AIR QUALITY STUDY

Sponsored by the West Side Community Fund

With the participation of State Senator Brad Hoylman, City Council Speaker Corey Johnson, Brough President Gale Brewer, Manhattan Community Board 4 and Hudson Guild

October 2019 – March 2020

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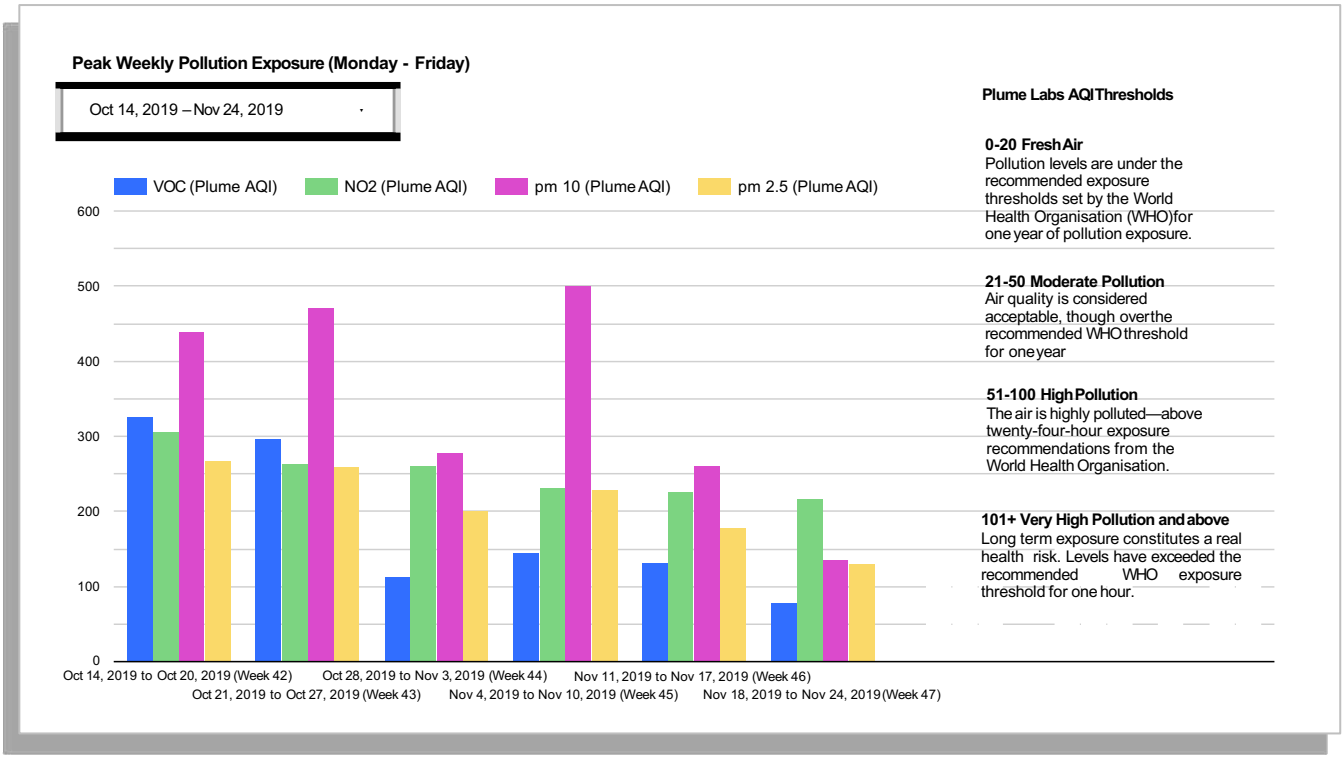
Summary Findings

- The communities of Hell's Kitchen South / Chelsea / Hudson Yards in New York City have reasons to be concerned about the quality of their air. A six-week study of the air quality performed by Clinton/Chelsea/ Hell's Kitchen Coalition for Pedestrian Safety (CHEKPEDS)'s 25 volunteers demonstrated that the air contains unhealthy levels of micro particulate matters that are known to cause cardio vascular and respiratory diseases like lung cancer.
- Every week for six weeks, peaks of particulate matter (PM1, PM2.5, PM10) and NO2 caused by fuel exhaust significantly exceeded levels considered safe by the World Health Organization (WHO)
- The areas closest to heavy vehicular flows and the bus terminal showed the worst measurements on the Air Quality Index (AQI).
- These results on the ground confirm and amplify the New York City Department of Health measurements that show this neighborhood as being the third worst in New York City for air quality. After 15 years of city programs, this neighborhood remains highly polluted and lags all others for air quality improvements.



