air ALLIANCE HOUSTON

Air Monitoring Data

for Gulfton

April – Oct 2022

Air Pollutants

Nitrogen Oxides (NOx)	Volatile Organic Compounds (VOC)	Ozone (O3)	Particulate Matter (PM2.5)
Oxides of nitrogen - primarily emitted by vehicles and industrial facilities. Contributes to breathing problems, smog, acid rain, ozone	Highly reactive carbon compounds – emitted by vehicles, industries, gasoline equipment, paints, chemicals, solvents etc. Toxic at high concentrations, contributes to ozone	Ground level ozone – forms due to reactions between NOx and VOCs in sunlight and heat. Contributes to breathing difficulties, respiratory issues	Inhalable particles - dust, dirt, soot, and even smaller – emitted by industries, vehicles, construction sites, fires, unpaved roads Contributes to heart & lung complications, asthma

Sources of Pollution

Toxic Release Inventory (TRI)

Industrial and federal facilities that report toxic chemical releases.

Typically, larger facilities involved in manufacturing, metal mining/recycling, electric power generation, petrochemical, refining, and chemical manufacturing and hazardous waste treatment.

Concrete Batch Plants (CBP)

Facilities that combine sand, cement, and other aggregates to make concrete

Typically, neighborhood-level facilities, that are significant sources of particulate matter (dust), diesel truck smoke, noise and light pollution among other nuisances.

Roads / Freeways / Trains (yards)

Vehicular exhaust significantly emits a noxious brew of multiple types of pollution:

NOx, VOCs, PM2.5, GHGs and the precursors for ozone and smog

Superfund sites

Polluted waste locations in the United States contaminated with extremely hazardous substances. Usually abandoned.

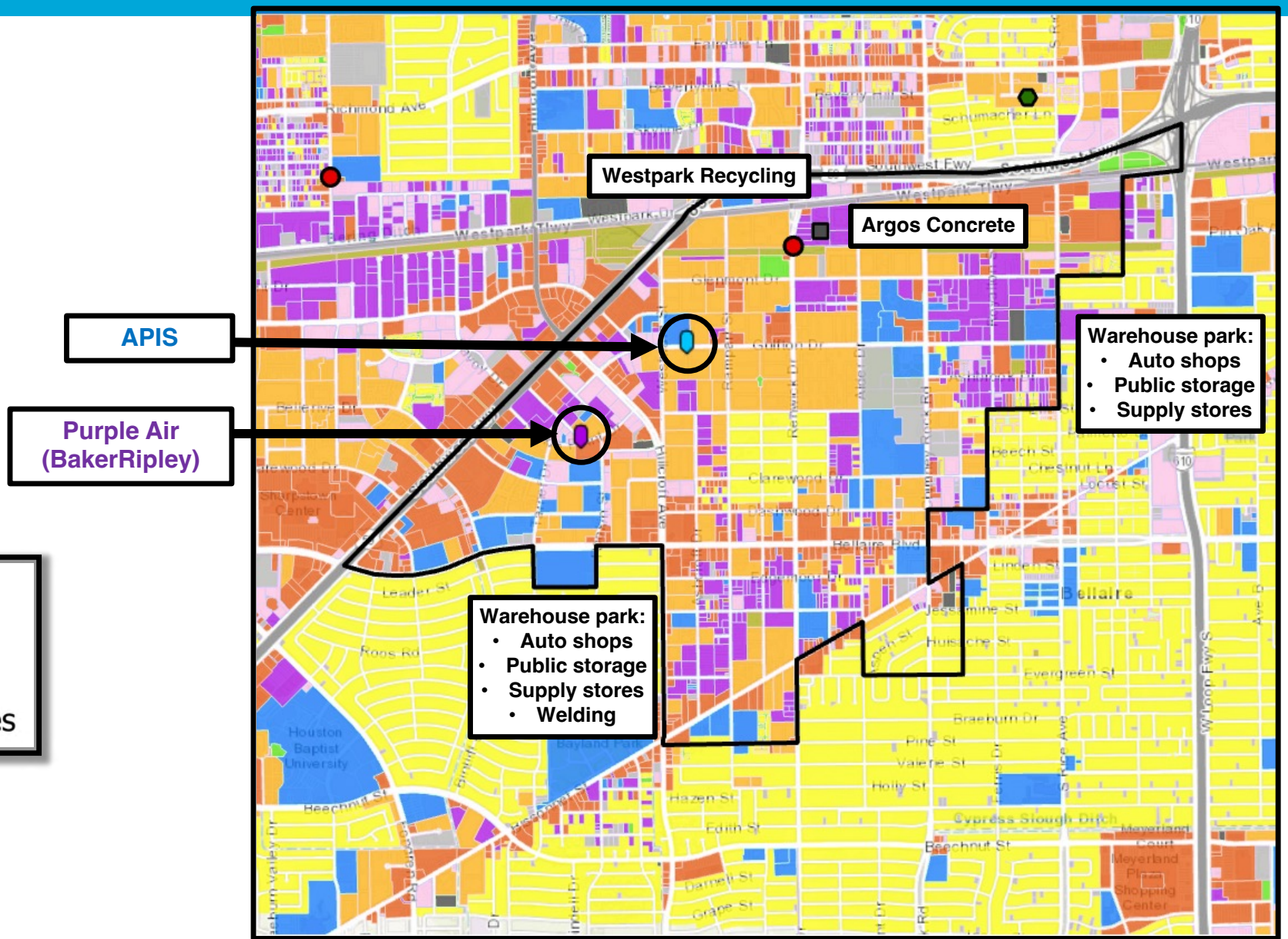
Uncleaned sites are continued sources of ground, air, and water pollution into the neighboring areas.

Surrounding Land Use Map: Gulfton

- Single-Family Residential
- Multi-Family Residential
- Commercial
- Office
- Public & Institutional
- Industrial
- Park & Open Spaces
- Transportation & Utility
- Undeveloped
- Agriculture Production
- Unknown

- Superfund Sites 2022
- Texas TRI Facilities, 2020
- Concrete Batch Plants 2021
- Active Municipal Solid Waste sites

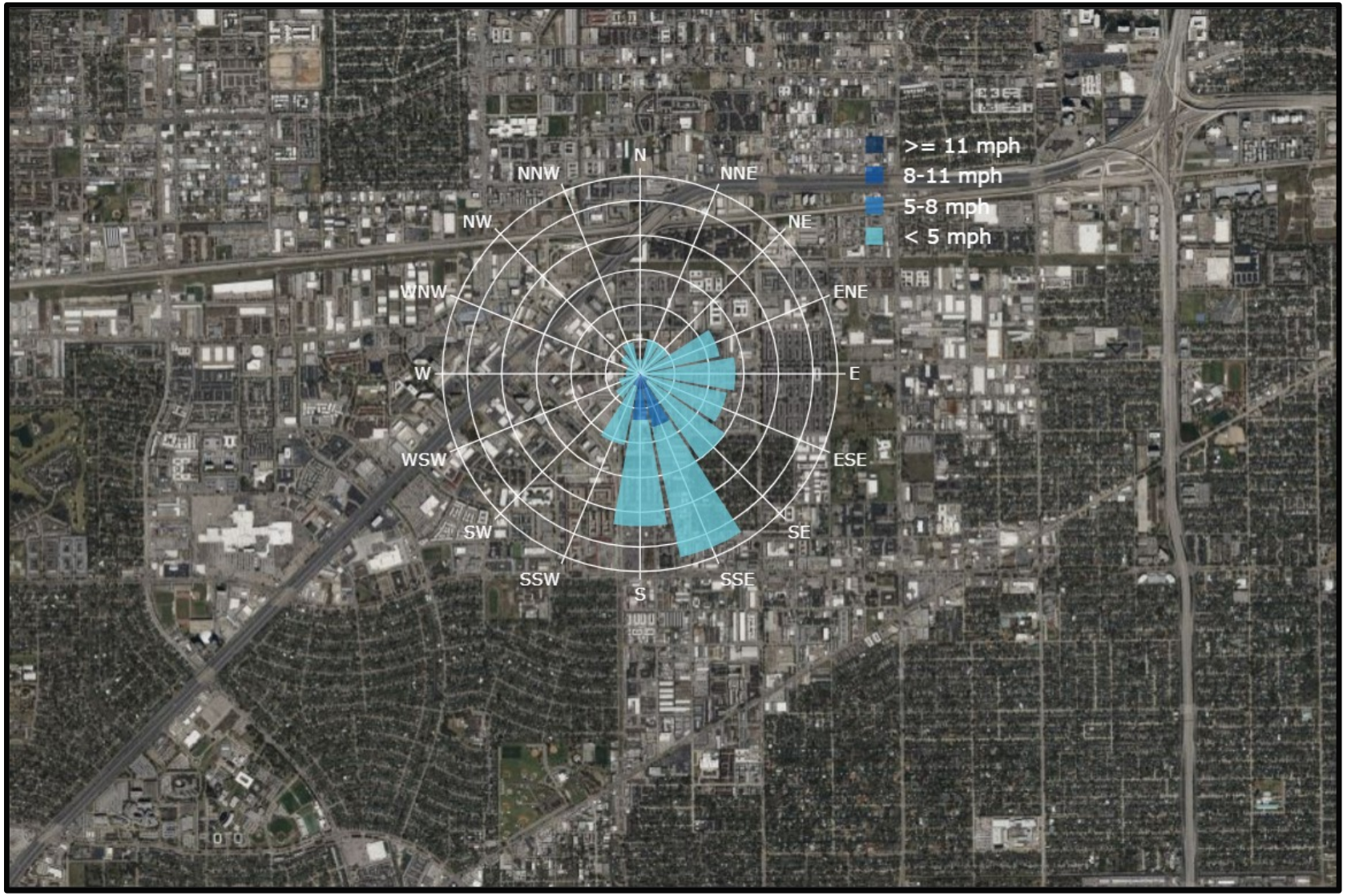
- APIS
- Purple Air



Wind Direction and Speed

Averaged over:
April – August 2022

Sources of pollution upwind of the monitors make significant contributions to readings and measurements



