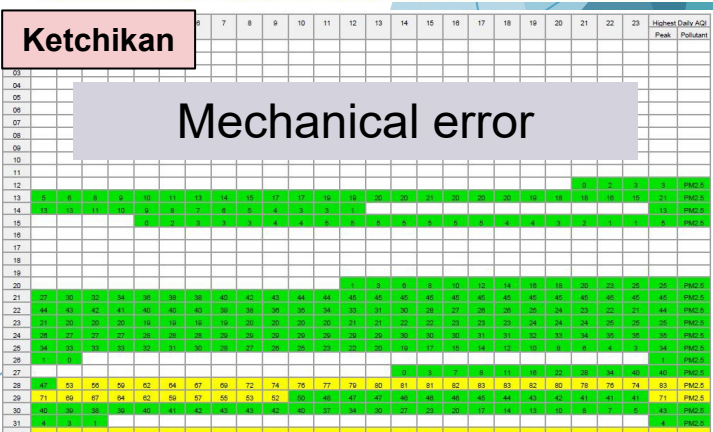
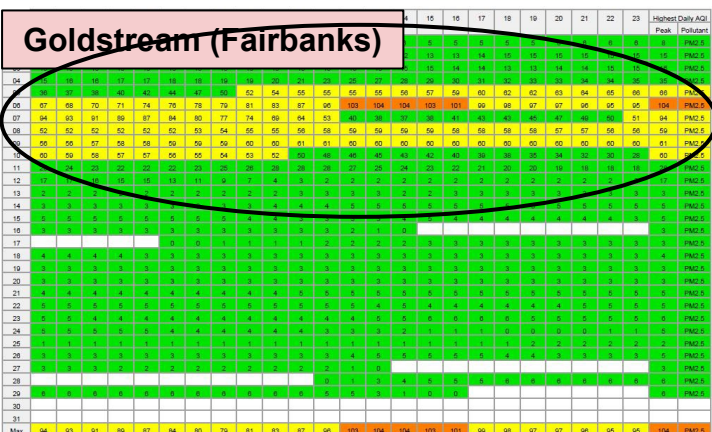
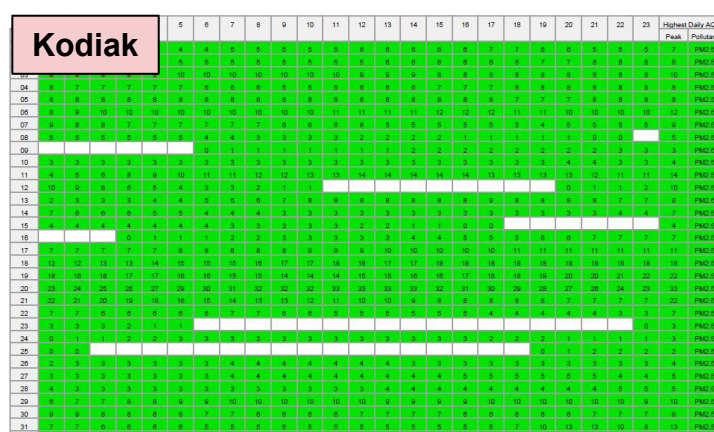
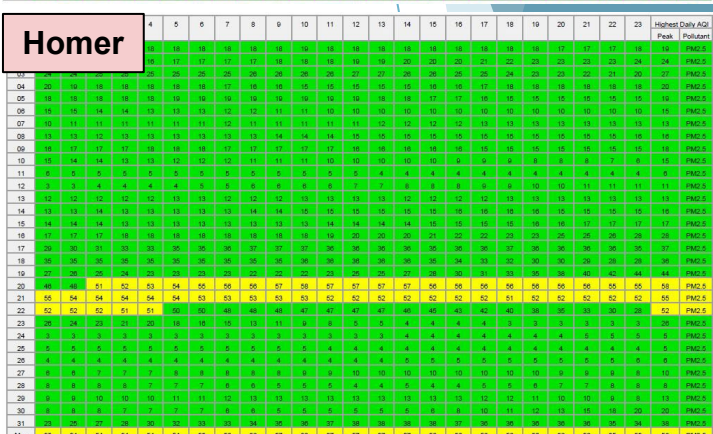
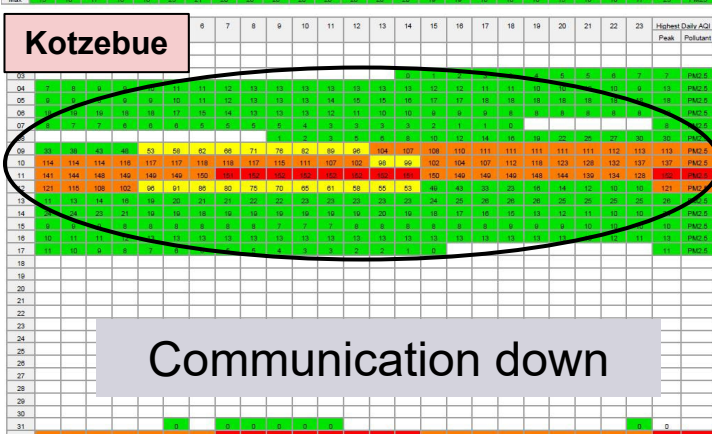