Average of Particulate Matter 2.5

- Small solid particles that can penetrate the airways, lungs and even bind to blood vessels
- Caused by road traffic or energy transformation
- Chronic exposure is a risk factor in cardiovascular and respiratory diseases as well as lung cancer

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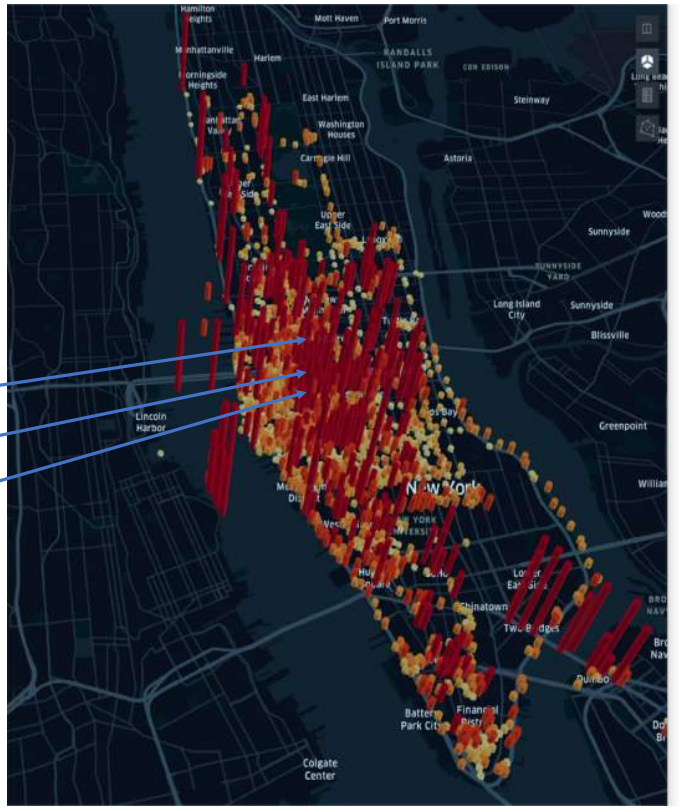


51-100 : high pollution , the air pollution exceeds the 24 hour exposure threshold from the World Health Organization. Every one may start to feel adverse health effects.

Here is the 3D visualization in action.

Next Steps

- Improve year- round measurements and available data : agencies like the New York State Department of Environmental Conservation (DEC) and the New York City Department of Health (DOHM H) should deploy additional measuring towers especially in underserved populations in our district. Report the results back to the community.

- Take short term measures: agencies must develop immediate plans for reducing air pollution in the area: DOT and Port Authority (PA) have some control over the use of streets and facilities in the area. New planning and vehicular rules that improve air quality should be developed and implemented as soon as feasible, especially for reducing idling cars and buses in order to address this health crisis.

- Incorporate into greenhouse reduction plans: agencies must include the impacted area in their long-term plans : Port Authority plans call for a 35 percent greenhouse gas (GHG) reduction by 2025. Both the PA and the City signed on to the Paris agreement that requires 80 percent reduction by 2050.

- Factor in future land use projects: Community Boards and the Department of City Planning exert influence over the characteristics of new developments; they will have to pay particular attention to this issue. The area's air quality improvement programs must be included in all projects, as well.

We thank the West Side Community Fund for their grant which helped assemble a new community of like-minded activists and gave us access to the tools necessary to gather information needed for future actions . Hudson Guild, Community Board 4 and our elected officials were instrumental in the success of this project.

Background

CHEKPEDS (Clinton/Chelsea/ Hell's Kitchen Coalition for Pedestrian Safety)[1] was founded in 2005 to fight the deadly traffic conditions in the district. Early on it became clear that a holistic approach to pedestrian conditions was necessary. This included expanding sidewalk space, addressing adverse walking conditions like heat, poor air quality and noise. In 2010, CHEKPEDS joined a coalition to advocate successfully for the bill that reduced permitted idling time from 3 to 1 minute around schools.

In 2017, CHEKPEDS joined the Hell's Kitchen South Coalition (HKSC) to develop a community position on replacing the Port Authority Bus Terminal (PABT) and developing PA owned properties to finance the plan[2]. As part of this effort it became clear that air quality was a major issue in our community due to Lincoln Tunnel - bound vehicles idling for hours in the streets, thousands of bus trips crossing our neighborhood every day and many more buses idling at curbside terminals.

Since 2012, development on the west side of Manhattan had exploded with thousands of new residents in buildings that replaced warehouses. As well, hundreds of thousands of tourists and commuters visit the district daily. All of these people are now exposed to harmful emissions. 20 firms that have set up offices in Hudson Yards joined forces to fund programs to support local youth and underserved populations. Their West Side Development Fund [3] funded this air quality project.

[1] www.chekpeds.com
2 www.hkscnyc.org
3 www.citizensnyc.org/grants/wscf

Monitoring Technology

As early as 2007 CHEKPEDS had sought to measure air quality in the district: we rented a portable air quality measurement unit that was accredited by the DEC to measure micro particulate PM 2.5 in the vicinity of the bus terminal. There were only two such units in New York City, one of them in the Bronx. The unit was very bulky and the owner could not explain to us how to use it . We drove him from the Bronx to operate the unit for us. Measurement towers were fixed and they were few of them. According to the DEC web site there is still no air quality captor in this district.