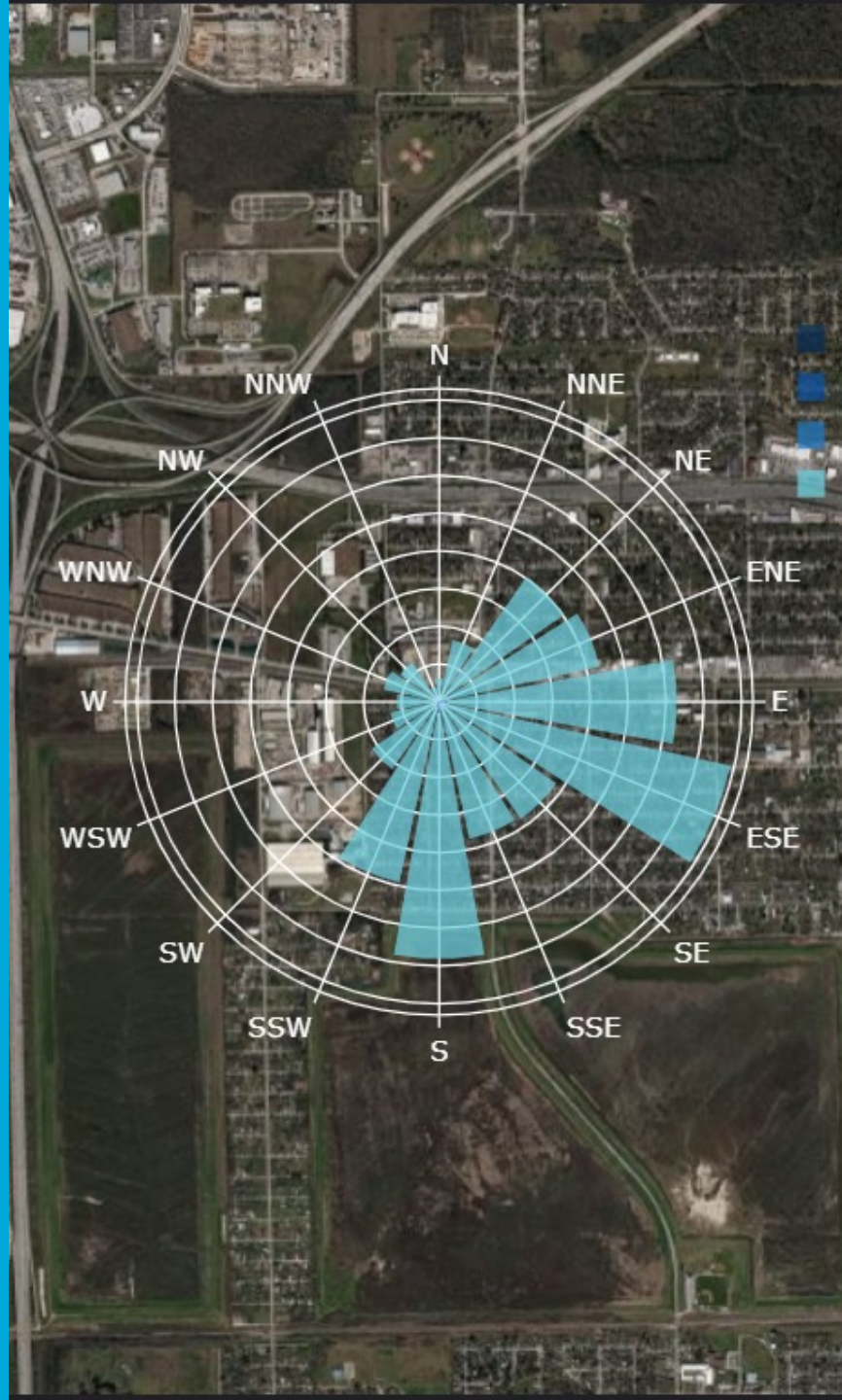
Predominant winds: SOUTHEAST

In line with regional prevailing winds from the Gulf of Mexico

Air Monitor Measurements

April - October 2022

1. Nitrogen Oxides (NOx)
2. Ozone (O3)
3. Volatile Organic Compounds (VOCs)
4. Particulate Matter (PM)

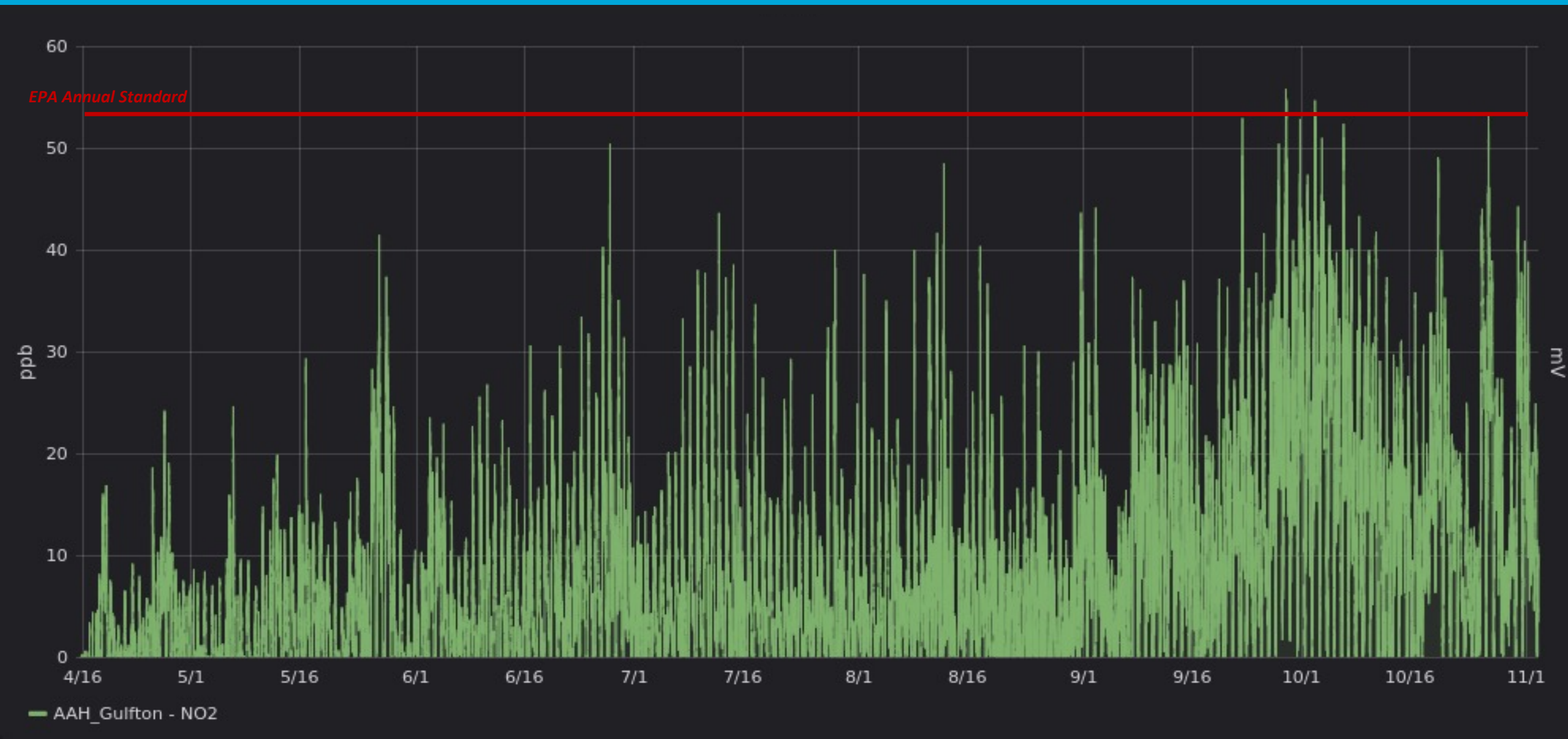


Nitrogen Oxides (NOx)

Includes Nitrogen Oxide (NO) and Nitrogen Dioxide (NO2)

