

“What’s Up?” in Air Monitoring

Solar-Powered Monitoring Site - Greg Crider

Village Green Project - Ryan Biggerstaff

Near-Road Monitoring and Ozone Update - Curt Goeller

Monitoring Section, Air Quality Division



Air Monitoring's Renewable Power Project





18 ft

6 ft

38 ft

9 ft

Solar or Wind?

Solar



Wind



Wind

- **Wind** turbine- Not the best choice for our situation.
- Very few monitoring sites meet the standards for good wind power generation of 12mph avg (aweaa.org) without a costly 100 ft tower
- Cost is the most prohibitive reason

Solar

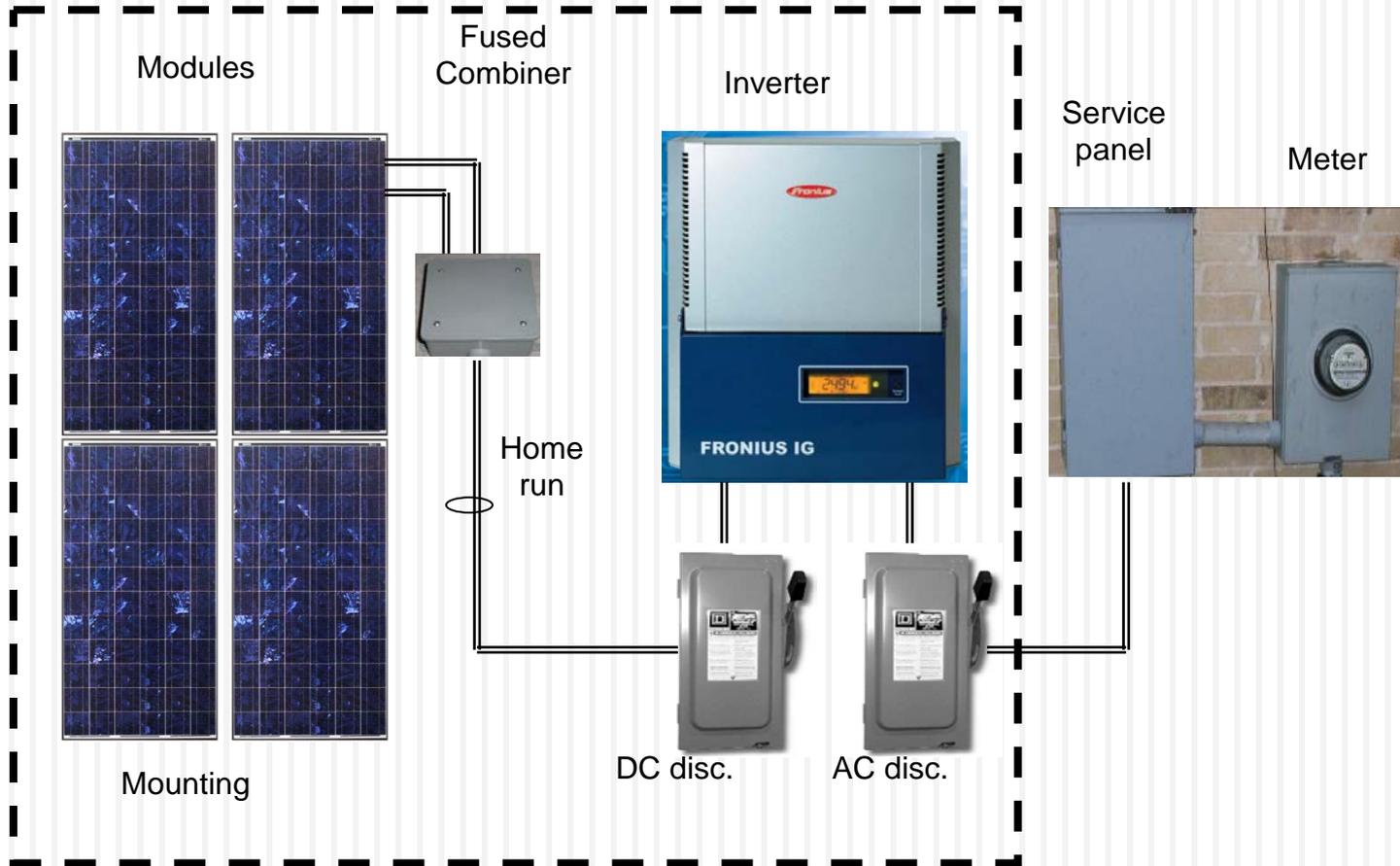
- **Solar** Photo-Voltaic power would be the most feasible option for our network
 - About a third of the cost for a comparable wind turbine
 - Plenty of sun. Shade will never be a problem because of site specifications
 - Low maintenance system with very few moving parts

Off or On the Grid?