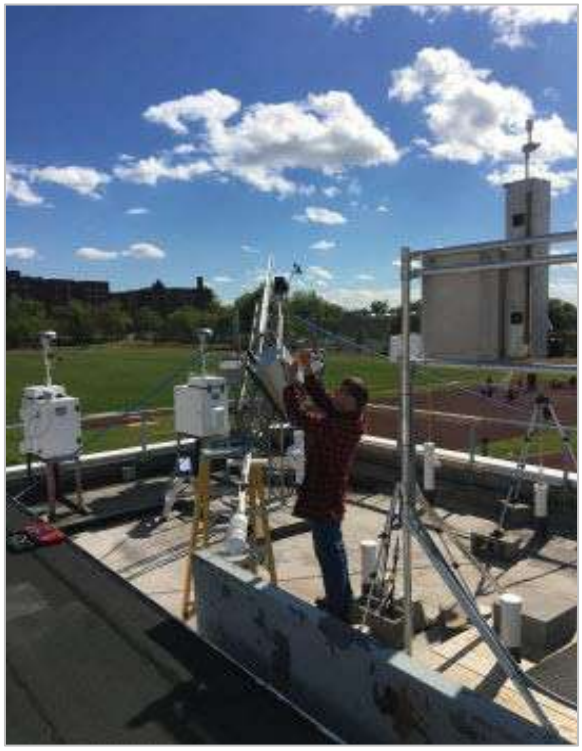


Figure 1 Air Quality Monitoring Equipement located at the Queens College air Monitoring site

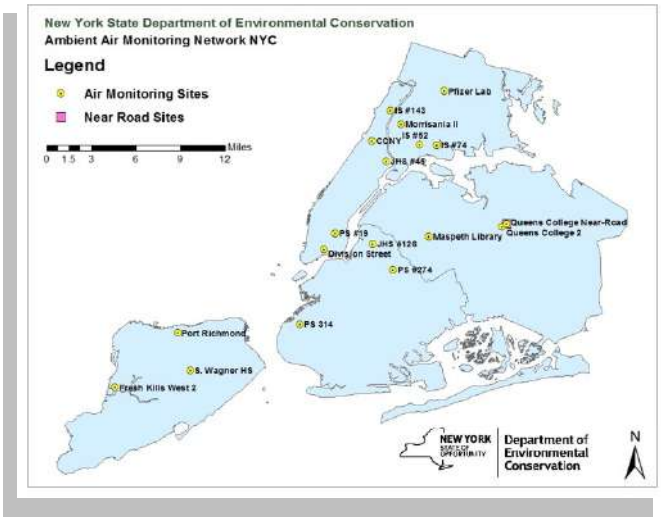


Figure 2 Air Quality Monitoring sites- NYSDEC

However, experts had been looking for the holy grail: testing the air at pedestrian level where air quality is worse than on a roof. Early prototypes came out in 2015: volunteers carried the measuring units in an empty coffee cup.

In 2017 Plume Labs[4] introduce the " Flow": a portable lab using 360 degrees intake, smallest fan technology, miniature light scattering for particulates and metal oxide reactions and processes information with miniaturized elements, and on-board calibration, the information is tagged with GPS readings.

The " Flow" has been four years in development with testing by Imperial College London's Center for Environmental Policy and France's CNRS-LISA to stress-test Flow's custom-built sensing technology.

Periodically the information is transferred to a central cloud- based database where the readings are stored in a llarge database and interpreted using neural networks to learn and extract patterns from the measurements.

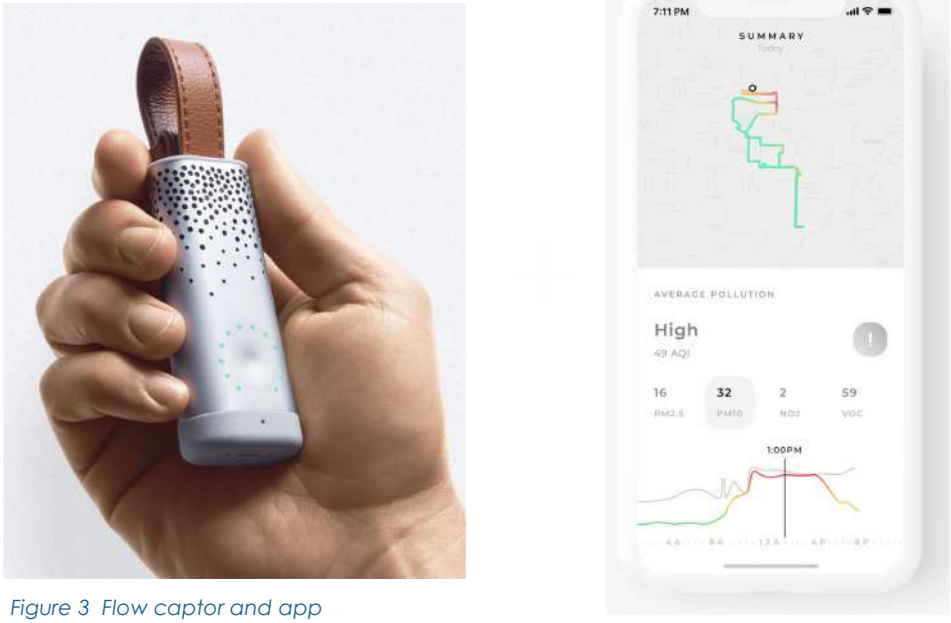


Figure 3 Flow captor and app

The Plume Air Quality index (AQI) gives an immediate overview of what one is breathing, just as the temperature might give a first indication of the weather outside.