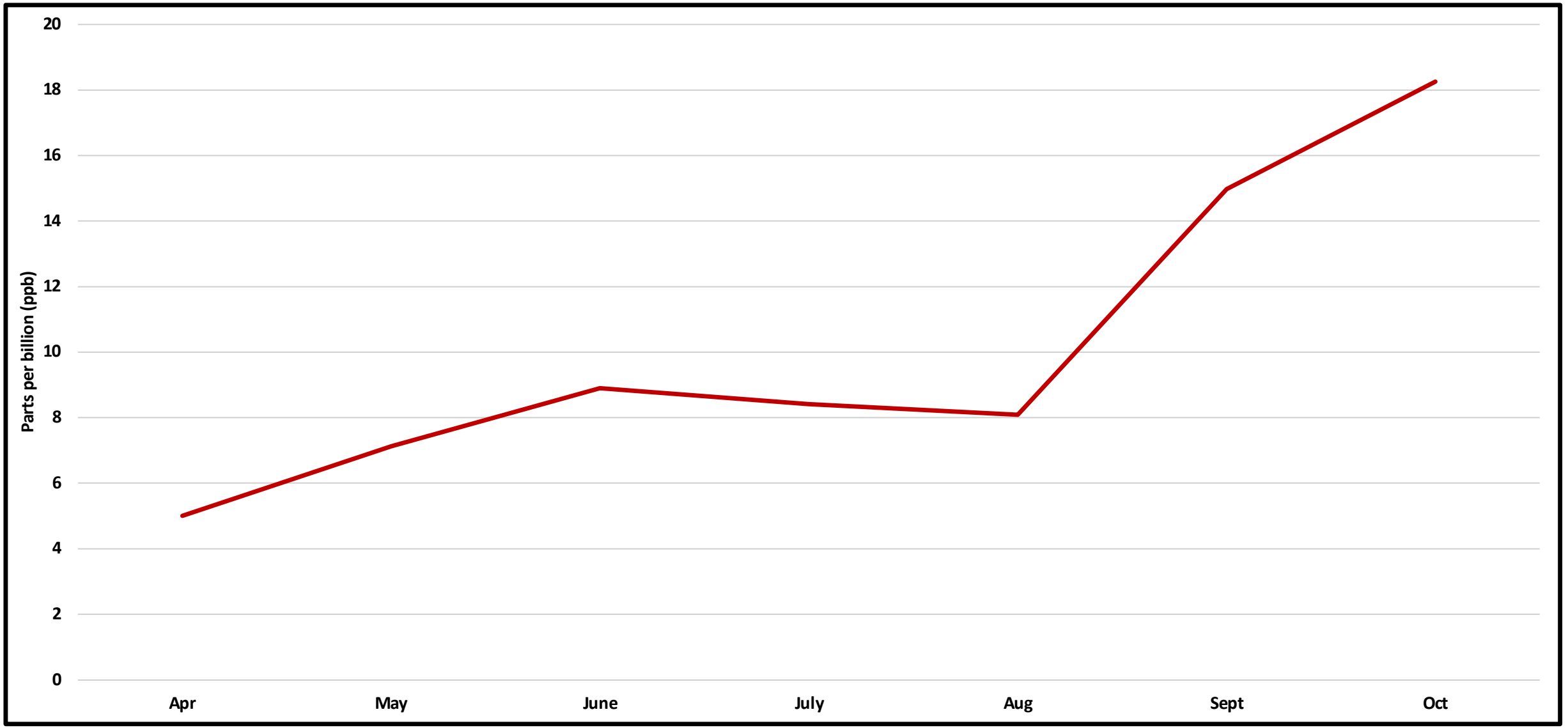
NOx: Day-to-Day

EPA NOx standard	1 hour	Annual
	100 ppb	53 ppb



NOx: Monthly Averages

EPA NOx standard	Annual
	53 ppb



NOx: Monthly Averages

EPA NOx standard	Annual
	53 ppb

	Apr	May	June	June	Aug	Sept	Oct	Overall
Gulfton NOx	5	7.13	8.9	8.4	8.1	15	18.3	11.21

Major takeaways

- Daily values peak twice daily:
  - Mornings: 6-9 am and Evenings: 6-9 pm
  - Evenings have significantly higher peaks
  - Zero concentration in the afternoon

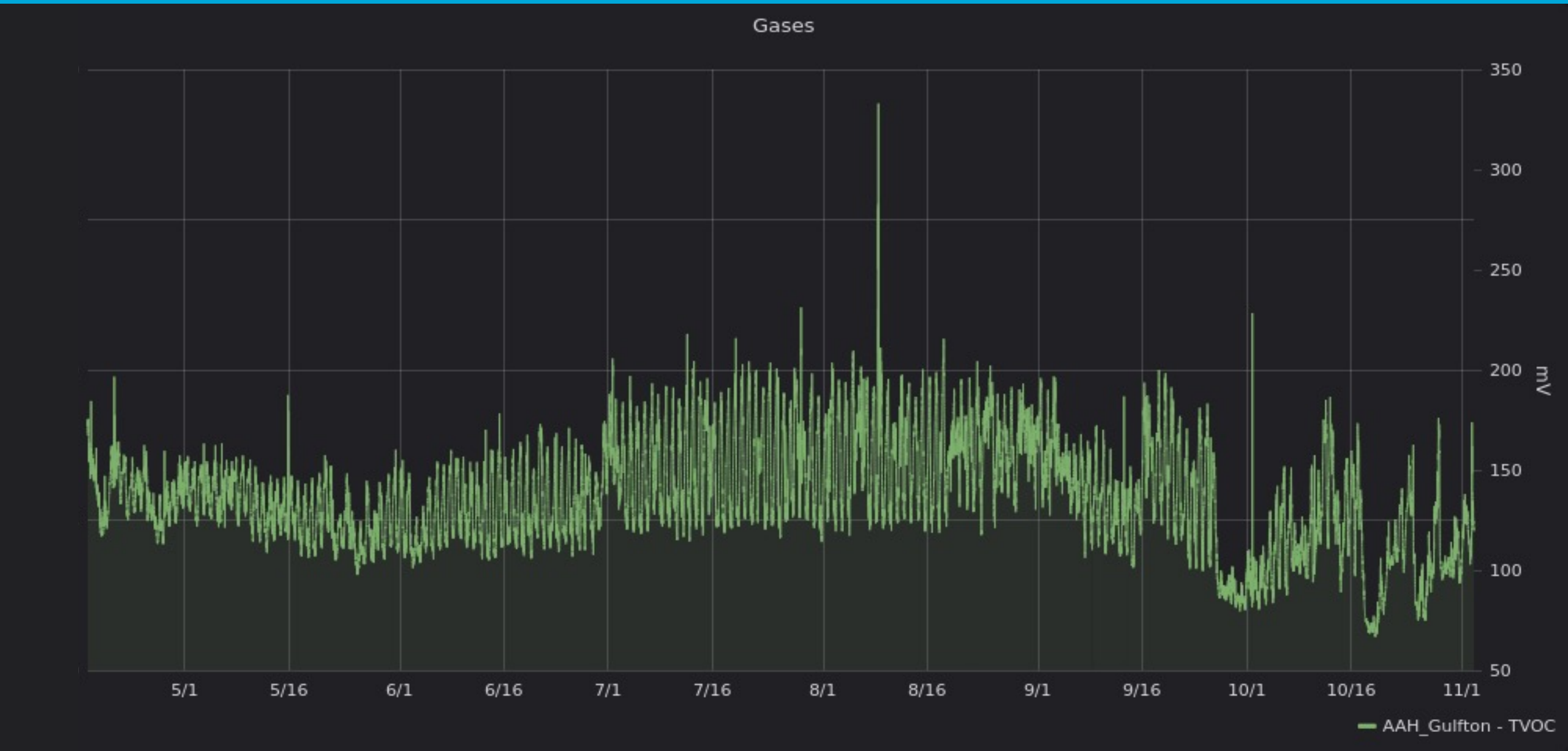
- Trending upward as the year goes on. Highest values in Sept-Oct
  - Peaks getting higher and more prolonged as well
  - Levels haven’t exceeded EPA standards yet