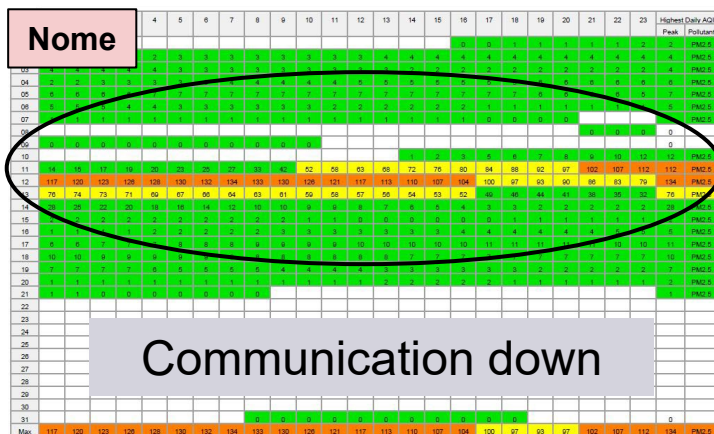
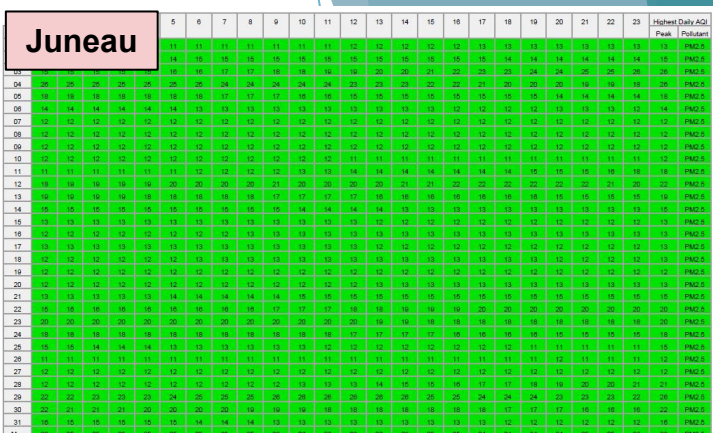
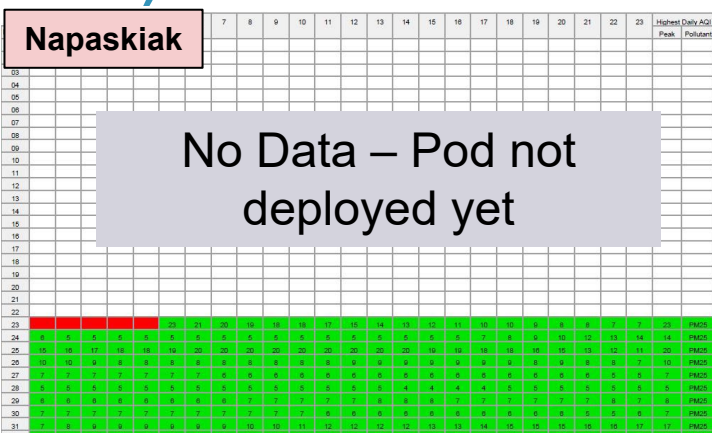
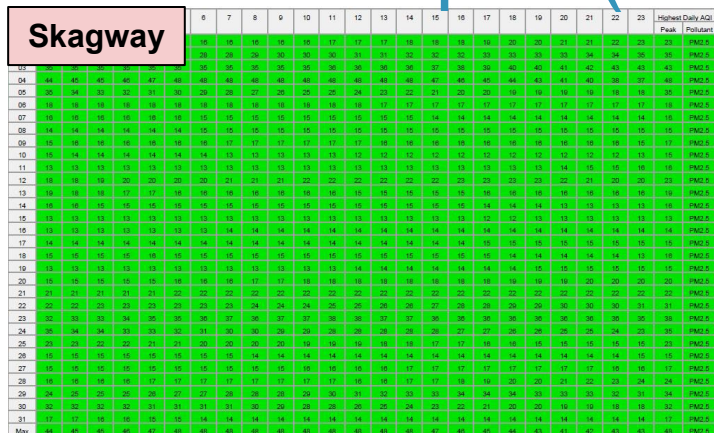