Plume Labs uses World Health Organization (WHO) guidelines as well as international standards developed by the United States Environmental Protection Agency (EPA) and other scientific studies to define the Plume AQI and its seven associated categories.

[4] https://plumelabs.com/en/flow/

Data Collection

Through a quick survey sent by email and social media, the CHEKPEDS team solicited the participation of neighbors to test the air. Hudson Guild and Penn South, Community board 4 and elected officials expanded our reach significantly to all populations. The response was swift and enthusiastic: 40 neighbors responded .

All were invited to a study kick- off event to receive the flow unit, learn how to set up the unit and the app, and understand when and where they would survey . Hudson Guild graciously provided meeting rooms, staff support and assistance.

Figure 4 Team welcoming participants at Hudson Guild

By the end of the evening, in spite of some technical challenges , the 25 volunteers who attended were ready to use their equipment.

Each volunteer was directed to collect 21 ten-minute readings between October 8 and October 25, 2019 : seven in the morning peak hour, seven in the evening peak hour and seven at lunch time . At least one measurement was to be taken on a Friday afternoon.

Figure 5,6,7 above right- Enthused participants and elected official. :Above left: Erik Bottcher from the NYC Counsel Speaker's office. Left: NY State Senator Brad Hoylman , second from left, and Manhattan Borough President Gale Brewer on the right,

Participants learned the location they were assigned with its specific characteristics. You can click Here to see the map .

The participants were educated on what they would be measuring :

PM 10 and PM 2.5 (Particulate Matter)

Small solid particles penetrate lungs and blood – from road traffic

NO2 (Nitrogen Dioxide)

Suffocating and irritating gas with a red brown color – causes bronchitis and asthma - especially in children - 50% of NO2 is caused by road traffic

VOC (Volatile Organic Compounds)

Molecules from carbon – from road traffic and industry – decrease lung capacity. Some molecules are carcinogenic

Figure 8 - Equipped with directions and knowledge, our Air Quality monitors patrolled the streets incognito.

Data Analysis

This was the most challenging phase of the study. Readings by twenty-five people, 1,440 minutes per day, during 45 days add up to a massive amount of data. It became clear that interpreting the data and combining it with geo localization would require professionals.

Fortunately, Plume labs' CEO heard our pleas and provided a team of data analysts and scientists to extract meaningful information from this trove of data. It was the first time their company was undertaking this exercise as their tools had typically been used by universities and laboratory research teams who have a deep bench of technical resources. Our effort became a prototype for a future offering geared toward university students uses and non-profits.

Criteria for adverse health effects

Plume AQI -Air Quality Index

This is a combination of measurements, based on the World Health Organization (WHO) annual, daily, and hourly exposure guidelines, along with other global institutions, including the European commission, Chinese air quality standards, and the united states EPA.

0-20 Low Pollution

The air is clear—perfect for outdoor activities! Pollution levels are under the recommended exposure thresholds for one year of pollution exposure.

21-50 Moderate Pollution

Air quality is considered acceptable, though above the recommended WHO threshold for one year. This means that, unless you have these kinds of conditions all year round, you shouldn't be experiencing adverse health effects. However, there may be health concerns for people with specific vulnerabilities.

51-100 High Pollution

The air is highly polluted—above twenty-four-hour exposure recommendations. Everyone may start to feel adverse health effects, and those with vulnerabilities should be cautious when performing outdoor activities.

