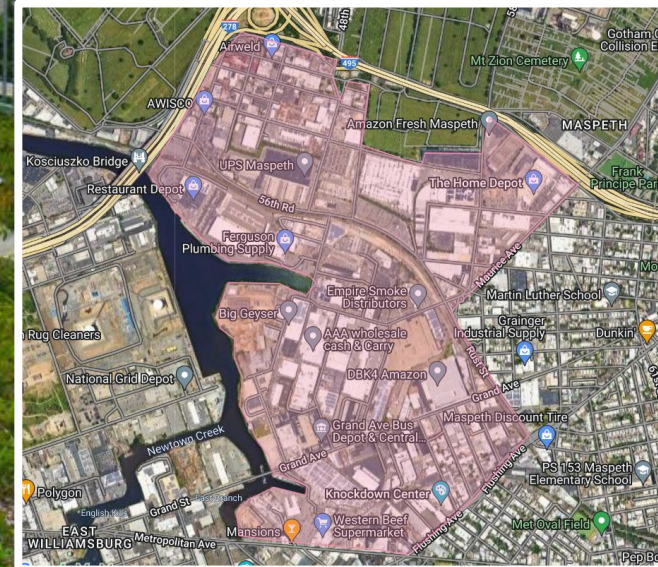


Alexis Czajkowski & Mohamed Nassar



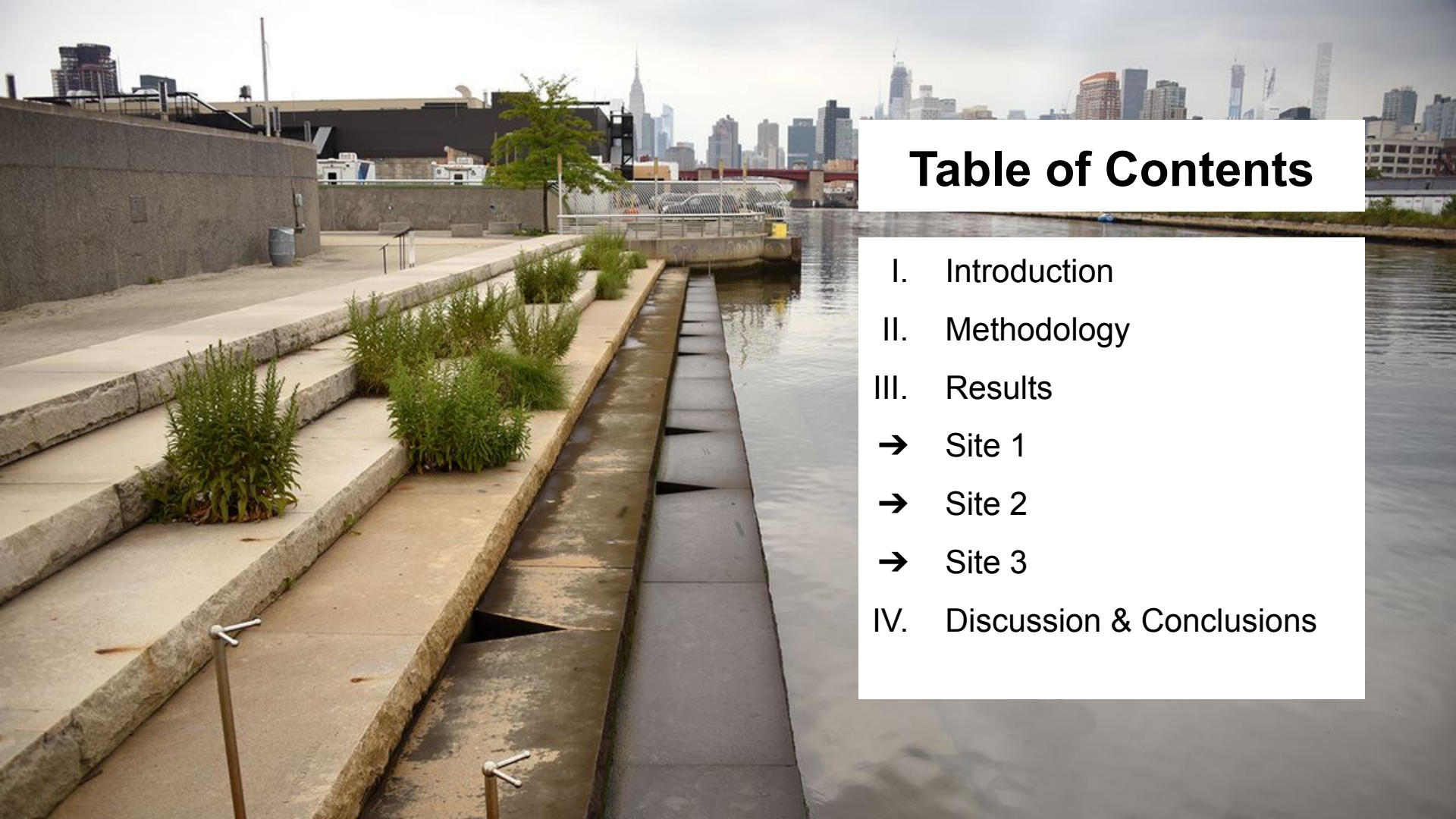


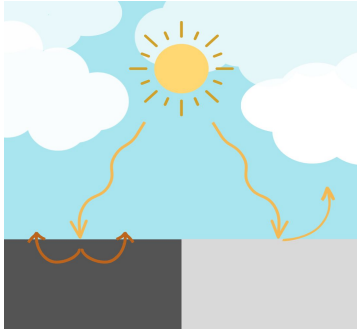
Table of Contents

- I. Introduction
- II. Methodology
- III. Results
 - Site 1
 - Site 2
 - Site 3
- IV. Discussion & Conclusions

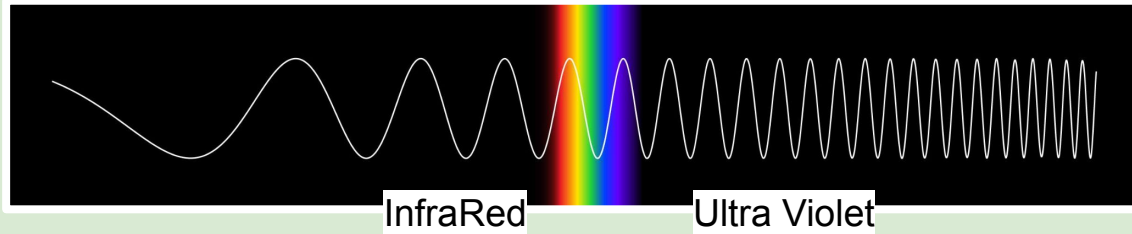
A scenic view of a river or lake with a city skyline in the background. The foreground is filled with lush green vegetation and wildflowers. A semi-transparent banner is overlaid across the middle of the image, containing the word "INTRODUCTION" in large, bold, black capital letters. The background shows a body of water, a bridge, and a city skyline with several tall buildings, including a prominent white cylindrical structure. The sky is clear and blue.

INTRODUCTION

The urban heat island effect is the phenomenon of increased and more intense temperatures in cities. This effect is particularly strong in Industrial Business Zones as a result of...



An abundance of dark surfaces, such as asphalt and black roofs, that absorb heat instead of reflect it¹

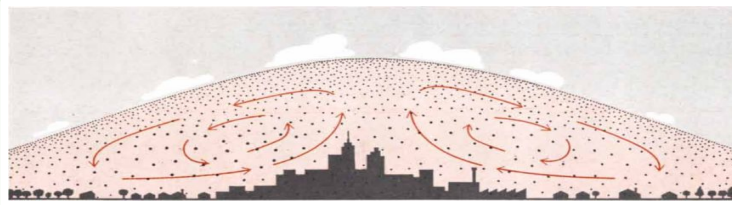


Little to no vegetation to facilitate evapotranspiration (evaporation & transpiration, which the process of plants absorbing moisture from soil and evaporating it off their leaves) or provide shade²

The urban heat island effect is the phenomenon of increased and more intense temperatures in cities. This effect is particularly strong in Industrial Business Zones as a result of...