Grid-tied systems are connected to the grid/electric company's lines after going through an AC/DC inverter and breaker box.

- These systems lower the electrical bill by reducing power used from the grid.
- While the grid provides a reliable source of energy when the sun doesn't shine.

Grid-tied System



Off The Grid

“Off the grid” systems are not hooked up to the utility company at all. They are a stand alone system that stores all of its power in a battery bank. There is no backup.





<http://www.deq.state.ok.us/aqdnew/monitoring/solar/index.html>











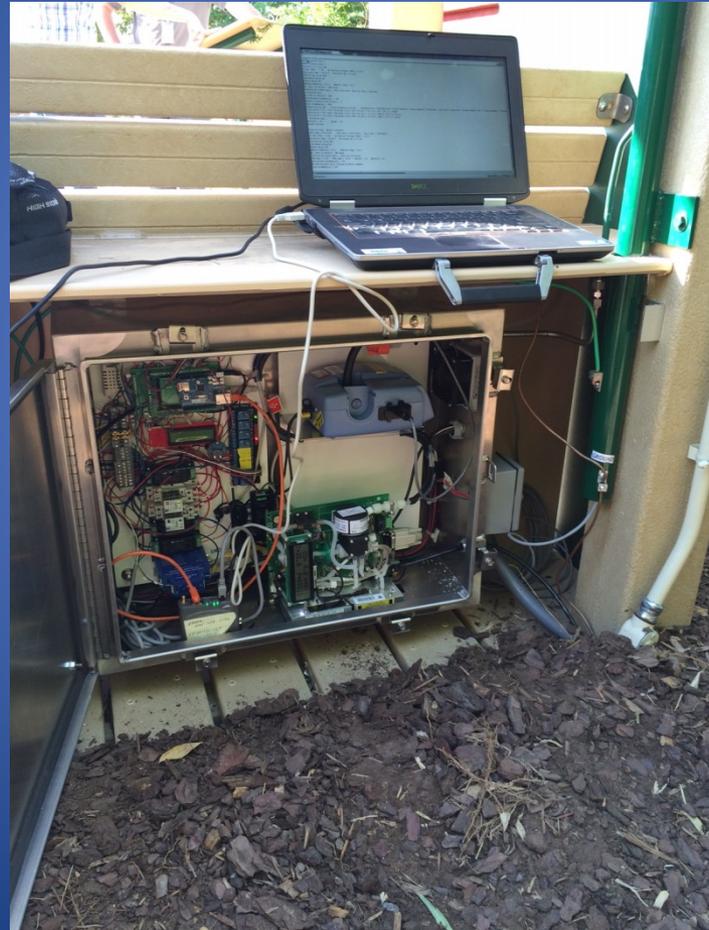
Village Green



Village Green



Village Green



Village Green

villagegreen.airnowtech.org/welcome?siteID=24291

Select a City ▼ Oklahoma City, OK ☰ Menu



Most Recent Observations
Oklahoma City, OK

41	Ozone ppb	82.4 °F
3	PM _{2.5} µg/m ³	36.8% humidity
		0.4 mph W

observed Tue 3:56 PM CDT Updating in 4

[Explore Oklahoma City, OK](#) >

Welcome to the Village Green Project

a research effort to discover new ways of measuring air quality and weather conditions in community environments.



Measuring and communicating on-the-spot air quality and weather conditions for research and awareness



Developing small and rugged data collection systems that can be powered by the wind and sun



Partnering with communities to pilot test the new technology in outdoor community spaces.

About Village Green

The Village Green project is a community-based activity to demonstrate the capabilities of new real-time monitoring technology for residents and citizen scientists to learn about local air quality. The goal of the project is to provide

A pilot station in Durham, NC has demonstrated the air monitoring station's ability to monitor several common air pollutants in real-time and make the data available online and by smartphone. The Village Green Project is

Village Green



Village Green

Village Green Air Monitoring

Solar panels convert sunlight into electricity to power the Village Green station.

The data can then be accessed on your mobile phone, tablet, or computer.

Real-time weather data and pollutant concentrations are transmitted to a database across the country.

Welcome to the Village Green Station at the Children's Garden.