101 + Very High Pollution and Above

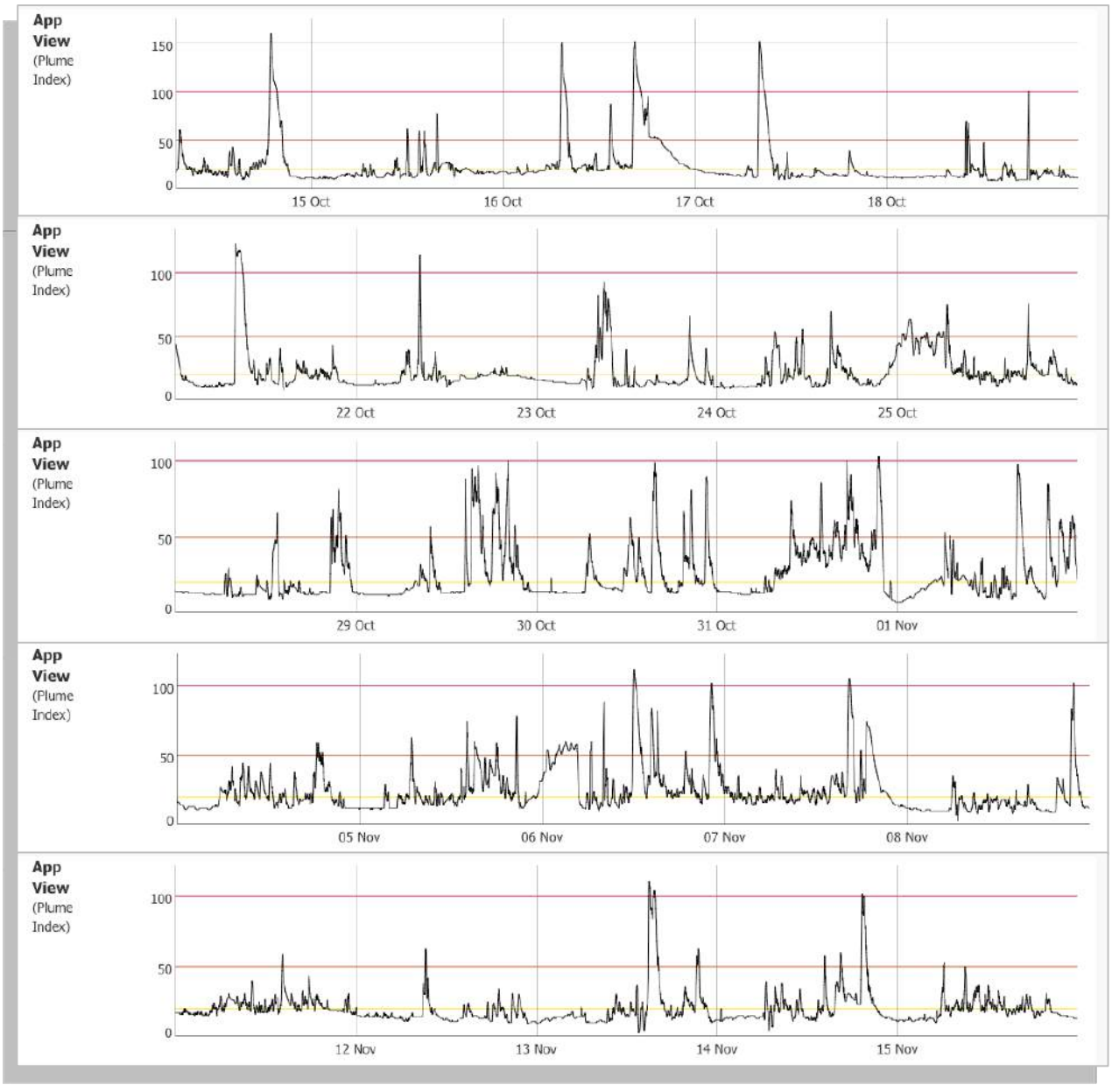
Everyone may start to experience more serious health consequences at these levels, and long-term exposure constitutes a very real health risk. Levels have exceeded the recommended WHO exposure threshold for one hour. In certain regions, or during exceptional pollution peaks, an area may experience higher levels of pollution over 200 or even 300. These warnings constitute emergency conditions. There can be harmful impacts on the general public, even in the case of short-term exposure. All individuals should avoid physical activities until pollution subsides, regardless of sensitivities.

Individual results

All participants were able to capture on their phones the maps and pollution profile of their measurements. Here is the example for one participant who was assigned the **north side of West 42nd Street between 8th and 9th Avenues.**

One must keep in mind that participants were capturing data throughout the day wherever they went, and took measurements at the hot spots only three times a day , 10 minutes each. The spikes would typically correspond to those times.

The results demonstrated that the air contains unhealthy levels of micro particulate matters that are known to cause cardio vascular and respiratory disease like lung cancer


App View (Plume Index)
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Peak results