Air pollution that traps, absorbs, and then re-emits thermal energy³ as well as creates stagnant air systems⁴ that prevents heat from dispersing naturally



William P. Lowry. "The Climate of Cities." *Scientific American*, vol. 217, no. 2, Aug. 1967.



Anthropogenic activities that generate excess heat such as:

- Manufacturing (smokestacks release heat-trapping particles into the atmosphere)
- Trucking (release of CO₂ and CO)
- Usage of daily apparatuses

"Even stoves in kitchens constitute a source of heat that cannot be neglected."⁴



Green roofs absorb incoming solar radiation and disperse thermal energy through evapotranspiration by 2-9°F¹.

Pollinator pathways provide sanctuary for pollinators such as butterflies and bees, as well as birds.



Rain gardens are used to enhance stormwater management, prevent soil erosion, and reduce flooding caused by cloudbursts or sudden, heavy downpours that would otherwise collect over impermeable surfaces like asphalt.

Shade Trees

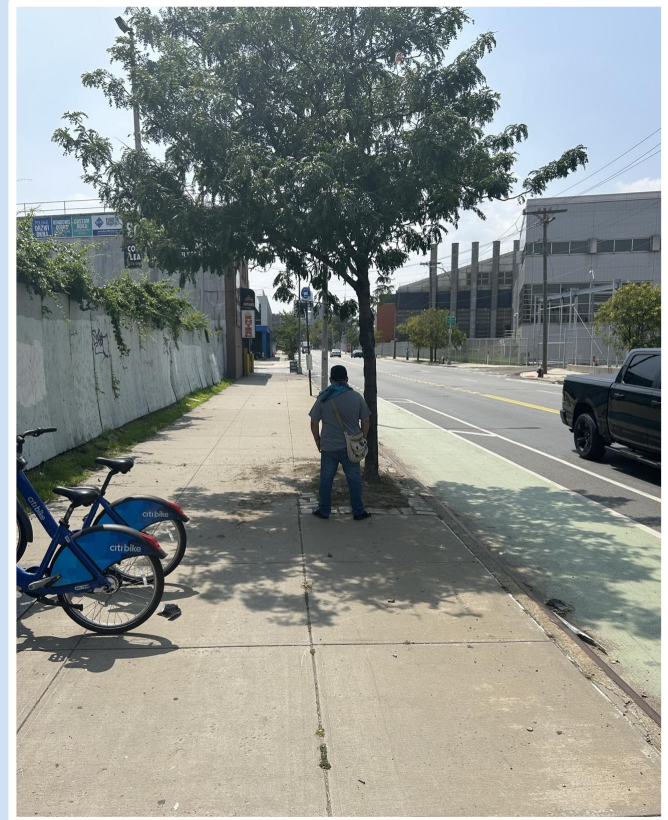
These are generally large trees that provide shade to the surrounding environment due to their spreading canopy and crown. They provide a refuge from the summer heat for both people and animals. Some common shade trees are maples, oaks, birches, elms, and willows.

Crown: an individual plant's aboveground parts including stems, leaves, and reproductive structures

Canopy: the aboveground portion of a plant community formed by a collection of individual plant crowns

NYC Tree Maps

We used the publicly available and easily accessible NYC tree map to count the amount of trees in the general area at each site.



Man taking shade under a thornless honeylocust tree (*Gleditsia triacanthos* var. *inermis*) while waiting for the bus near the Citi Bike stop across from the wastewater treatment facility. Wednesday, July 26th, 2023



METHODOLOGY



There are few shaded bus stops along IBZ Routes!



Commuters waiting for public transportation remain exposed to direct sun and intense temperatures, increasing their risk of heat-induced complications.



Select a start and end date

2023/06/26 – 2023/07/26

Select routes (blank selects overall)