Goldstream

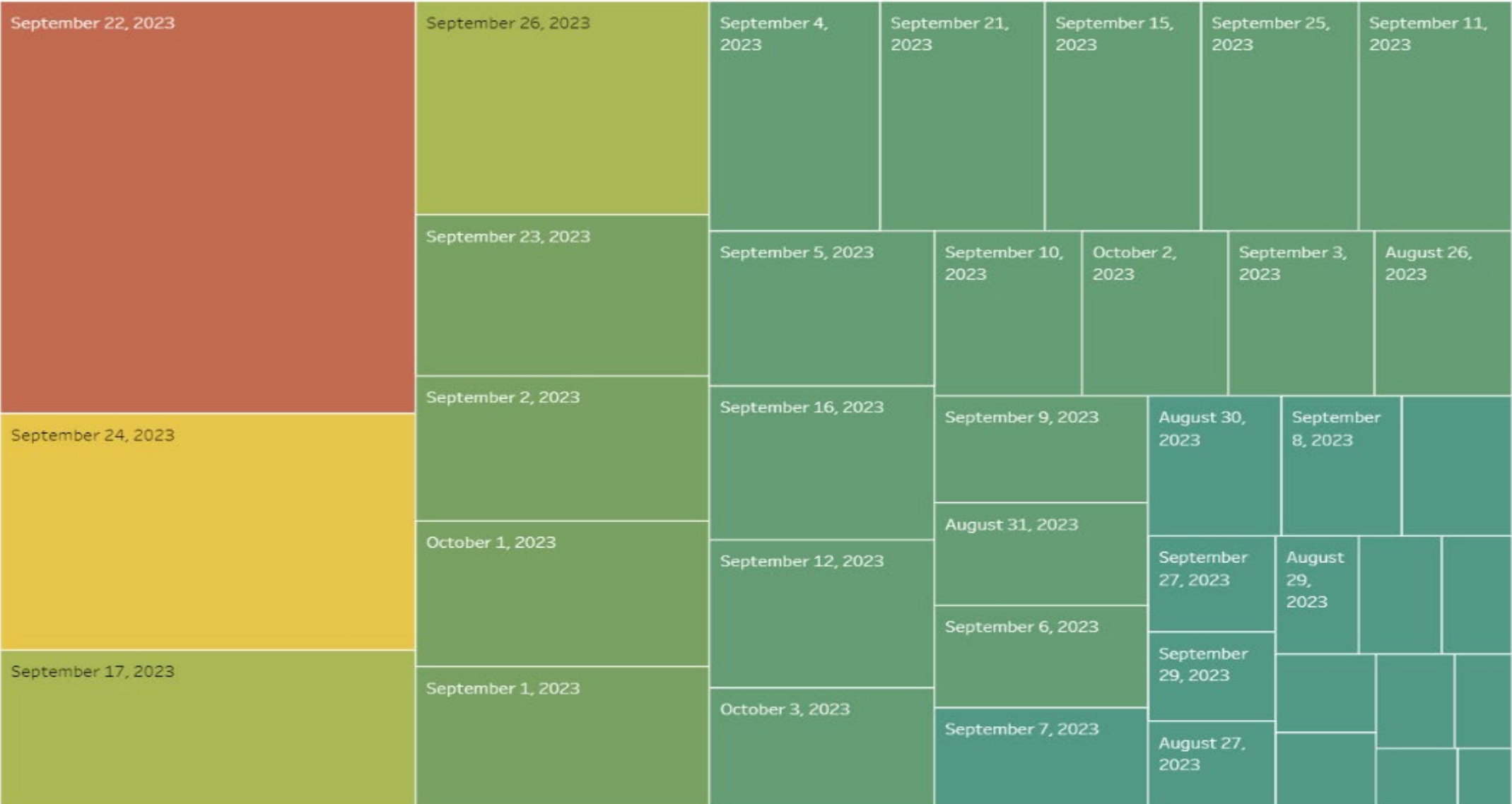
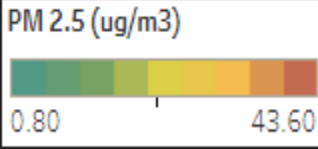
Year Overview of AQMesh Pod Data