- No unusual spikes observed. Regular cycle

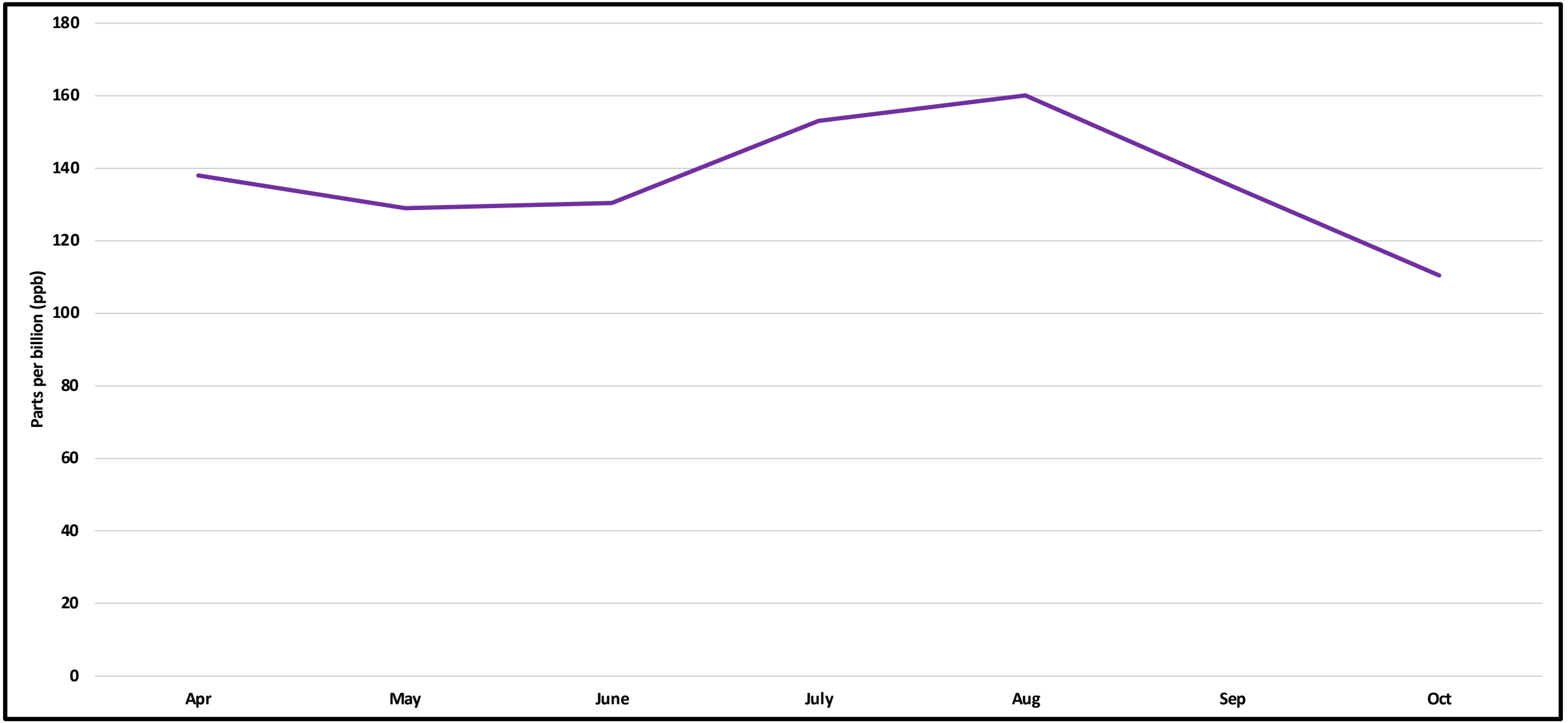
Volatile Organic Compounds (VOCs)

Includes benzene, ethylene, formaldehyde, butadiene, propane, and ethane among many others

Total VOC: Day-to-Day



VOC: Monthly Averages



Total VOC: Monthly Averages

	Apr	May	June	June	Aug	Sept	Oct	Overall
Gulfton TVOC	138	129	130.4	153.1	160.1	135.1	110.5	136.4

Major takeaways

- Daily values peak early mornings: 4-9 am
  - Starts going up during the evenings 7-9 pm

- Levels trending slightly downward as the year goes on:
  - Daily peaks are not reaching as high in Sept-Oct

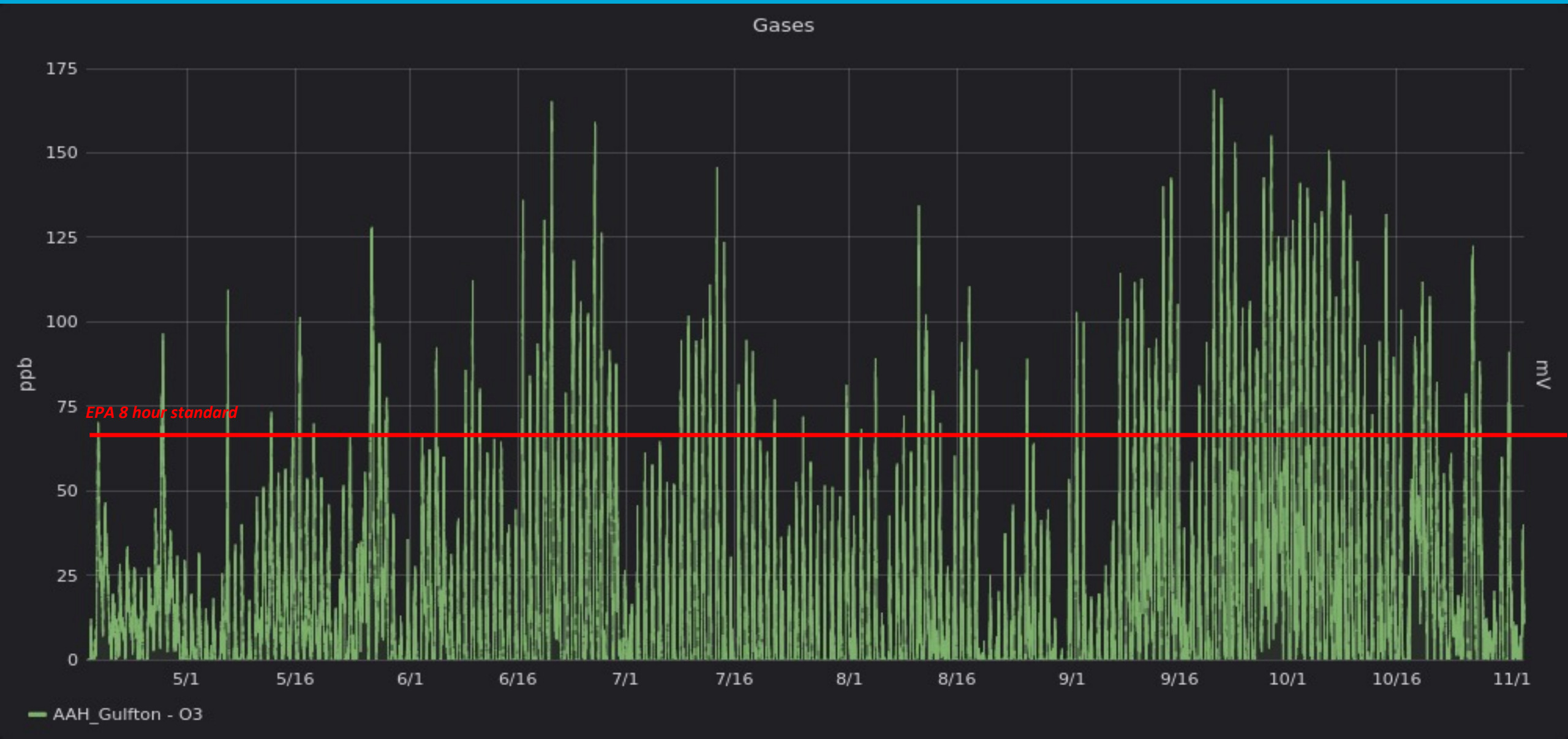
- Very few high spikes outside of regular cycles
  - Mainly at night 8-9 pm

Ozone (O3)