Q59 ×

Q37 ×

Q67 ×

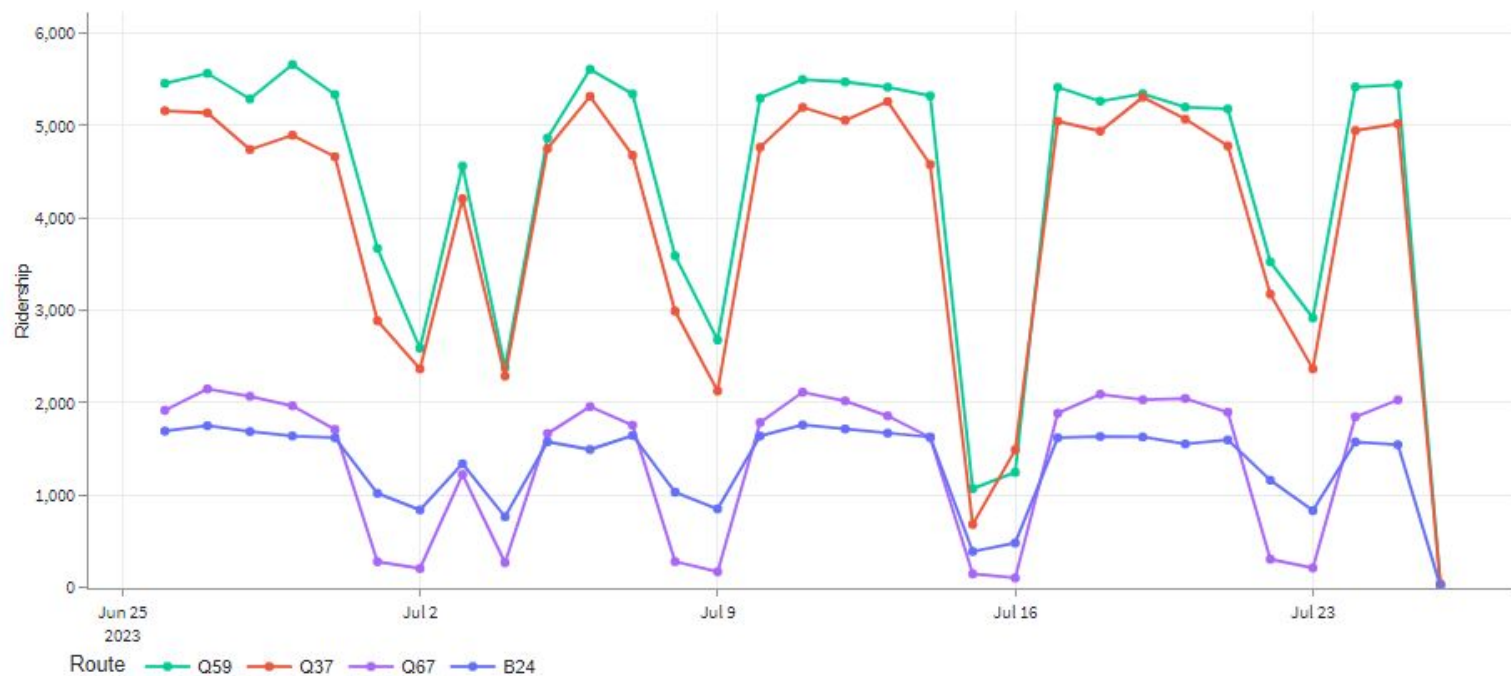
B24 ×

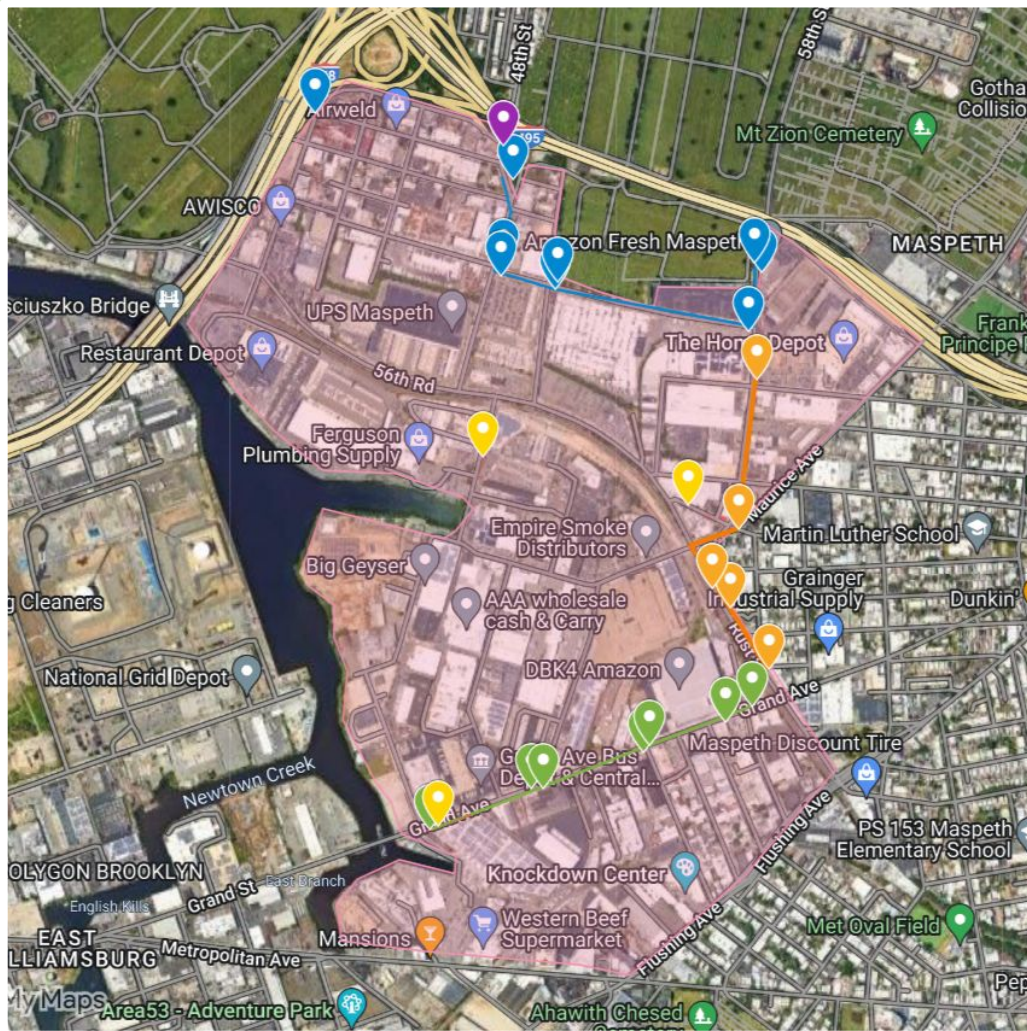


Date Day of week Time of day

Select which interval to view dates

Daily





Bus Routes

Q39 (orange)

Q67 (blue)

Q59 (green)

B24 (purple)

- Bus routes are concentrated along the eastern side of the IBZ
- Grand Ave (Bus Depot) and 56th Terrace are located near stops
- 49th St is farther, but still walkable

Workers in the IBZ most likely commute to work by car; however...



Pictured above is an example of an area in the IBZ that is less ideal for green infrastructure. When choosing our sites, it was important we kept the following in mind...

- ❑ Located near industry, but not in conflict with working spaces
- ❑ Open areas with adequate sidewalk access
- ❑ Capacity for an increase in quantity and/or quality of vegetation



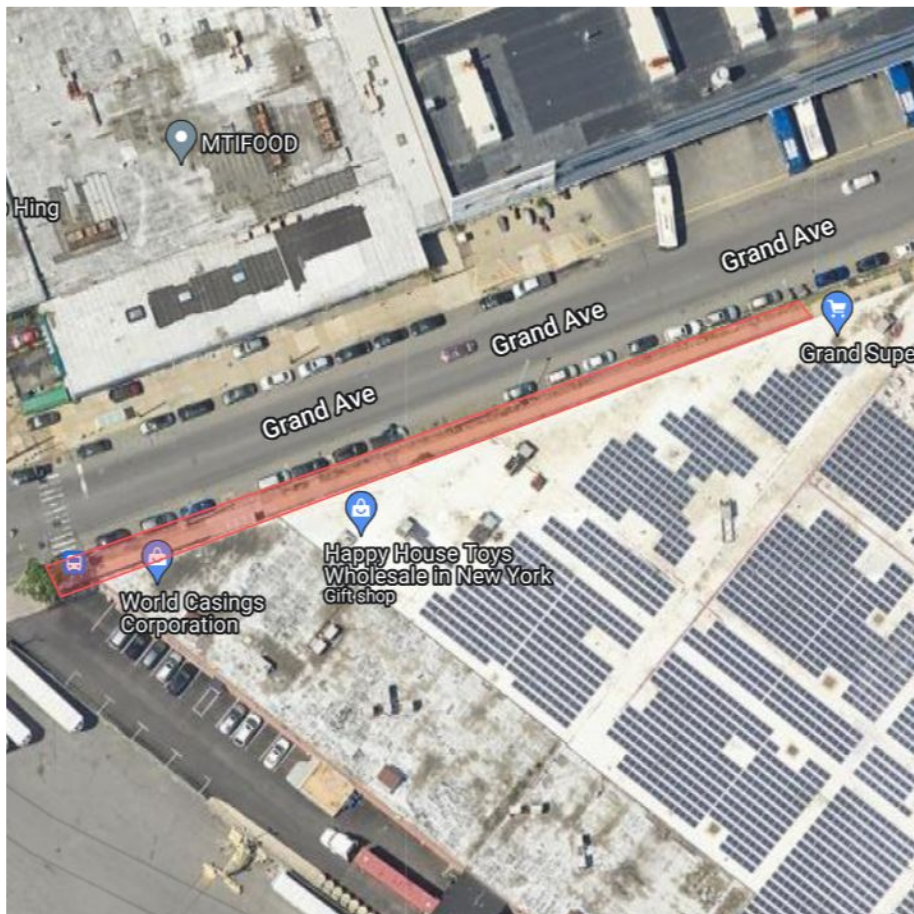
Site 1: Grand Ave
Site 2: 56th Terrace
Site 3: 49th Street

Measured Variables

- Time of Day
- Surface Type
- Surface Temperature
- Air Temperature
- Air Quality
- Shade Percentage
- Tree Count
- Foot traffic