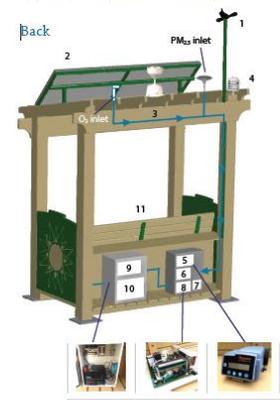
This park bench is an experimental air quality monitoring station developed by the U.S. Environmental Protection Agency (EPA). It is a prototype air and weather monitoring system designed to measure air pollution where people work, play, and live.

Sensors inside this bench measure ozone (O₃) and fine particle pollution (PM_{2.5}) which are the two most common air pollutants in our state.

O₃ and PM_{2.5} are two of six criteria air pollutants that are regulated by the federal government because studies have shown that repeated exposure to them is unhealthy.

The air quality data displayed on the LCD screen can also be accessed from your mobile phone and electronic devices anytime, anywhere. Scan the QR code below or go to airnow.gov/villagegreen.

- Bench components:**
1. Wind sensor
 2. Solar panel
 3. Precipitation sensor
 4. Humidity/temp. sensor
 5. PM_{2.5} monitor
 6. Microprocessor
 7. Cellular router
 8. Ozone monitor
 9. Power controller
 10. Battery
 11. Bench structure
*Made of recycled milk cartons



Making Sense Out of Numbers

This color-coded chart is the Air Quality Index (AQI). It uses an algorithm to associate pollutant concentrations with their effects on human health. The current conditions at this site are represented by the flag flying near the bench.

AQI #	Air quality conditions	Represented by color
0 - 50	Good	Green
51 - 100	Moderate	Yellow
101 - 150	Unhealthy for Sensitive Groups	Orange
151 - 200	Unhealthy	Red
201 - 300	Very Unhealthy	Purple
301 - 500	Hazardous	Maroon

Air Quality Right Here, Right Now.

Air quality changes minute-by-minute. Readings are averaged to give a snapshot of pollution at any point in time.

1-Hr 5-min Checksum - 04/09/08

Time	24-hr
Date	mm/dd
Forecast of today's air quality	- AQI for O ₃ - AQI for PM _{2.5}
1-min. readings	- O ₃ ... ppb - PM _{2.5} ... µg/m ³
Temperature	°F
Humidity	%
Wind speed	mph
Wind direction	deg
Today's rainfall	in
ppb (parts per billion)	
µg/m ³ (micrograms per cubic meter)	

Scan here for the latest air and weather data from this monitoring station: airnow.gov/villagegreen

View data from DEC's two dozen other, traditional air monitoring sites in the state.

*Air data is preliminary and subject to review. Data from this site is not used to determine compliance with the federal Clean Air Act.



Village Green



Near Road NO2



Near Road NO2

February 9, 2010 New NO2 NAAQS

100 ppb one hour average. (Three year averages of 98th percentile of daily maximum shall not exceed.)

Old NAAQS retained (53 ppb annual arithmetic average).

New monitoring requirements in near-road environment of larger urban areas. (Near-road is no greater than 50 meters away from the nearest lane of traffic, but within 20 meters if possible.)