***Ground level ozone* (not stratospheric) that contributes to smog formation**

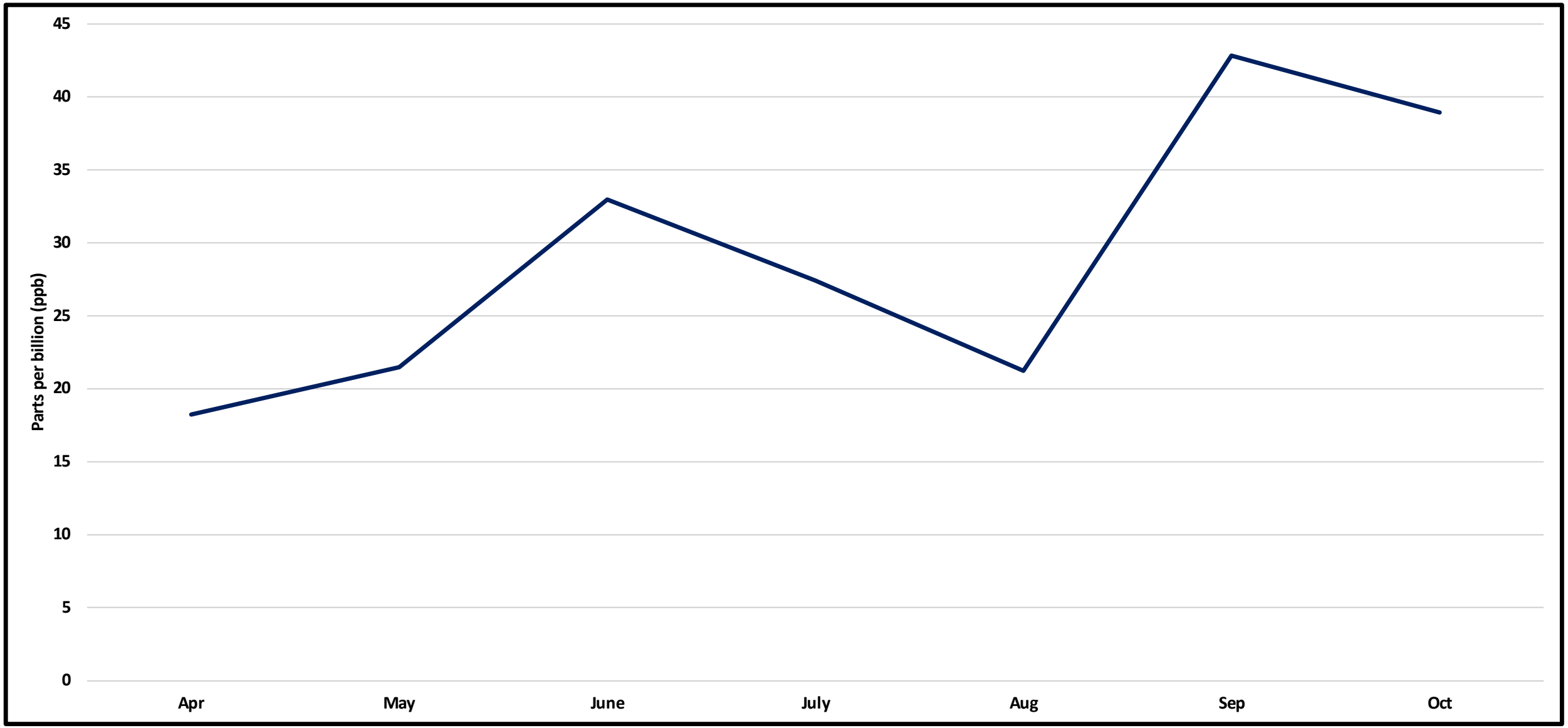
Ozone (O3): Day-to-Day

EPA O3 standard	8 hour
	70 ppb



Ozone: Monthly Averages

EPA O3 standard	8 hour
	70 ppb



Ozone: Monthly Averages

EPA O3 standard	8 hour
	70 ppb

	Apr	May	June	June	Aug	Sept	Oct	Overall
Gulfton O3	18.2	21.5	33	27.4	21.23	42.84	39	30.1

Major takeaways

- Daily values peak regularly around late afternoon: 2 - 4 pm
  - Likely daily traffic cycles . Zero concentration at night

Katie Watkins/Houston Public Media

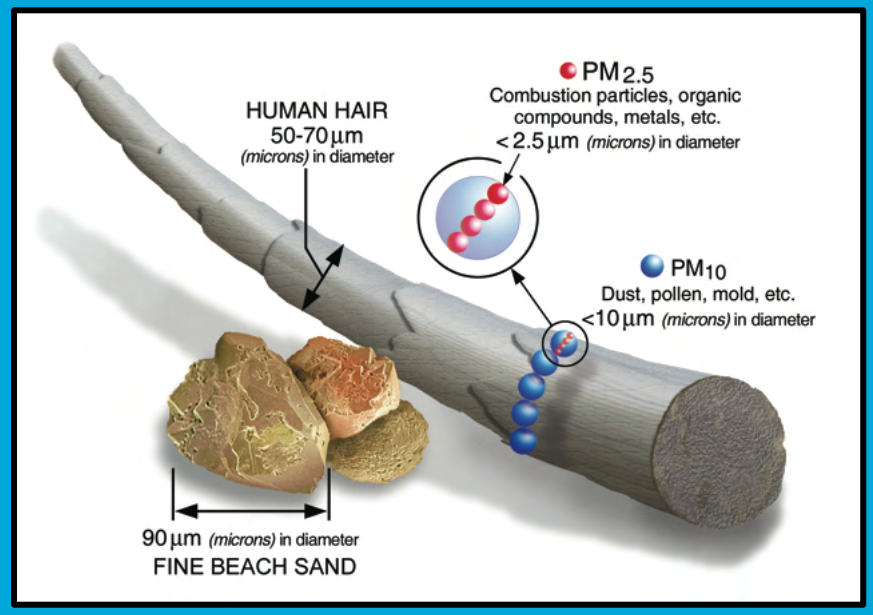
Too much concrete and a lack of greenspace makes Gulfton one of Houston's warmest neighborhoods.

- Trending generally upward as the year goes on
  - Could be lingering summer heat + increased traffic
  - Esp. true since Gulfton is one of Houston's warmest neighborhoods

- Daily peaks are far **above EPA ozone standard**:
  - High NOx and VOC levels: High traffic + few industries + neighborhood heat
  - **THREE freeways** intersect at Gulfton + many other major streets

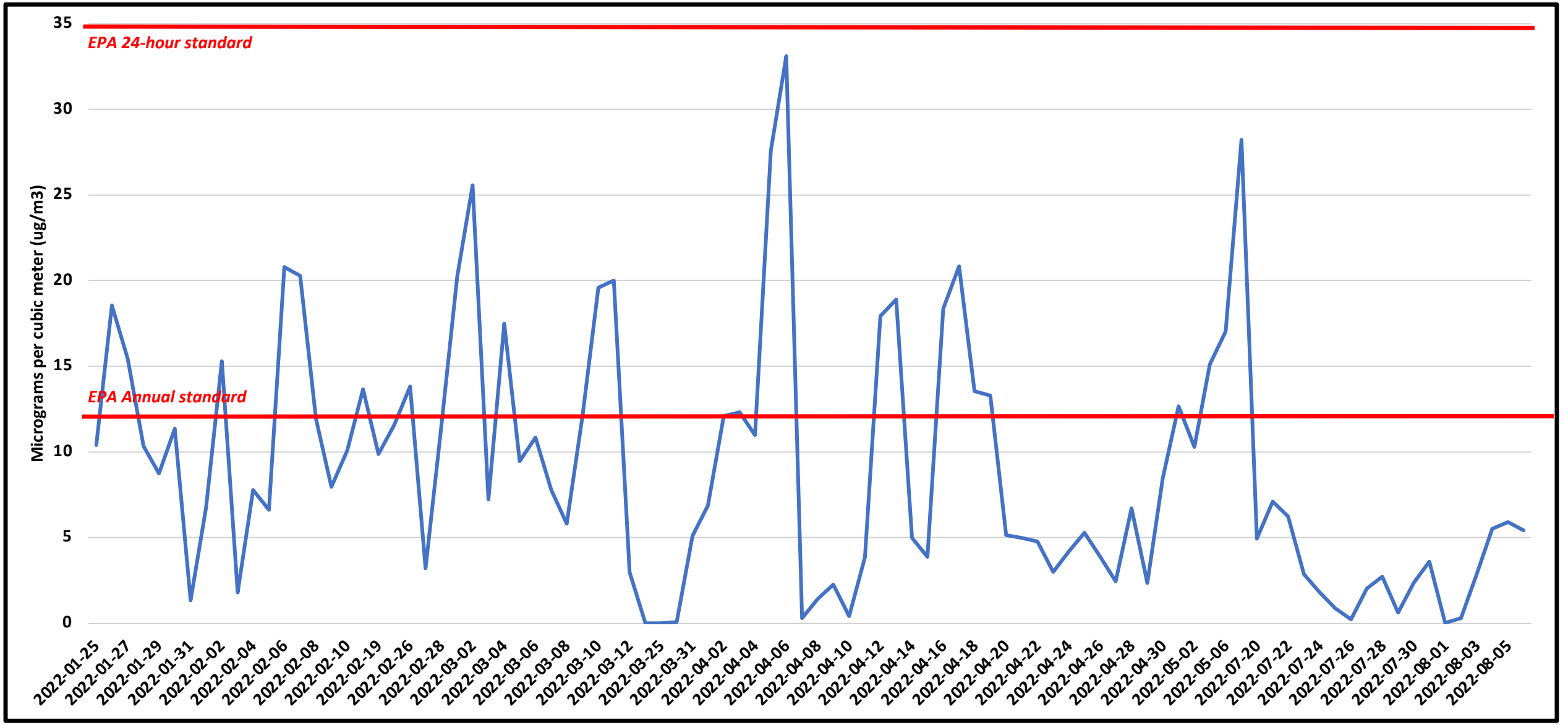
Particulate Matter 2.5 (PM2.5)