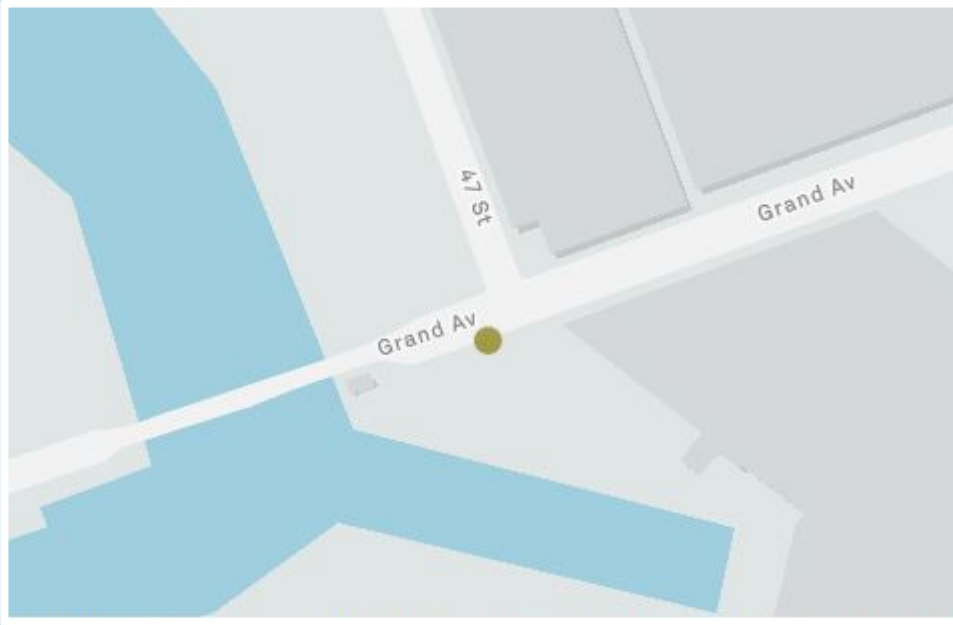
RESULTS: SITE 1



Site 1: Grand Avenue

This site is composed of a long stretch of asphalt on either side of the Q59 Grand Ave & 47th St bus stop. It is located in front of World Casing Corp., a sausage casing manufacturer. The nearby Maspeth Bus Depot and Grand St Bridge bring in additional vehicle traffic in the area. There are virtually no street trees in this area; however, shadow from the buildings provide a degree of shading depending on the time of day.

1 tree was counted in the site area: *Ailanthus altissima*, the tree of heaven. It's a fast-growing invasive tree in NYC but it is a shade tree and is able to grow in poor conditions.



Ailanthus altissima tree at Grand Avenue site.



Elderly woman waiting for bus in the shade under the *ailanthus altissima* tree. Thursday, July 26th, 2023.



Grand Avenue Site, July 25th, 2023, 12:00 PM



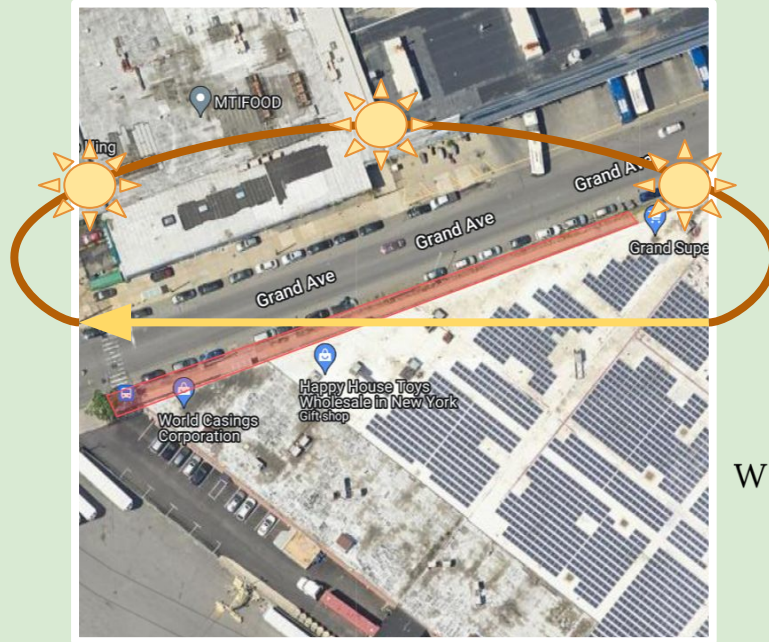
Grand Avenue Site, July 26th, 2023, 4:00 PM



The sun is directly ahead leading to barely any accessible shade. Grand Avenue Site July 26th, 2023 4:00 PM

Daylight Analysis

The angle of the sun determines how an area is shaded as seen with the Grand Avenue site as well as the other two sites.



60%

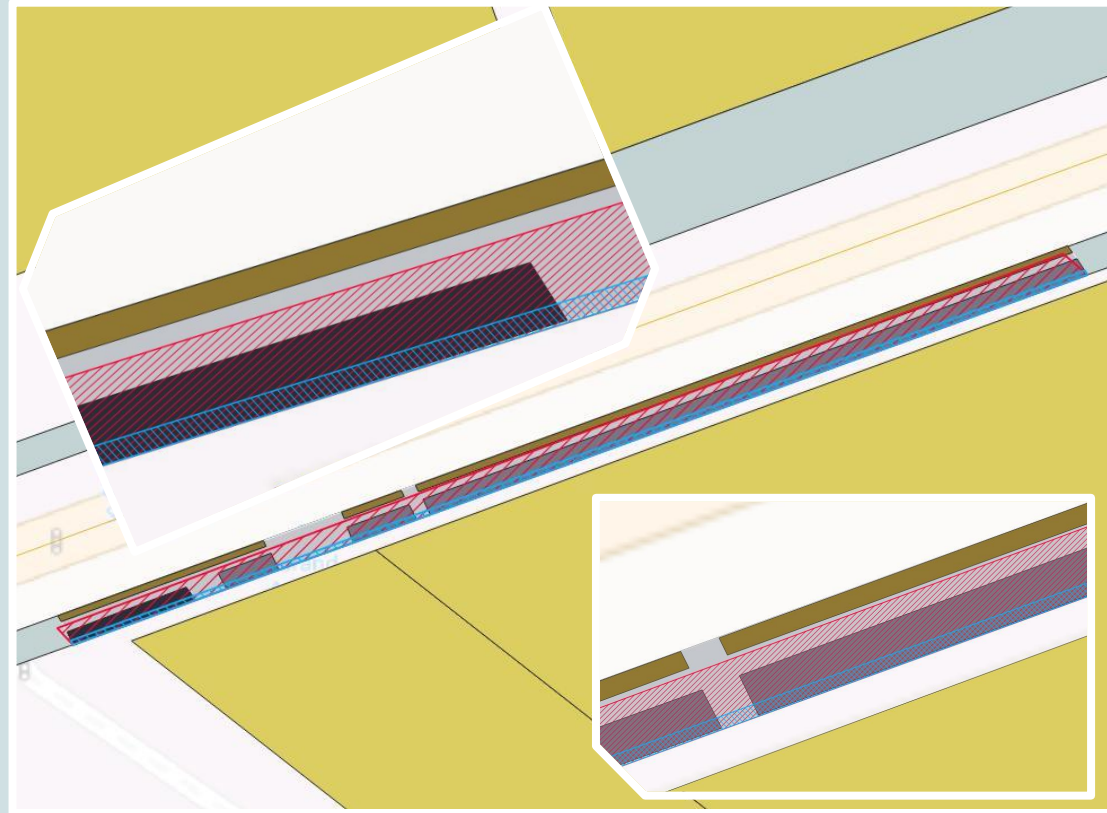
12 PM
Coverage

5%

4 PM
Coverage

- Shade at 12 pm is created by the shadow of buildings, but as the sun shifts to a new position at 4 pm, most shade disappears
- Nearby Q59 bus stop with a roof provides shade for commuters

Grand Ave Shade Coverage



Foot Traffic Patterns at Grand Ave in a 15 Minute Period

8.5 Average Foot Traffic at 12 PM

7 Average Foot Traffic at 4 PM

Dominant Behaviors:

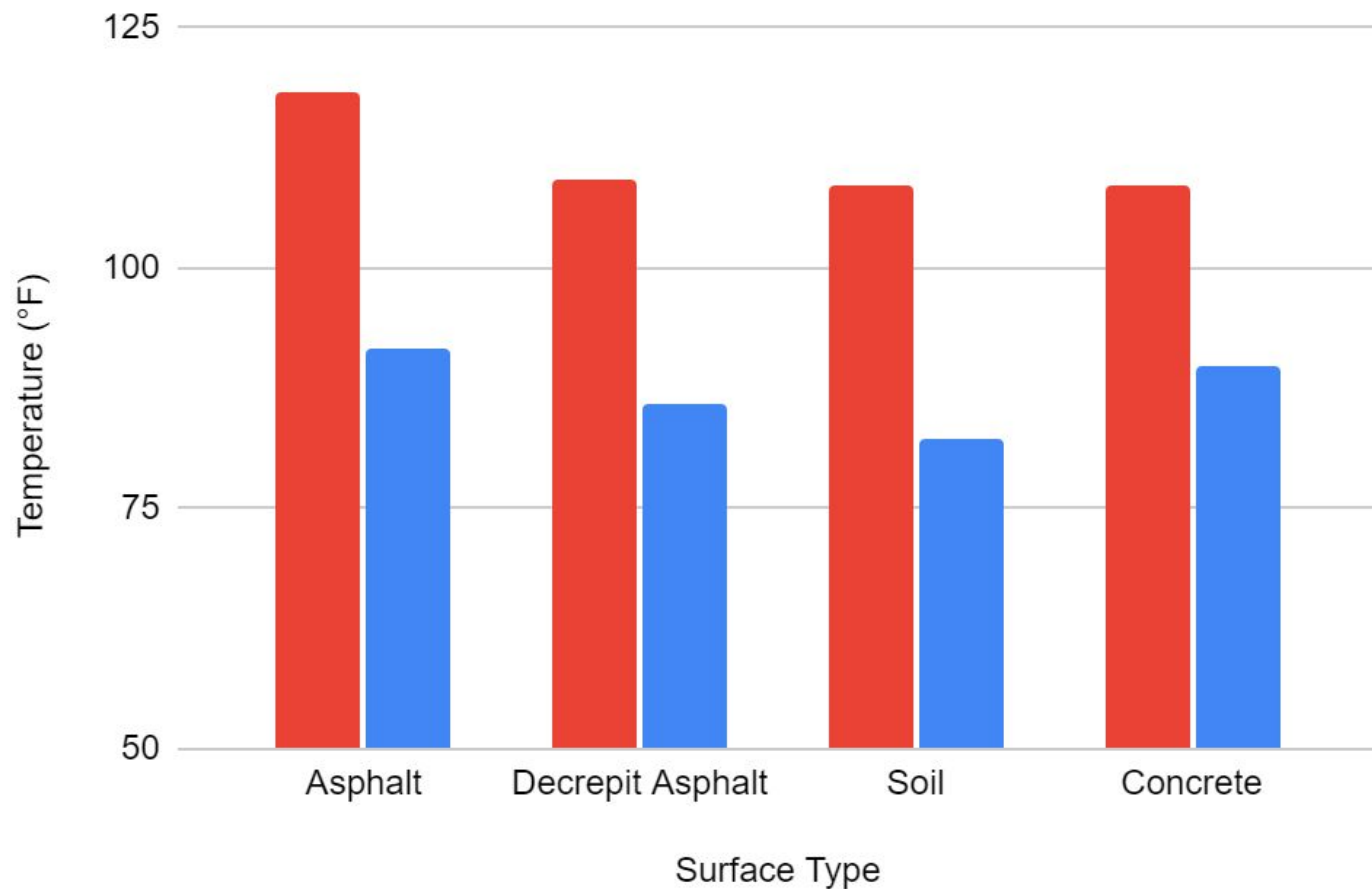
- Seeking shade along sidewalk (12 PM) or beneath bus stop/tree canopy (4 PM)
- Waiting for bus



Unshaded vs Shaded Surface Temp at Grand Ave (12 PM)

Unshaded

Shaded



91 Air Temperature

52 Relative Humidity

13 AQI PM1

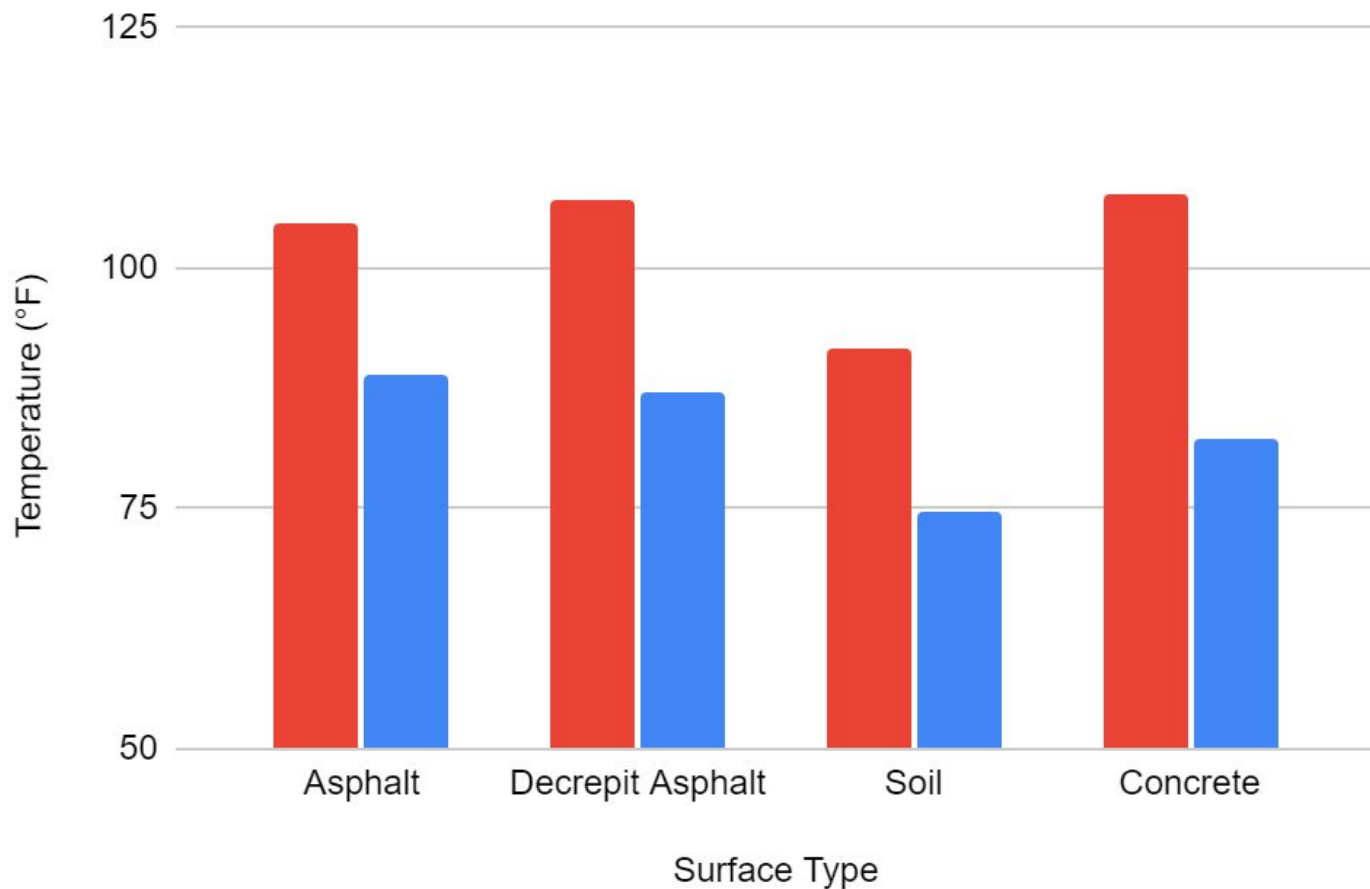
14 AQI PM2.5

15 AQI PM10

Unshaded vs Shaded Surface Temp at Grand Ave (4 PM)

Unshaded

Shaded



96 Air Temperature

47 Relative Humidity

19 AQI PM1

20 AQI PM2.5

22 AQI PM10



RESULTS: SITE 2



Site 2: 56th Terrace

This site is apart of a triangular block, nearby, but isolated from the heavier industrial activity in Maspeth. Businesses along this block include Oriole Realty Corp., Flash Electric Services Corp., and a warehouse of Ontime Distribution Inc. An empty dirt plot is connected to the event venue, Majestic Hall. This block receives adequate shading as a result of the abundance of street trees. However, they are overgrown and littered with trash.