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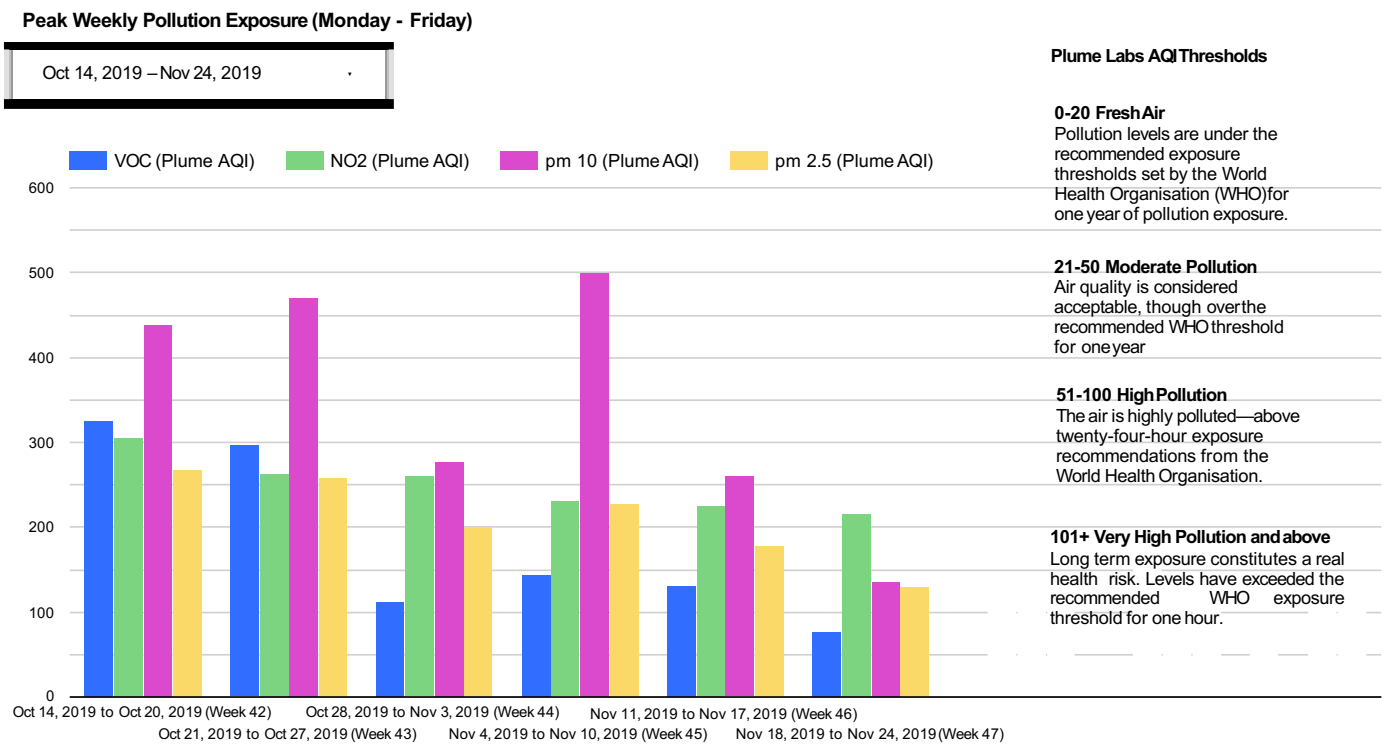

Average Results

The areas closest to heavy vehicular flows and supporting infrastructure showed the worst measurements on the Air Quality Index (AQI).

Average of Particulate Matter 2.5

- Small solid particles that can penetrate the airways, lungs and even bind to blood vessels
- Caused by road traffic or energy transformation
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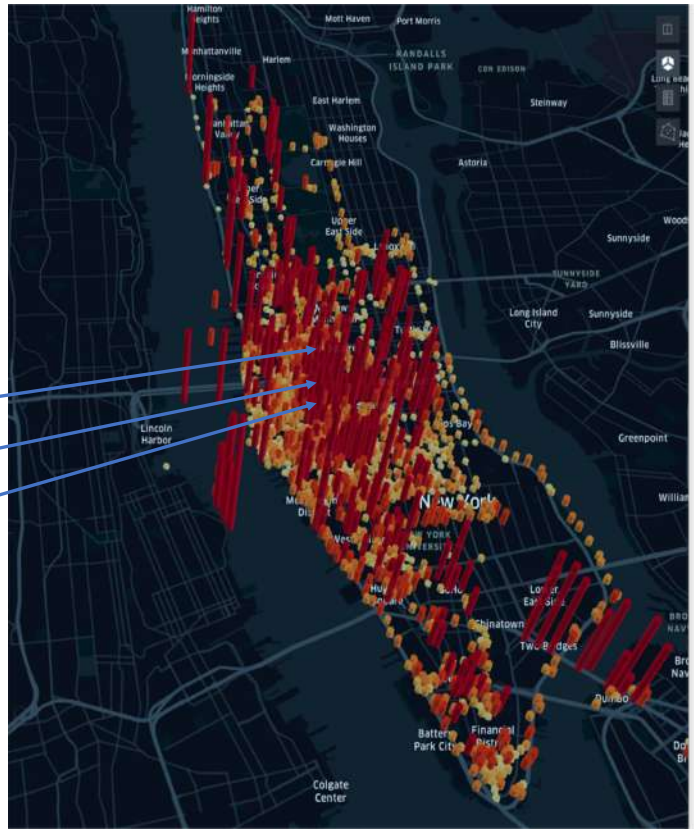