Fine inhalable particles that can penetrate deep into the lungs



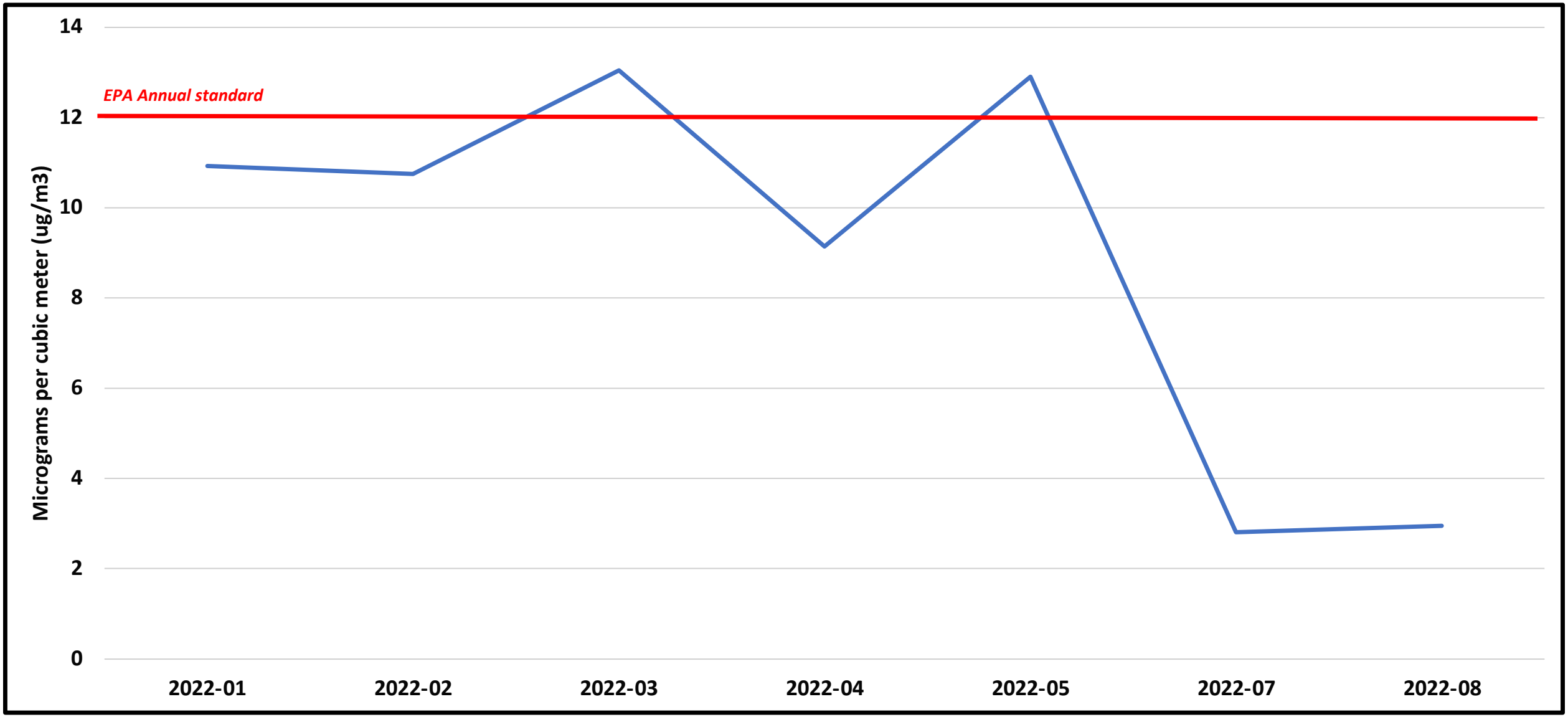
PM 2.5: Day-to-Day

EPA PM 2.5 standard	24 hour	Annual
	35 ug/m3	12 ug/m3



PM: Monthly Averages

EPA PM 2.5 standard	Annual
	12 ug/m3



PM: Monthly Averages

EPA PM 2.5 standard	Annual
	12 ug/m3

	Jan	Feb	March	Apr	May	July	Aug	Overall
Gulfton PM	10.9	10.8	13	9.1	12.9	2.8	2.9	10

Major takeaways

- Daily values peak in mornings and evenings:
  - Likely during traffic peaks

- Trend has been stable to increasing until July-Aug
  - Monthly averages **near or over the EPA standard** for most months
  - Monitor taken down: Limited measurements during July – Aug may be contributing to lower values

- Peaks are far above annual standard. Haven't exceeded 24-hour standard yet

REVIEW

Methodology

- Calculated pure averages (mean) for each month and overall
  - Easy comparison with EPA standards
  - No further statistical manipulation
- Plotted progression of monthly averages on a line graph
  - To track seasonal pollution trends
- Screenshots of raw day-to-day measurements
  - To visualize short term spikes and exceedances of standards
- Observed times of highest daily pollution levels
- Tested hypotheses with real-world maps, data, information
  - Drawing informed conclusions about measurement/trend causes

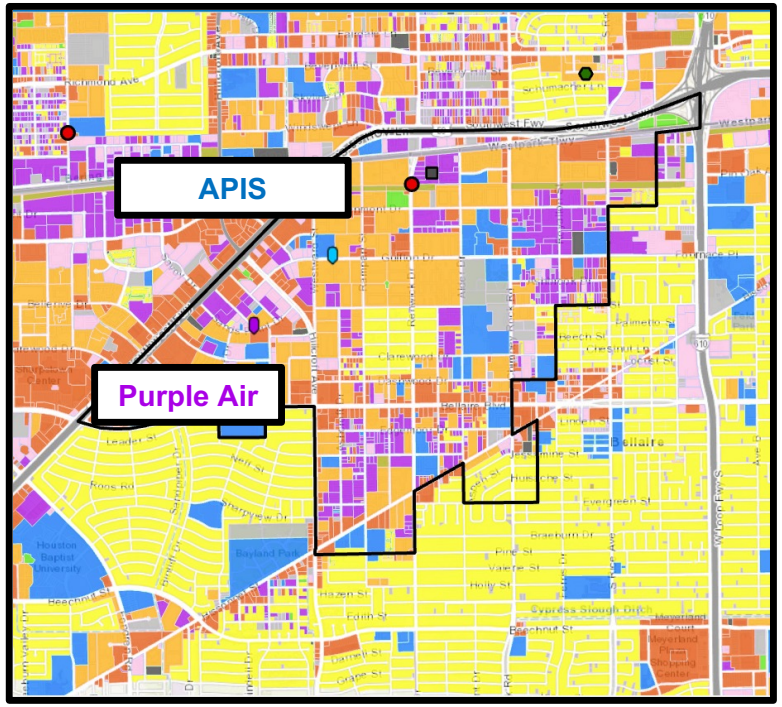
Caveats / Limitations

- **EPA Standards:**
  - Guidelines for public health protection. Regularly updated / revised
  - Just because averages aren't at/near limit, doesn't mean there aren't effects
  - Short-term spikes can still have significant effects

- **Monitors:**
  - Limited by wind direction, technology (pollutants measured)
  - Area of location: Results may be affected by seemingly smaller events
    - E.g.: Idling cars, household events, fireworks, outages, etc.
  - Sensitivity: A high measurement point to multiple possible sources. Cannot pinpoint 100%
  - There may be pollution levels and types that are not being caught
  - Limited number of monitors across neighborhood: Not everywhere

Conclusions: April – October 2022

NOX	VOC	O3	PM2.5
Daily values peak twice daily: Mornings and evenings	Daily values peak early mornings	Daily values peak around late afternoon	Daily values peak twice daily: Mornings and evenings
Trending upward as the year goes on (below EPA standard yet)	Trending downward as the year goes on	Trending generally upward as the year goes on	Trending upward until recently
No unusual spikes	Few spikes outside regular cycles	Very high daily spikes above EPA standard (Traffic + heat)	Peaks are far above the annual standard



Next Steps

- Will continue collecting and analyzing data
- Averages may change as monitors capture more emissions
  - Greater amounts of data coming in will improve accuracy
- Will develop action plans
- Identifying new locations for additional monitors:
  - To expand network

Sampling the City (STC)

July 30th, 2022

1. Nitrogen Oxides (NOx)
2. Volatile Organic Compounds (VOCs)
3. Particulate Matter (PM)

SAMPLING THE CITY

GULFTON

Saturday, July 30 at 8 AM

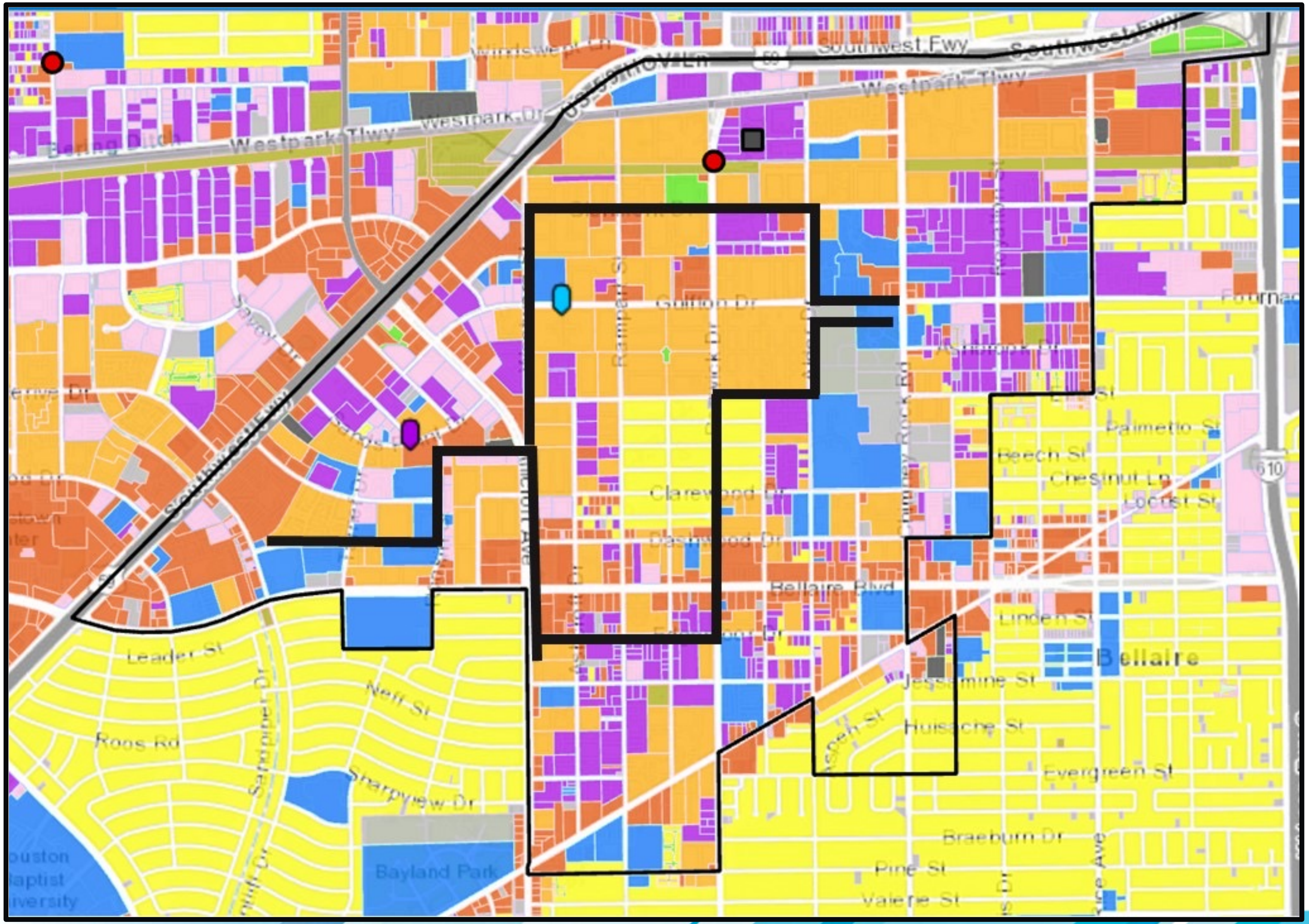
At Burnett Bayland Park
(6000 Chimney Rock rd.,
Houston 77081)