Near-Road NO₂

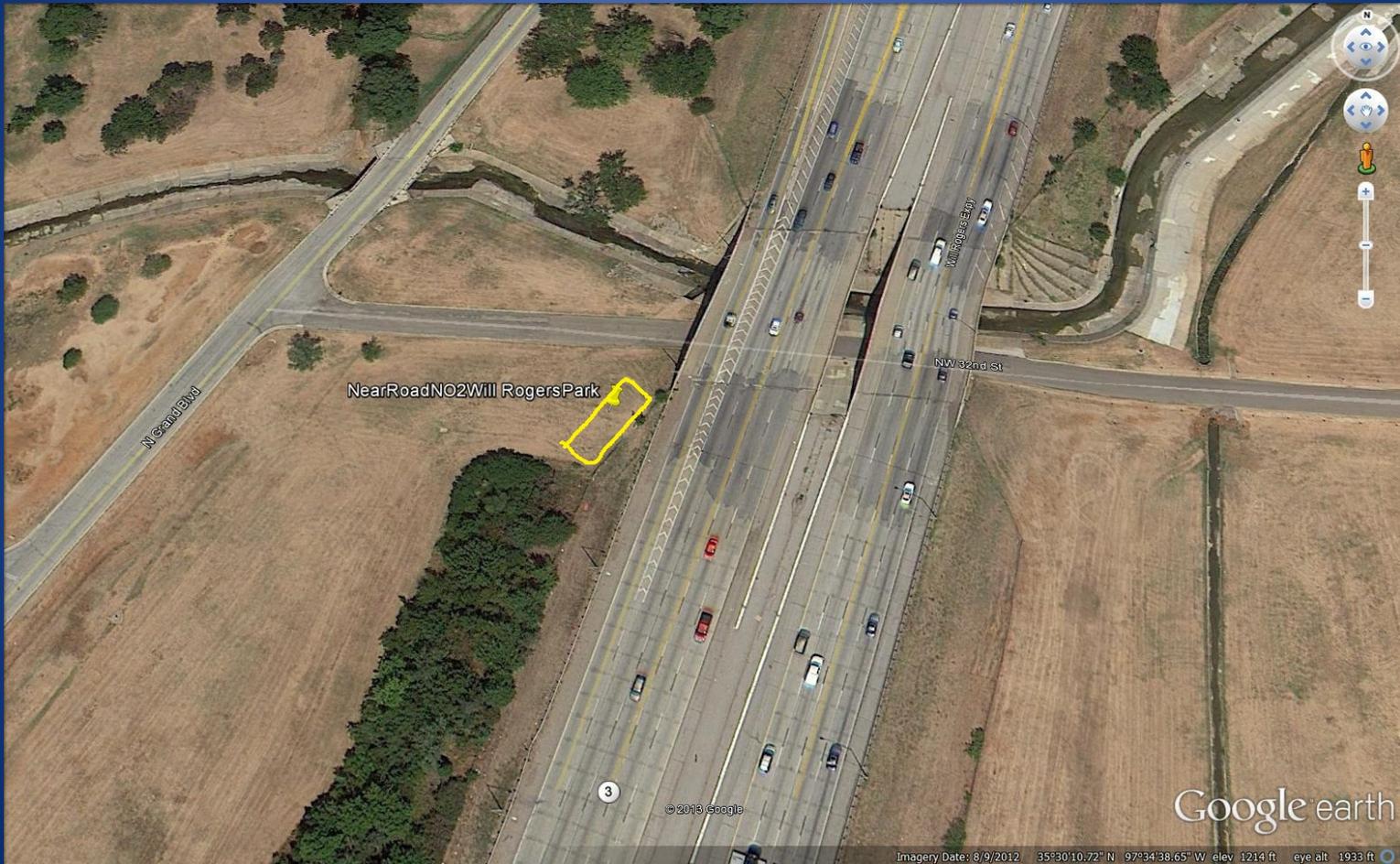
First phase Near-Road sites required in larger cities (population >2.5 million). Began sampling 1/1/13

Second phase Near-Road sites, included Oklahoma City (population >1 million but <2.5 million). Begin sampling 1/1/14

How close is it?



Exactly where is it?



How does it compare?

(NAAQS 53ppb annual average)

- NO2 Monthly Averages (ppb)

• Month	Bradley	OSDH	Near Road	Yukon	Tulsa
• January		10		7	11
• February		8		6	11
• March		7	26	6	11
• April	3	5	14	3	7
• May	2	5	16	3	6
• June	2	5	16	3	6
• July	3	5	15	2	7
• August	5	6	20	5	8
• September	8	4	20	2	7

How does it compare? (NAAQS 100 ppb one hour average)

Rank	Bradley	OSDH	Near Road	Yukon	Tulsa
1	52	60	57	44	52
2	52	52	51	43	48
3	48	45	49	42	46
4	39	45	48	42	43
5	36	45	47	40	42
6	32	43	44	36	42
7	21	42	44	36	42
8	21	40	43	35	42
9	16	40	43	35	41
10	15	40	42	35	40

New Ozone NAAQS

- .070 ppm eight hour average, 3 year average of annual fourth high 8hr daily maximum.
- Designations likely to be made in late 2017, 2014 through 2016 data will be used to determine attainment.
- PAMS monitoring sites will be required at Ncore sites in CBSAs over 1 million population.
- No new Oklahoma ozone monitoring sites are required now.
- Ozone season, March 1 – November 30, the same.