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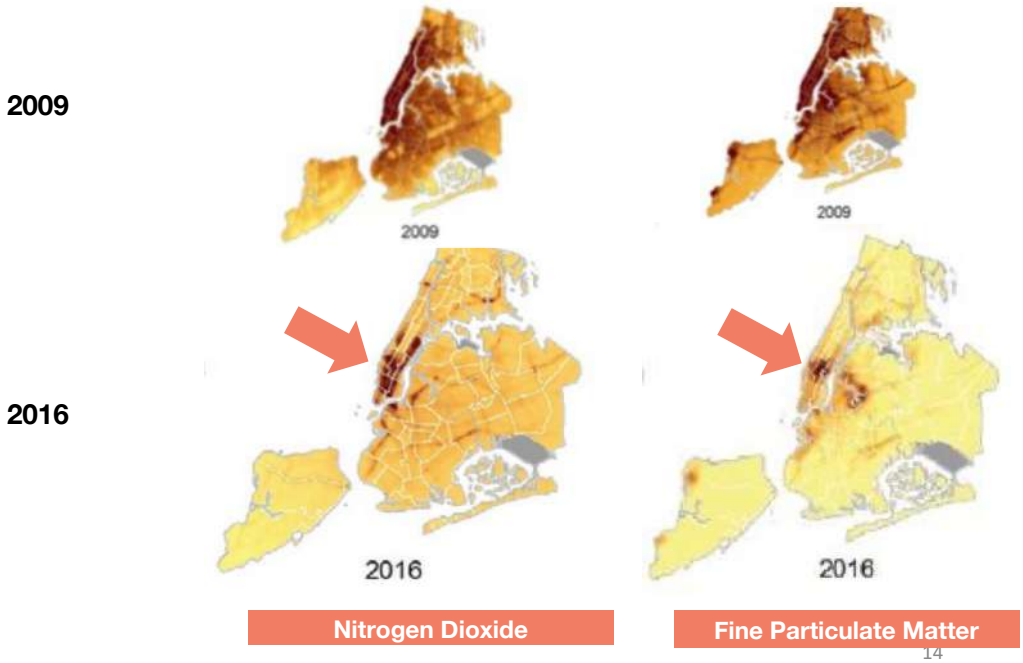
Here is the 3D visualization in action.

Correlation to NYC measurements

These results at pedestrian level confirm and amplify the New York City Department of Health measurements that show this neighborhood as being the third worst in New York City for air quality. After 15 years of city programs, this neighborhood remains highly polluted and lags all others for air quality improvements.

Air Quality is not improving



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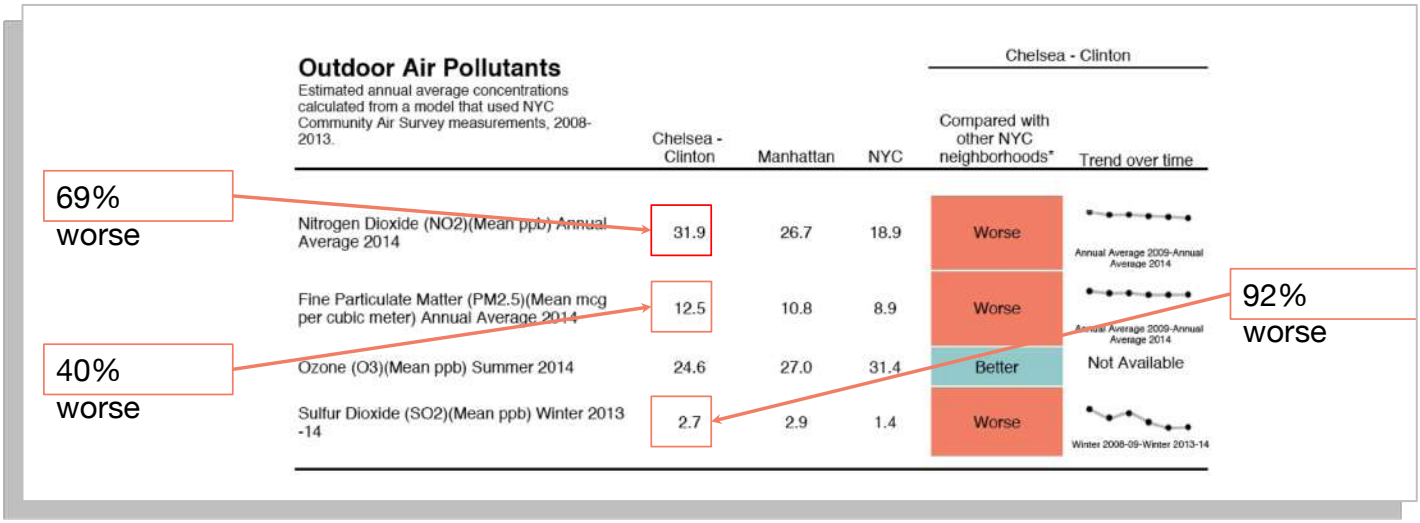
NYC Health Department Report