Ride Length: 6 mi

- Single-Family Residential
- Multi-Family Residential
- Commercial
- Office
- Public & Institutional
- Industrial
- Park & Open Spaces
- Transportation & Utility
- Undeveloped
- Agriculture Production
- Unknown

- Texas TRI Facilities, 2020
- Concrete Batch Plants 2021

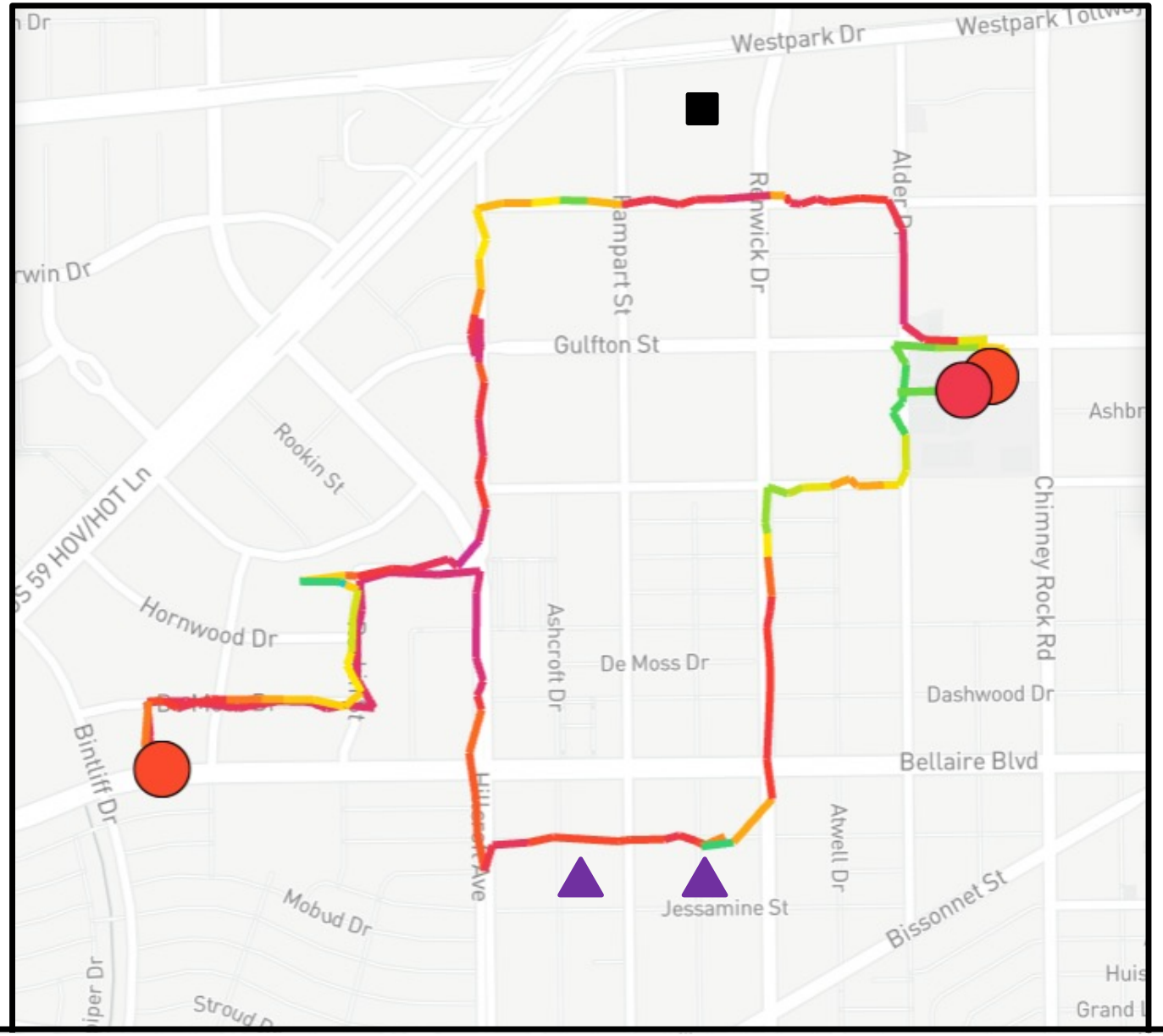
- APIS
- Purple Air



Overall AQI

Quick takeaways:

- High levels at concrete batch plant in the north
- High levels when passing by the west side
- Metal shops at the south side

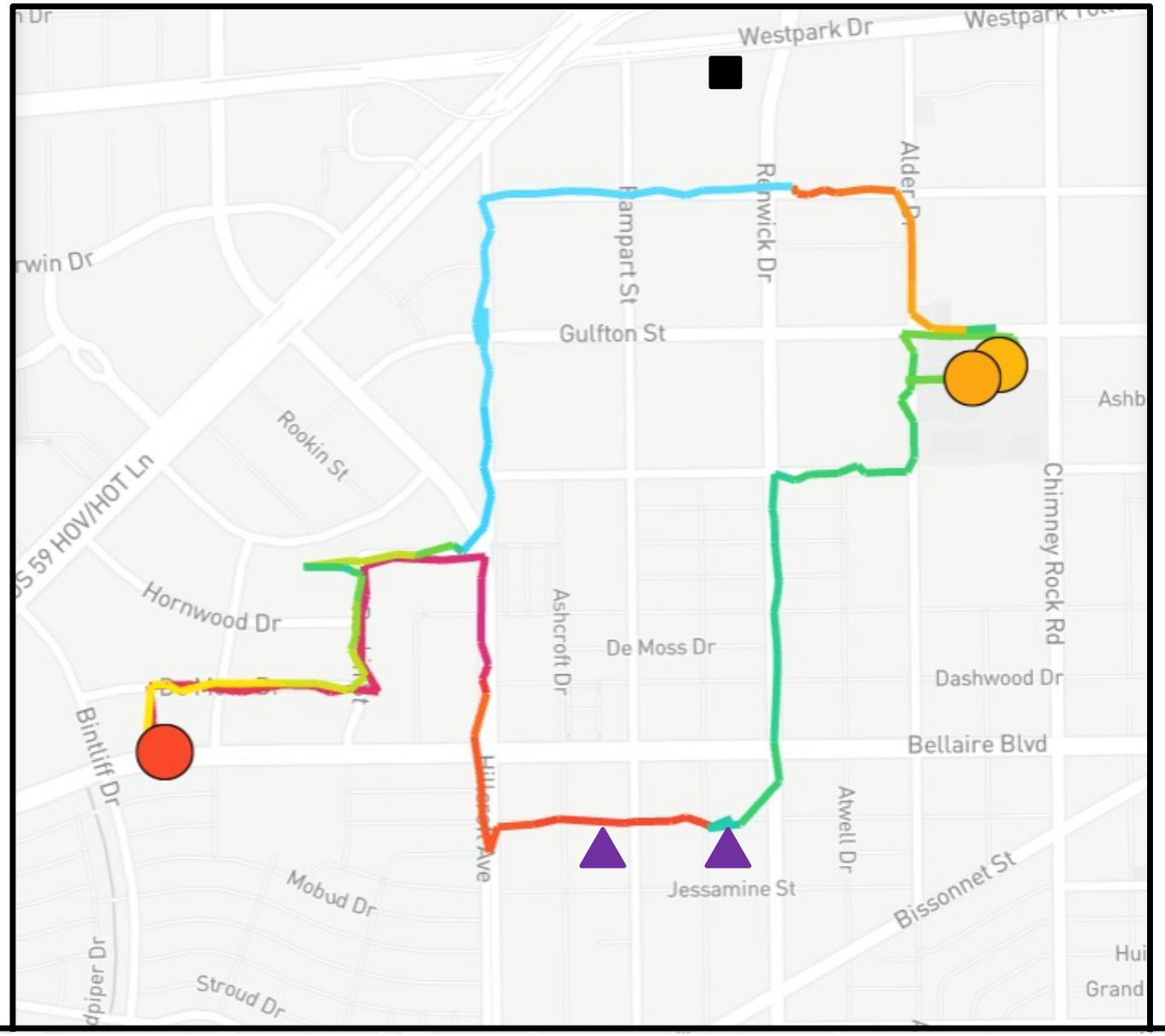


NO2

- Highest levels recorded on the west side
- Moderate levels near metal shops on south side
- Average: 40 ppb
- Peak: 481 ppb