6 *Gleditsia triacanthos* var. *Inermis* (thornless honeylocust), 1 *Acer platanoides* (norway maple), 1 *Acer saccharum* (sugar maple), 1 *Pinus strobus* (Eastern white pine), 1 *Tilia cordata* (littleleaf linden), 1 *Thuja* ("Green Giant" arborvitae), 4 *Pyrus calleryana* (Callery pear), 1 *Quercus palustris* (pin oak), 2 *Styphnolobium japonicum* (japanese pagoda tree)





56th Terrace Site,
July 20th, 2023, 12:00 PM





56th Terrace Site, July 27th, 2023 4:00 PM

78%

12 PM
Coverage

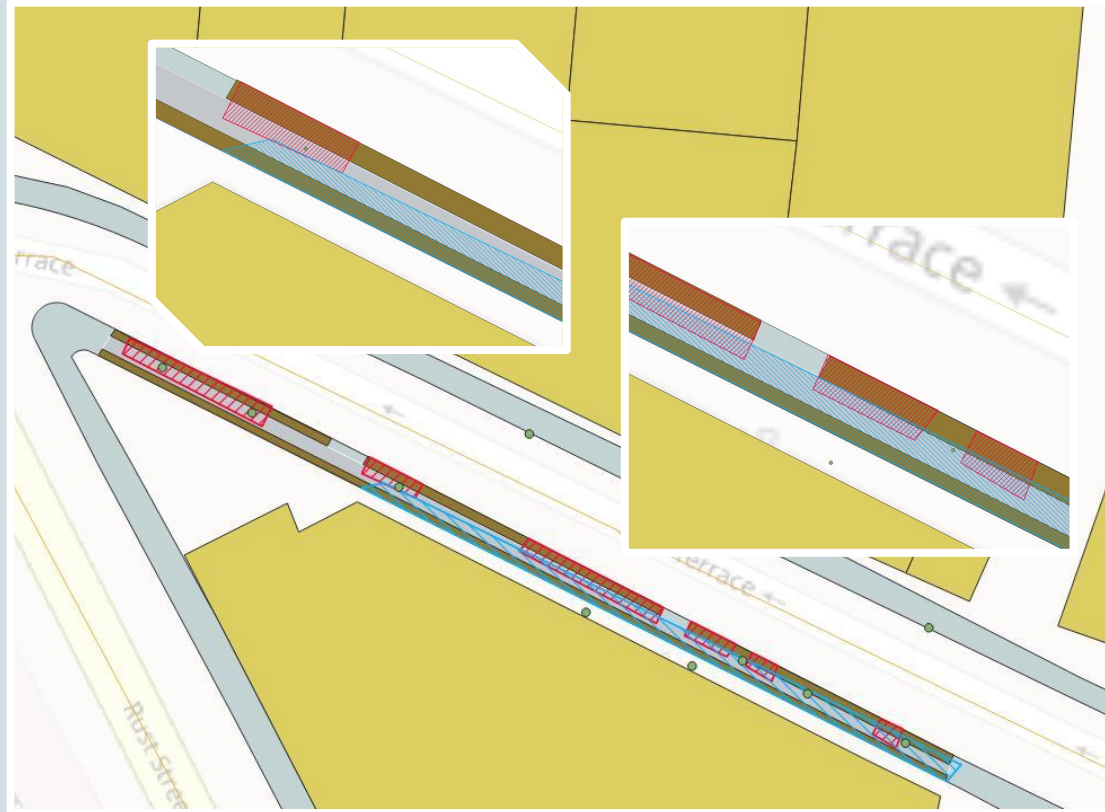
58%

4 PM
Coverage

- Adequate walking space in shaded areas during both 12 pm and 4pm
- Shade at 12 pm is created by tree canopies, but shade at 4 pm is created by the shadow of buildings



56th Terrace Shade Coverage



Foot Traffic Patterns at 56th Terrace in a 15 Minute Period

8 Average Foot Traffic at 12 PM

6.5 Average Foot Traffic at 4 PM

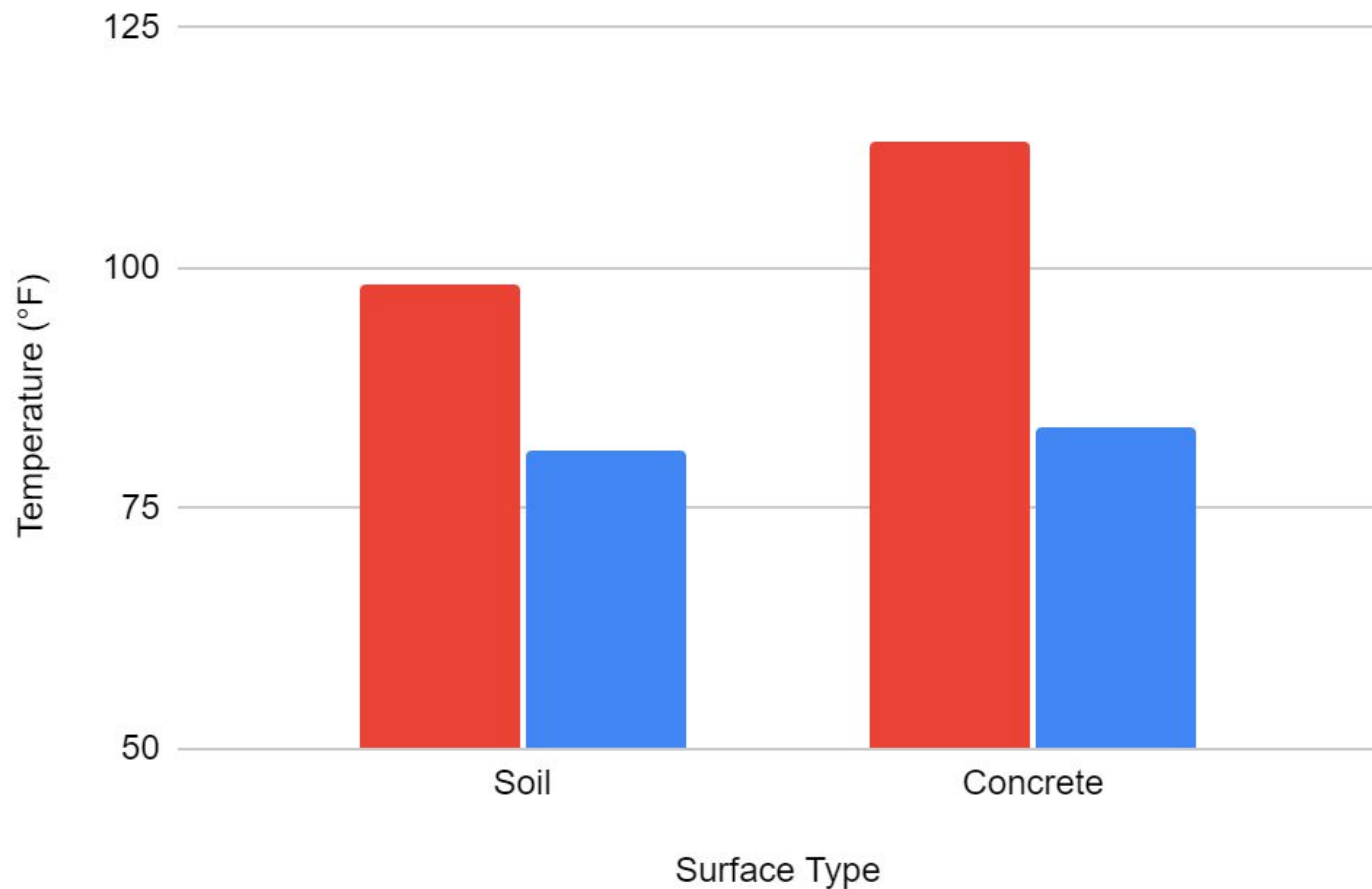
Dominant Behaviors:

- Working: unloading/loading trucks
- Resting in shade provided by buildings and/or tree canopy
- Most pedestrians choose to walk along the shaded street



Unshaded vs Shaded Surface Temp at 56th Terrace (12 PM)

Unshaded
Shaded



96 Air Temperature

44 Relative Humidity

16 AQI PM1

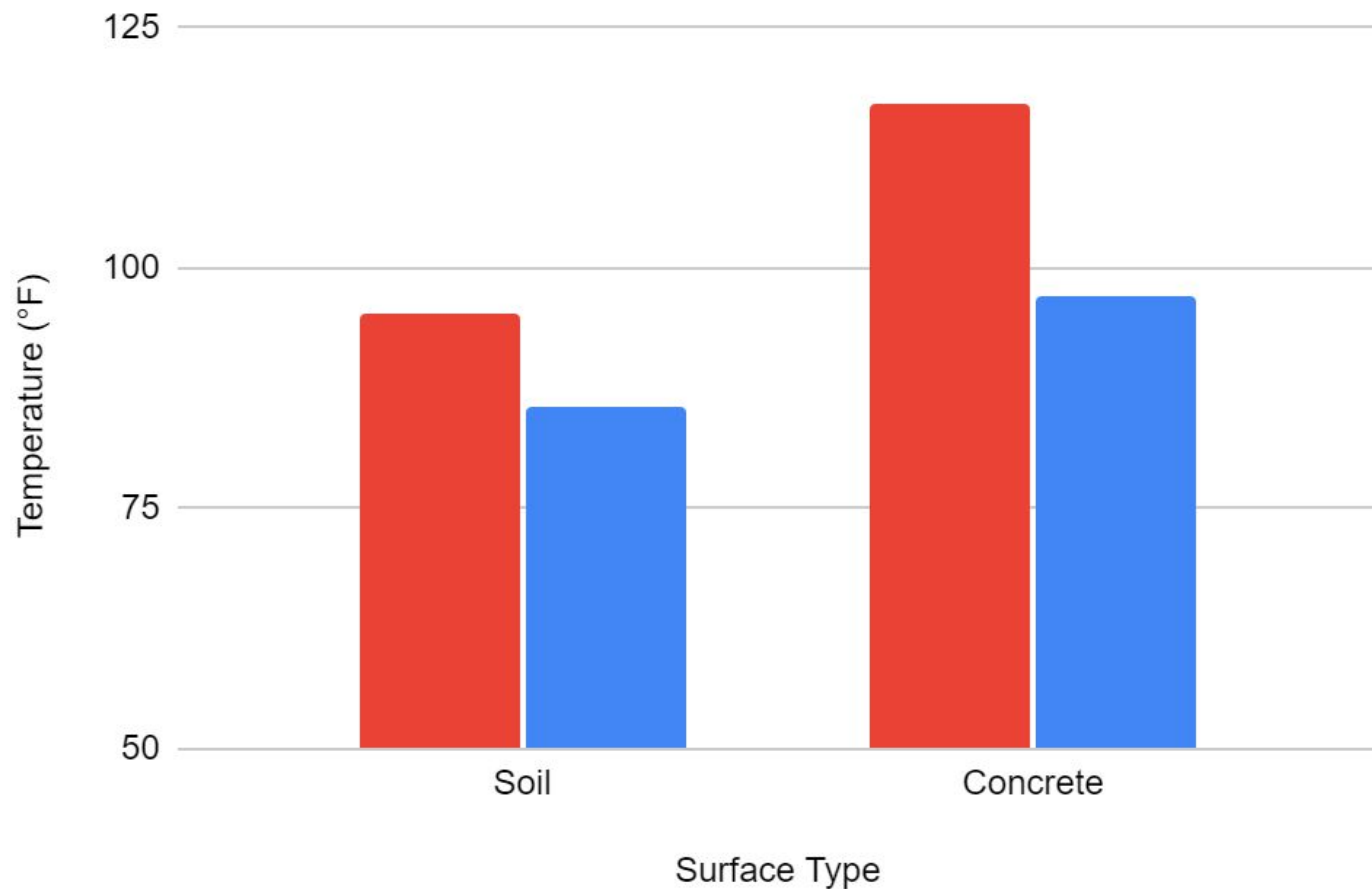
18 AQI PM2.5

22 AQI PM10

Unshaded vs Shaded Surface Temp at 56th Terrace (4 PM)