August AQI Graphs (PM2.5)



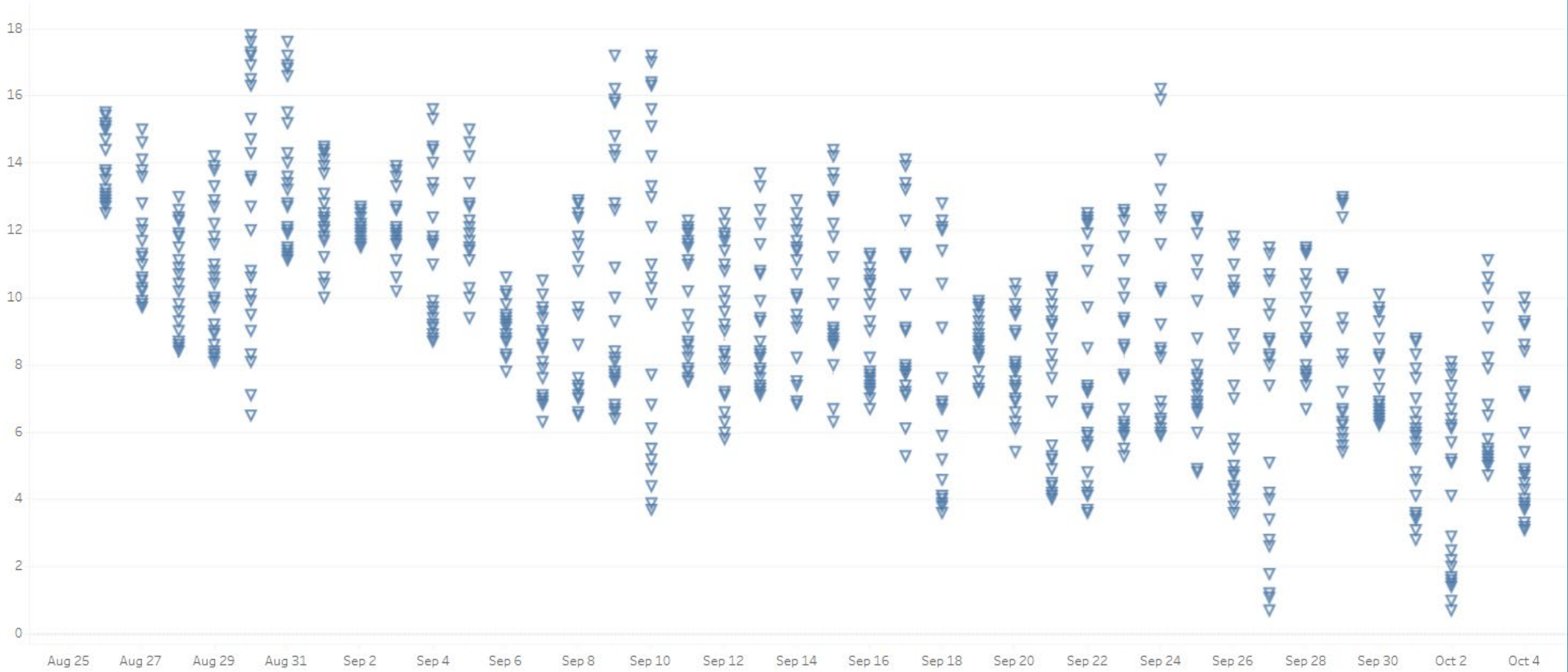
PM 2.5 (ug/m3) - Napaskiak, AK (August 23rd to October 4th)