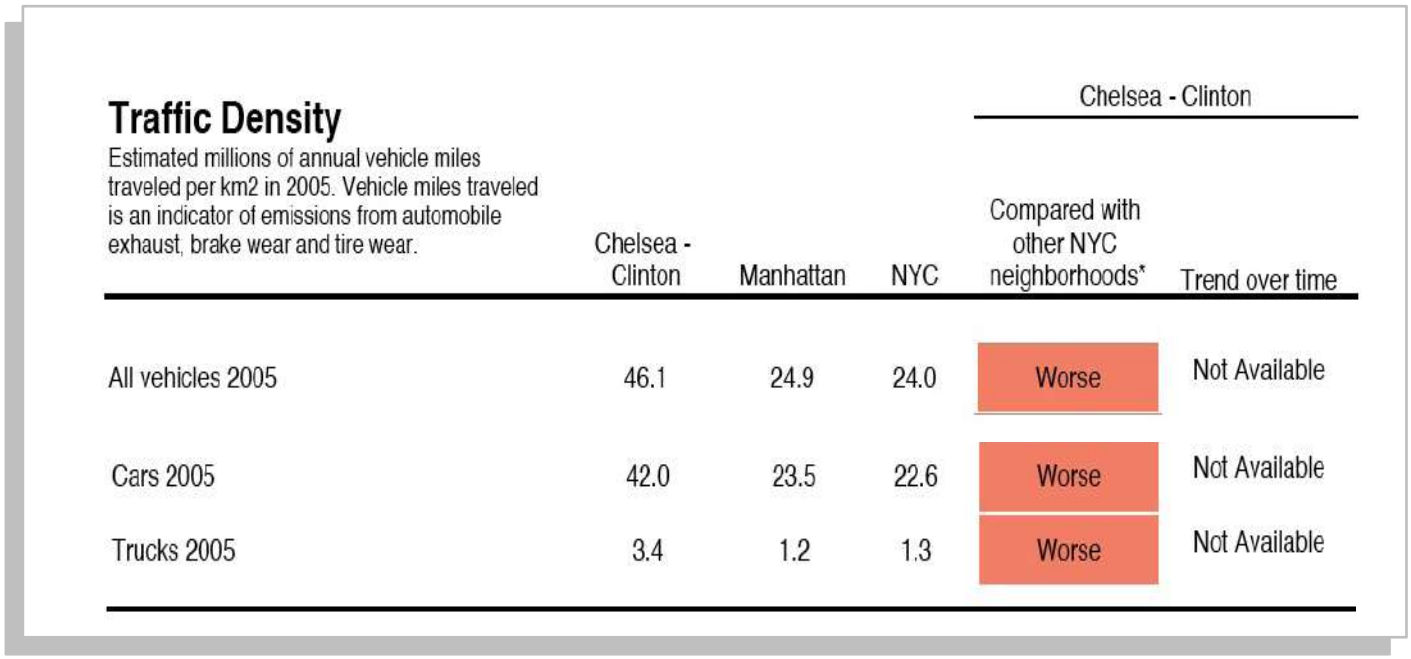
Hell's Kitchen - Chelsea has the 3rd WORST air quality in New York City



Outdoor Air Pollutants

Estimated annual average concentrations calculated from a model that used NYC Community Air Survey measurements, 2008-2013.

	Chelsea - Clinton	Manhattan	NYC	Chelsea - Clinton: Compared with other NYC neighborhoods*	Chelsea - Clinton: Trend over time
Nitrogen Dioxide (NO2)(Mean ppb) Annual Average 2014	31.9	26.7	18.9	Worse	Annual Average 2009-Annual Average 2014
Fine Particulate Matter (PM2.5)(Mean mcg per cubic meter) Annual Average 2014	12.5	10.8	8.9	Worse	Annual Average 2009-Annual Average 2014
Ozone (O3)(Mean ppb) Summer 2014	24.6	27.0	31.4	Better	Not Available
Sulfur Dioxide (SO2)(Mean ppb) Winter 2013-14	2.7	2.9	1.4	Worse	Winter 2008-09-Winter 2013-14



Traffic Density

Estimated millions of annual vehicle miles traveled per km2 in 2005. Vehicle miles traveled is an indicator of emissions from automobile exhaust, brake wear and tire wear.

	Chelsea - Clinton	Manhattan	NYC	Chelsea - Clinton: Compared with other NYC neighborhoods*	Chelsea - Clinton: Trend over time
All vehicles 2005	46.1	24.9	24.0	Worse	Not Available
Cars 2005	42.0	23.5	22.6	Worse	Not Available
Trucks 2005	3.4	1.2	1.3	Worse	Not Available

Next Steps

We are calling on our elected officials and agencies to put air quality front and center of many efforts in our neighborhood:

- Improve year- round measurements and available data: agencies like the New York State Department of Environmental Conservation (DEC) and the New York City Department of Health (DOHMH) should deploy additional measuring towers especially in New York City Housing Authority (NYSHA) properties in our district. Results should be reported to the community annually.

- Take short term measures: agencies must develop immediate plans for reducing air pollution in the area: DOT and Port Authority (PA) have some control over the use of streets and facilities in the area. New planning and vehicular rules that improve air quality must be developed and implemented now, especially reducing idling cars and buses.

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