Trivia

Number of Oklahoma Ozone Monitoring Sites Not Attaining .070 ppm NAAQS

(3 year average of fourth highs ending on year below)

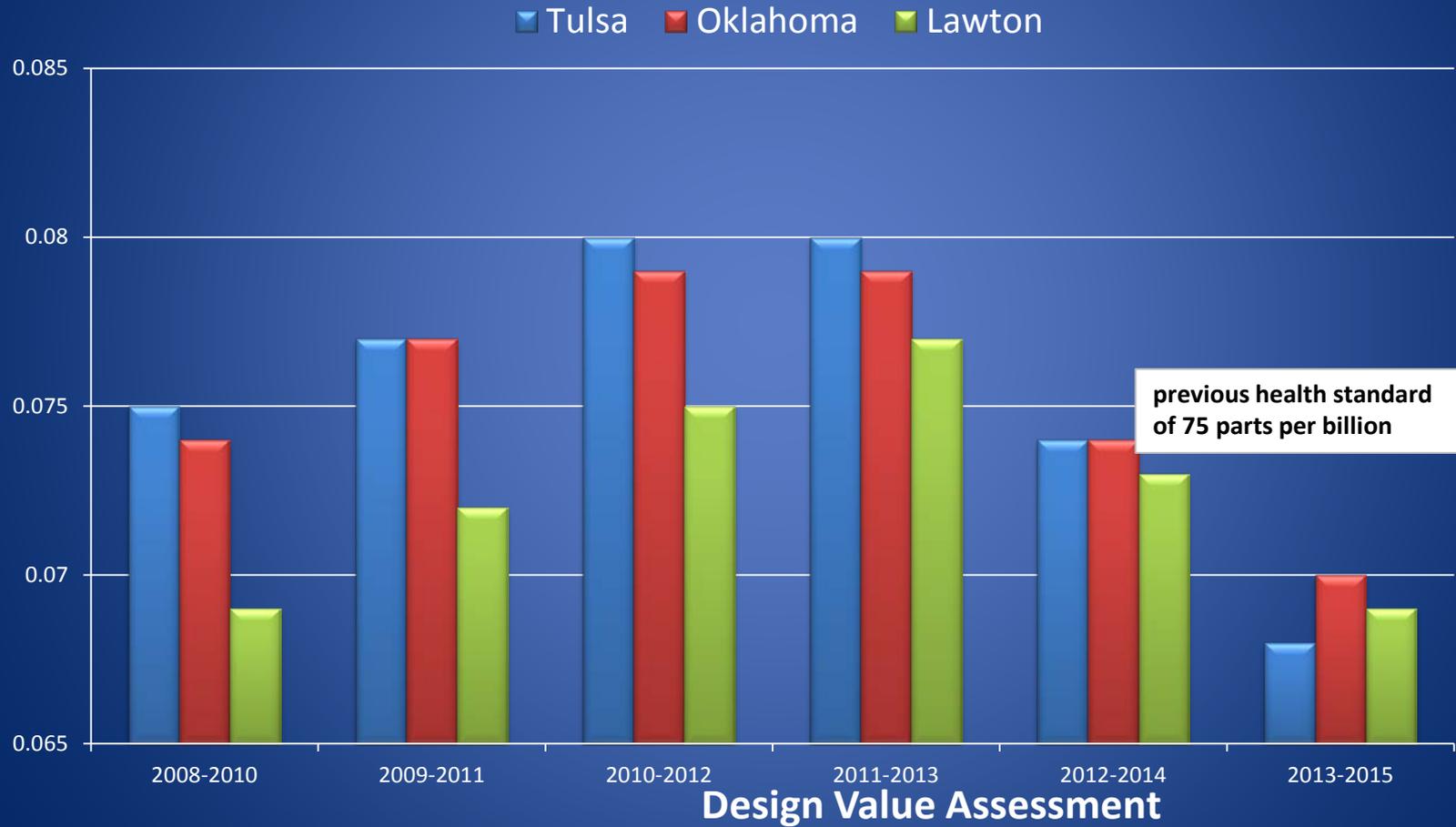
2007	2008	2009	2010	2011	2012	2013	2014	2015
13	12	8	5	13	14	14	11	0

More Trivia

**Number of Days Ozone 8 Hour Average Exceeded .070
ppm at ODEQ Sites**

2010	2011	2012	2013	2014	2015
16	63	60	23	13	4

Where do we stand?



Ozone NAAQS History

1971 NAAQS for photochemical oxidants

.08 ppm one hour avg, no more than once/yr

1979 Ozone NAAQS

.12 ppm one hour avg, no more than once/yr

1997 Ozone NAAQS

.08 ppm 3 year average of 4th highest 8 hour average daily maximum

2008 Ozone NAAQS

.075 ppm 3 year average of 4th highest 8 hour average daily maximum

2015 Ozone NAAQS

.070 ppm 3 year average of 4th highest 8 hour average daily maximum