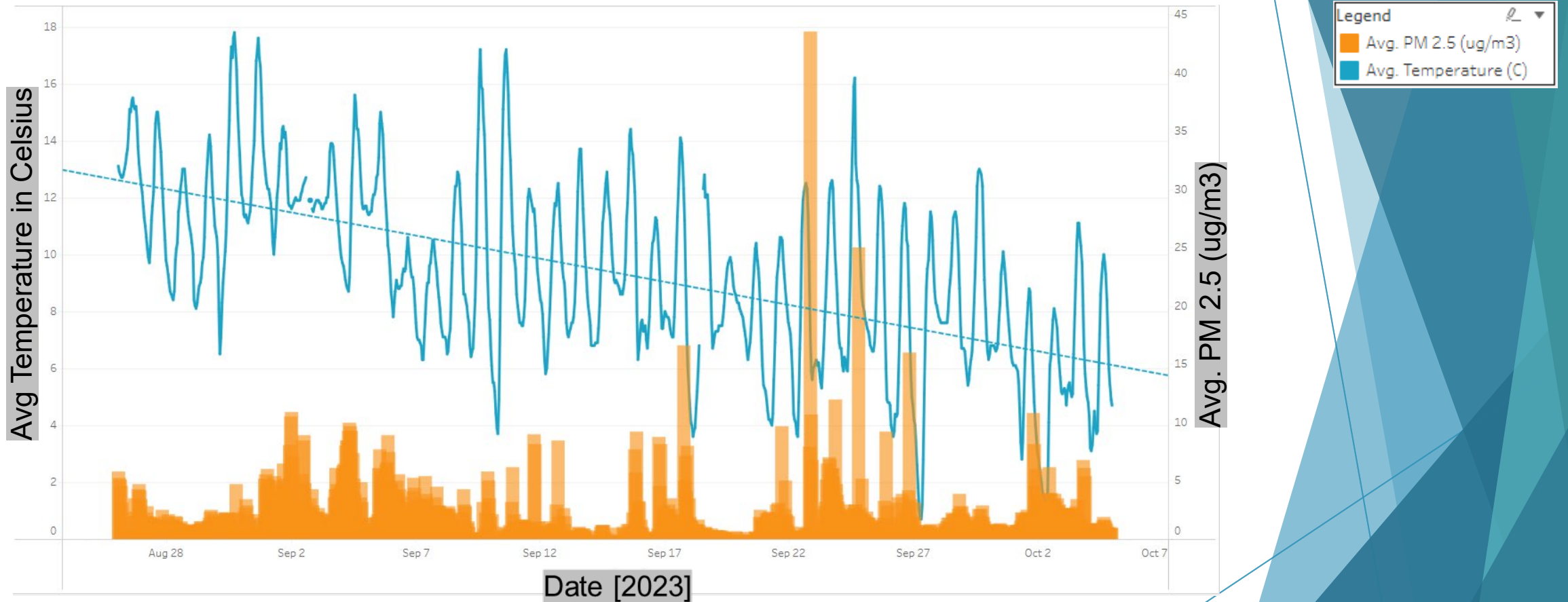
Temperatures (Celsius) - Napaskiak, Alaska (August 23rd to October 4th)

▽ 1 hour Temperature (C)