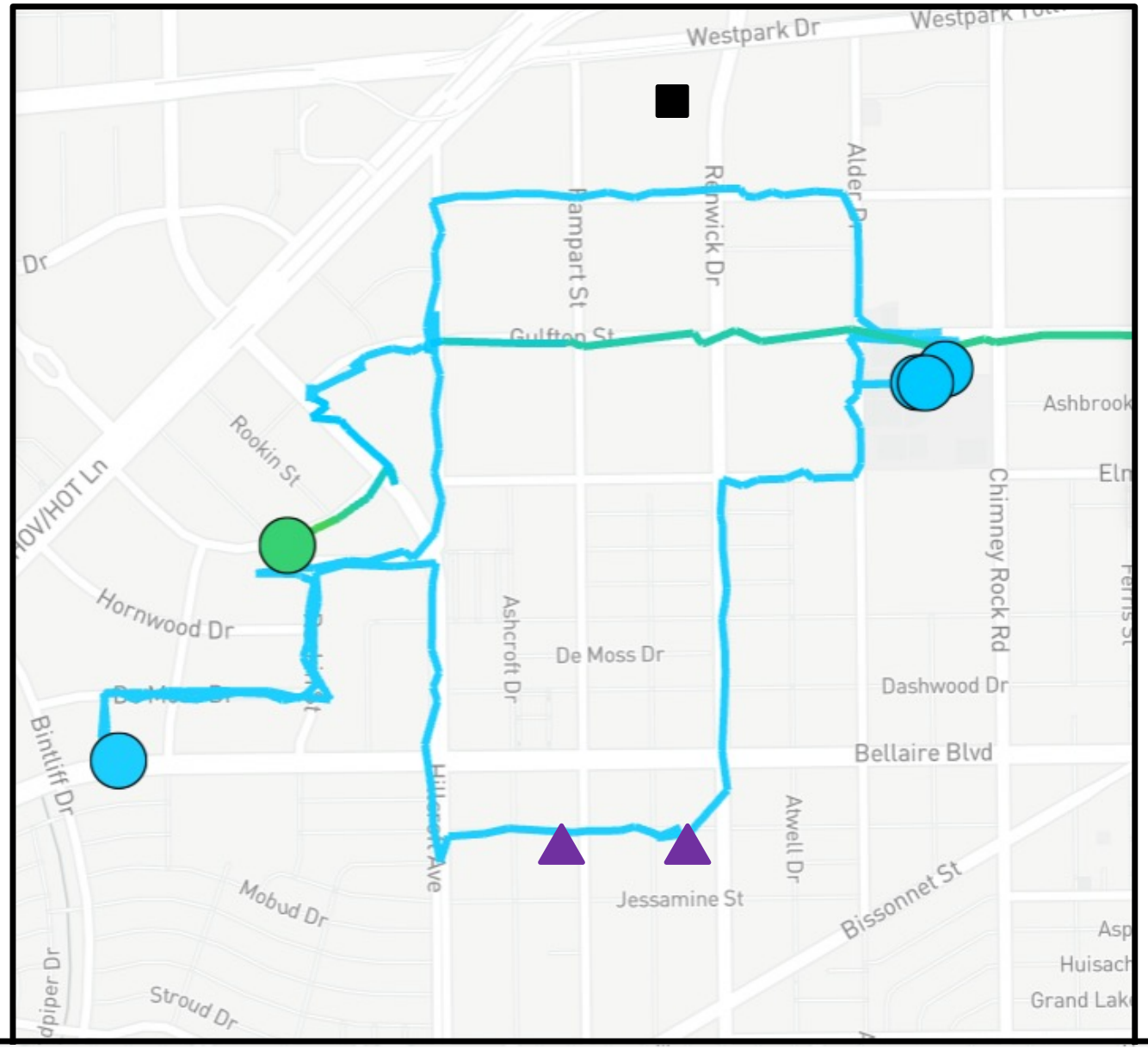
EPA Standards:

- 1 hour: 100 ppb
- Annual: 53 ppb



VOC

- Low levels measured throughout ride

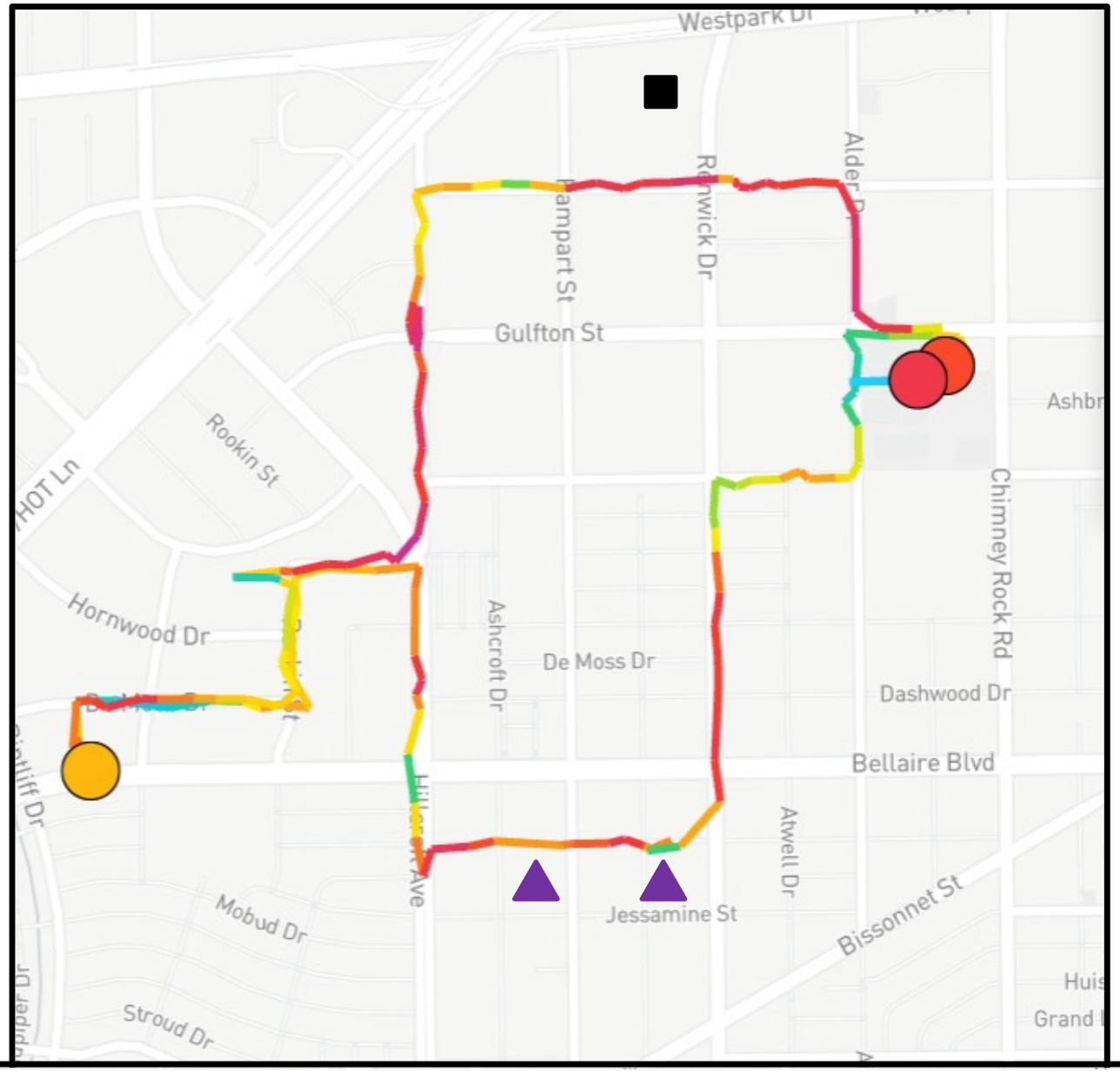


PM

- Highest at concrete batch plant and near west side
- Moderate near south side
- Average: 5 ug/m3
- Peak: 31 ug/m3

EPA Standards:

- 24 hour: 35 ug/m3
- Annual: 12 ug/m3



FLOW

July 30, 2022

	NO2	VOC	PM
Average	40 ppb	108 ppb	5 ug/m3
Peak	481 ppb	413 ppb	31 ug/m3

C.A.M.P.

April – October 2022

	NO2	VOC	PM	O3
Average	11.2 ppb	136.4	8.9 ug/m3	30 ppb
Peak	55.8 ppb	333	85 ug/m3	168.7 ppb