Temperature in Celsius

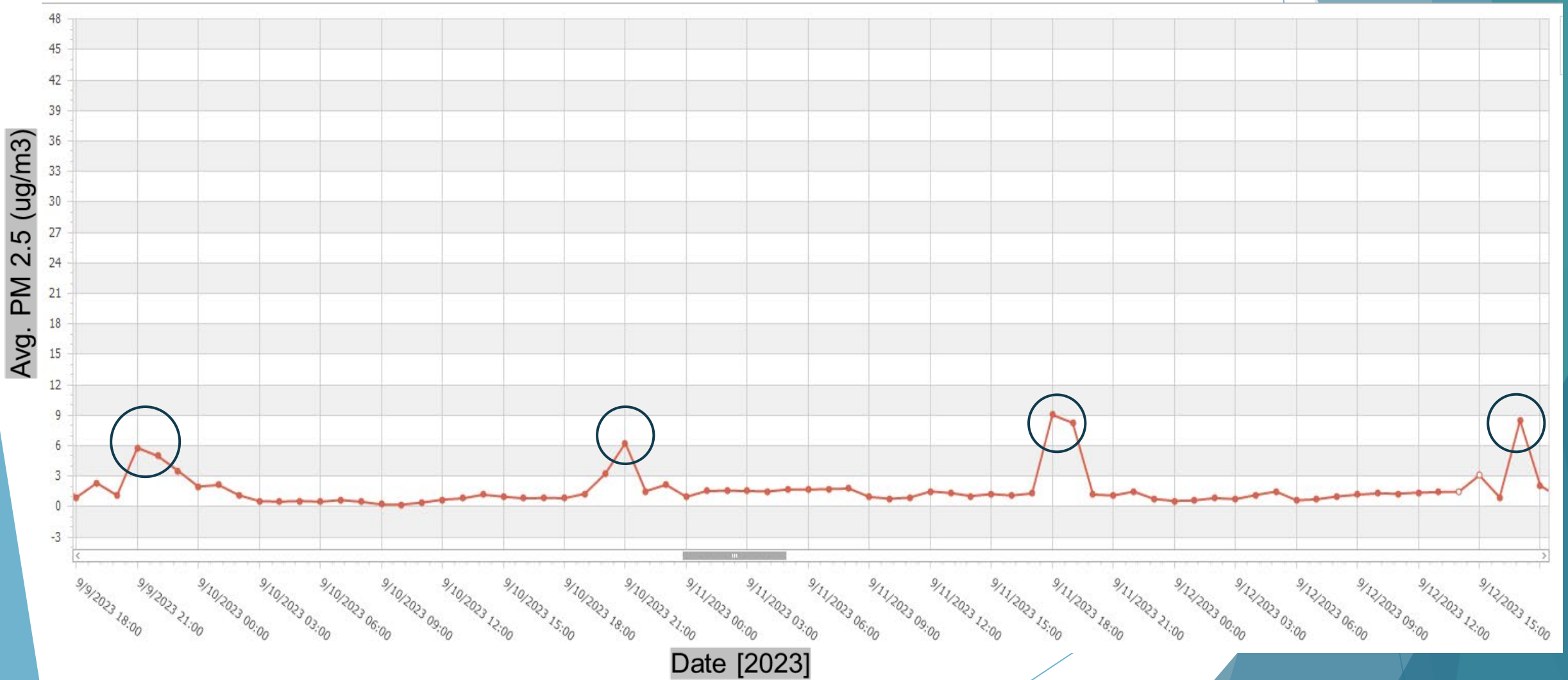


Date [2023]

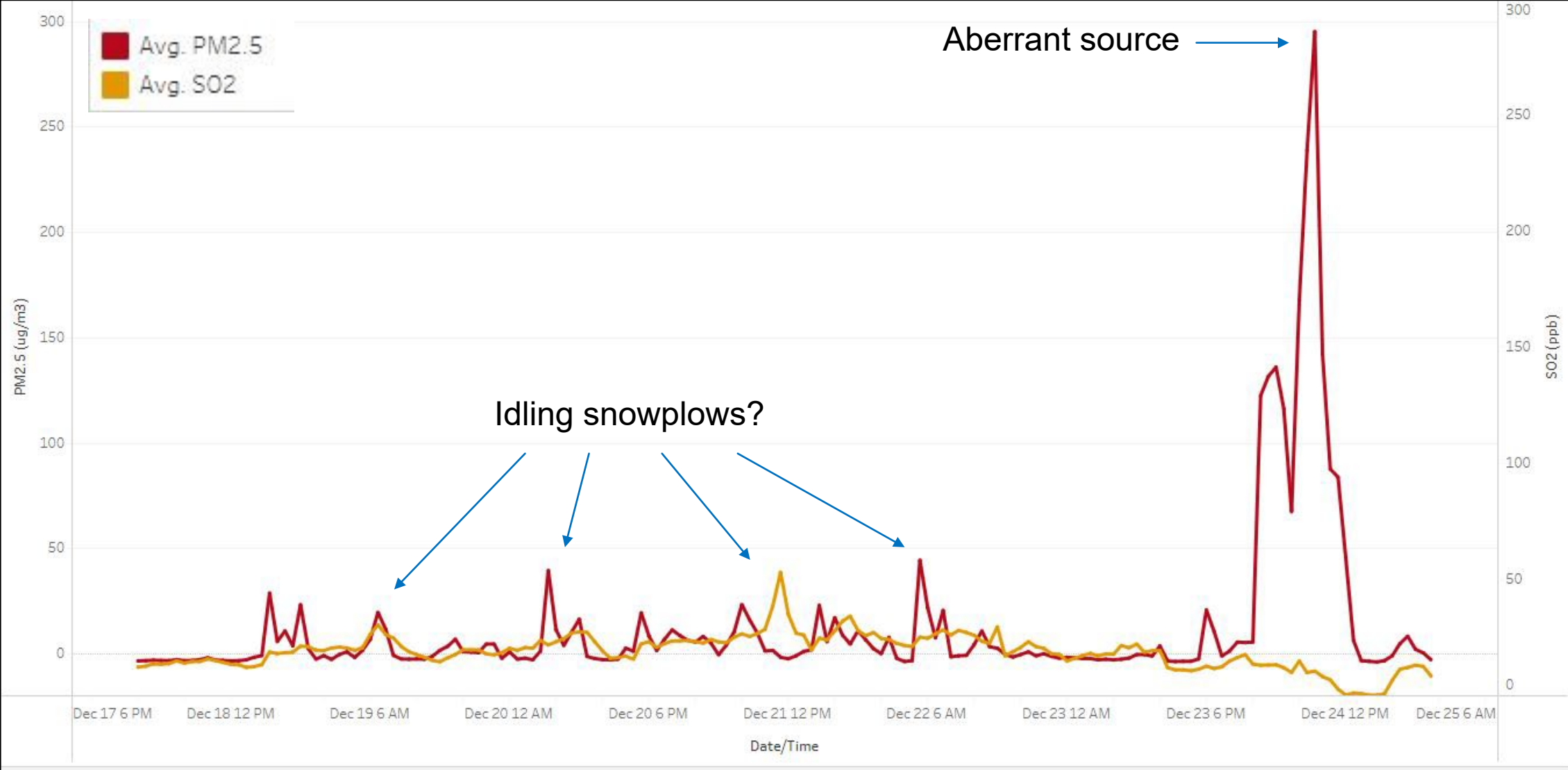


PM 2.5 (ug/m3) - Napaskiak, AK
(August 23rd to October 4th)

PM 2.5 (ug/m3) Hourly Data- Napaskiak, AK (August 9th- August 12th)



Ketchikan PM2.5 & SO2





Rowing in the same direction

- ▶ **Looking for Community Champions**
 - ▶ Finding a location and deployment
 - ▶ Receive training on sensor
 - ▶ Join the network! On the map, network calls, semiannual data reports
 - ▶ Data available at request
- ▶ **We want to host your air quality data on our website!**
- ▶ **DEC sensor network collaboration**
 - ▶ Contact us for direct collaboration
 - ▶ Future calls and knowledge share
 - ▶ Hiring staff to help with tribal/rural air quality!





Questions

- ▶ Next quarterly call date: January 16th @ 10-11am. Link in chat will take you to registration and will be emailed to our contact list.
- ▶ Visit our Air Quality website: dec.alaska.gov/air/air-monitoring/alaska-air-quality-real-time-data (or Google 'Alaska air quality' and look for DEC AQI link)
- ▶ Contact info is in chat and in QR code

Resources

- ▶ Not sure what sensor to buy?
 - ▶ EPA Air Sensor Toolbox: epa.gov/air-sensor-toolbox
 - ▶ South Coast AQMD's AQ-SPEC program and evaluations: aqmd.gov/aq-spec
 - ▶ Contact us!
- ▶ ANTHC's PurpleAir program – contact Andrew Willman
- ▶ <https://events.gcc.teams.microsoft.com/event/3e433ca9-b23e-4e4e-974d-6a5db4fda7ca@20030bf6-7ad9-42f7-9273-59ea83fcfa38>

Contact us



ARP Recipients

- ▶ Aleutian Pribilof Islands Association
- ▶ Chilkoot Indian Association
- ▶ Skagway Village (DBA Skagway Traditional Council)
- ▶ State of Alaska - DEC