Unshaded

Shaded



99 Air Temperature

40 Relative Humidity

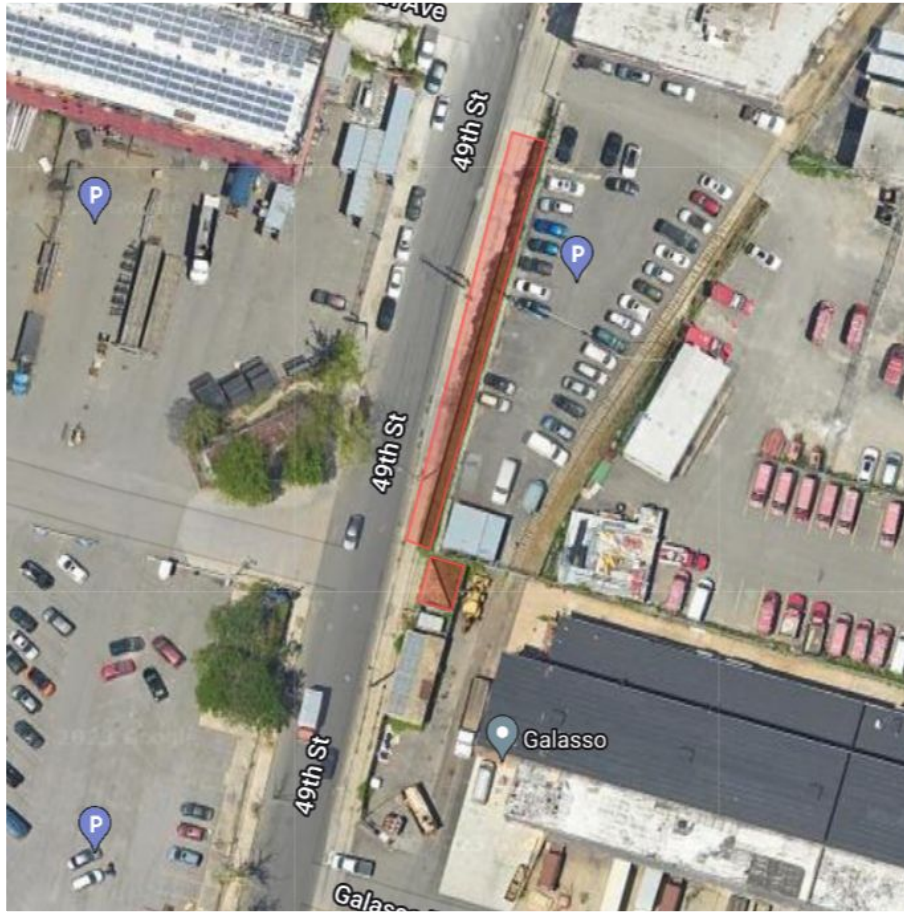
15 AQI PM1

16 AQI PM2.5

18 AQI PM10



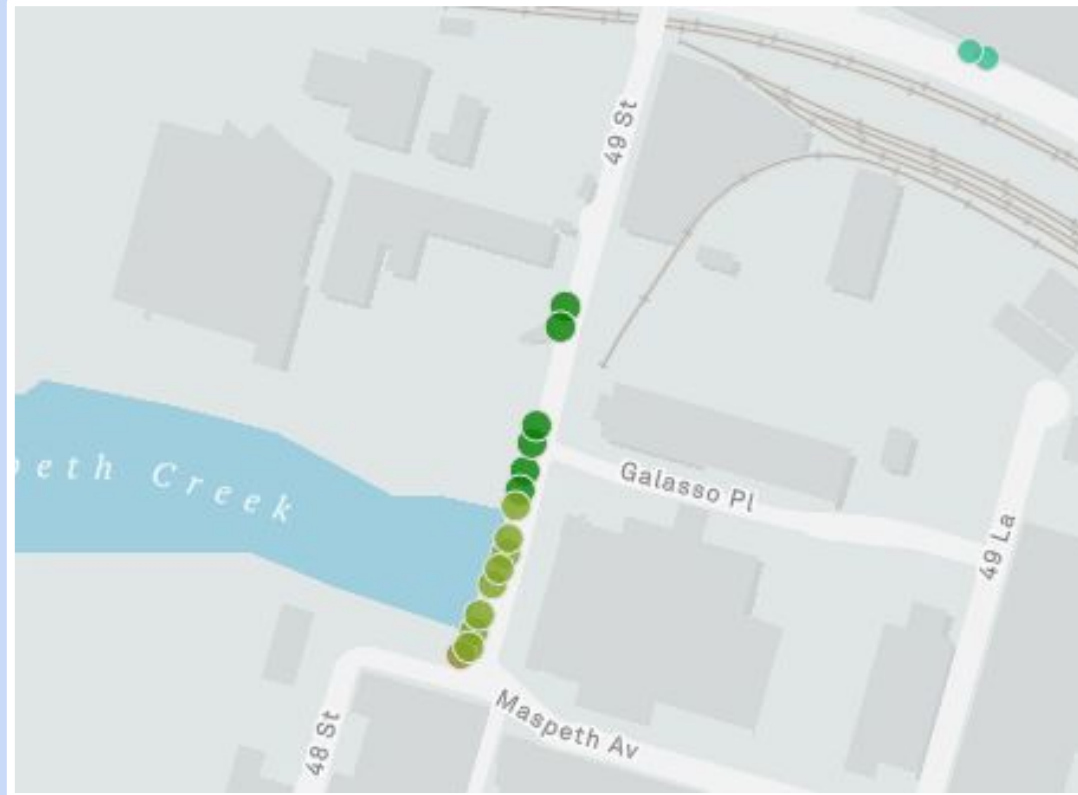
RESULTS: SITE 3



Site 3: 49th Street

This site is bordered by expansive parking lots. Nearby is a CSO site emptying into the Newtown Creek and railroad tracks that service trains transporting goods. The Maspeth UPS facility is also located to the North of 49th Street, leading to an increase in trucks in the area. There is little shading provided by a fence of overgrown vines, but the shaded walking space is inaccessible. Shade from the nearby trees is limited due to thin, spotty canopies.

6 *Platanus x acerfolia* (London planetree), 8 *Gleditsia triacanthos* var. *Inermis* (thornless honeylocust), 1 *Ailanthus altissima* (tree of heaven)





49th Street Site, July 20th, 2023 12:00 PM



49th Street Site July 27th, 2023 4:00 PM

39%

12 PM
Coverage

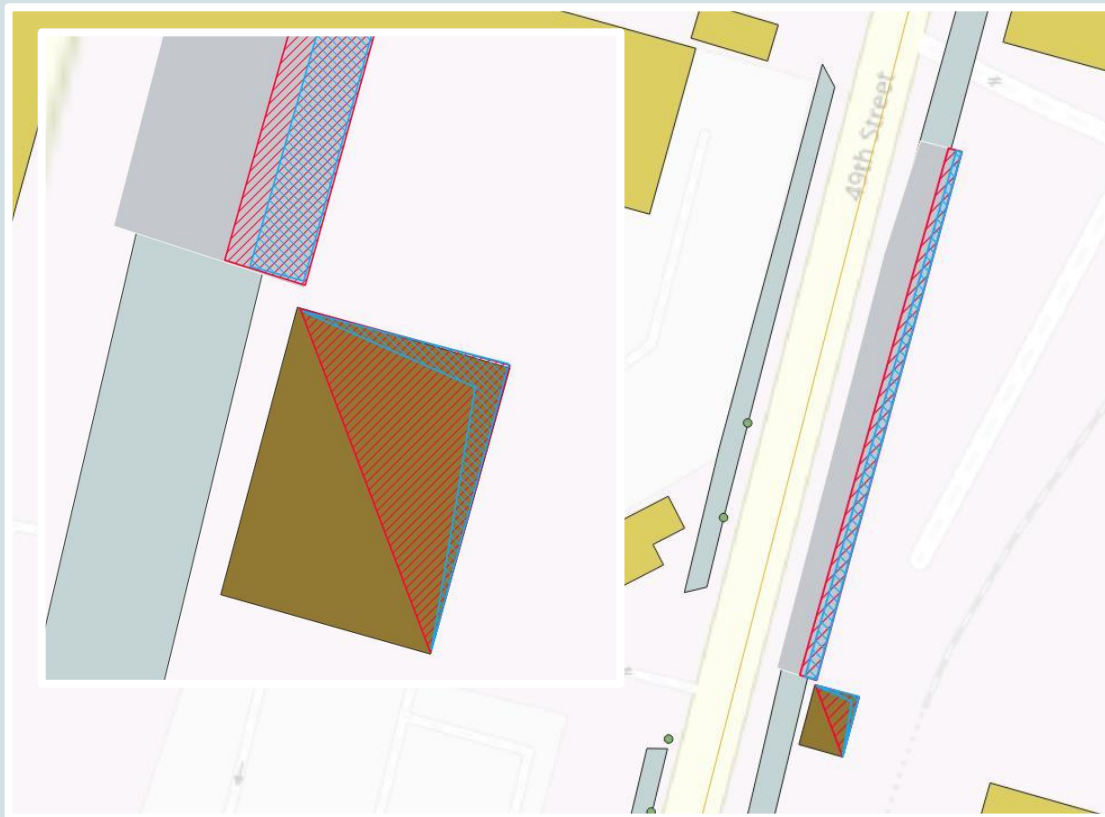
22%

4 PM
Coverage

- Minimal shade provided by overgrown wall of plants; however, it is inaccessible as walking space
- Soil plot is also inaccessible
- Virtually no shade at 4 pm in comparison to 12 pm



49th Street Shade Coverage



Foot Traffic Patterns at 49th Street in a 15 Minute Period

9.5 Average Foot Traffic at 12 PM

3 Average Foot Traffic at 4 PM

Dominant Behaviors:

- Working: unloading/loading trucks
- Pedestrians prefer street side with trees; however, they appear visibly exhausted from the heat



Unshaded vs Shaded Surface Temp at 49th St (12 PM)

Unshaded

Shaded

125

100

75

50

Temperature (°F)

Soil

Concrete

Surface Type

94

Air Temperature

47

Relative Humidity

17

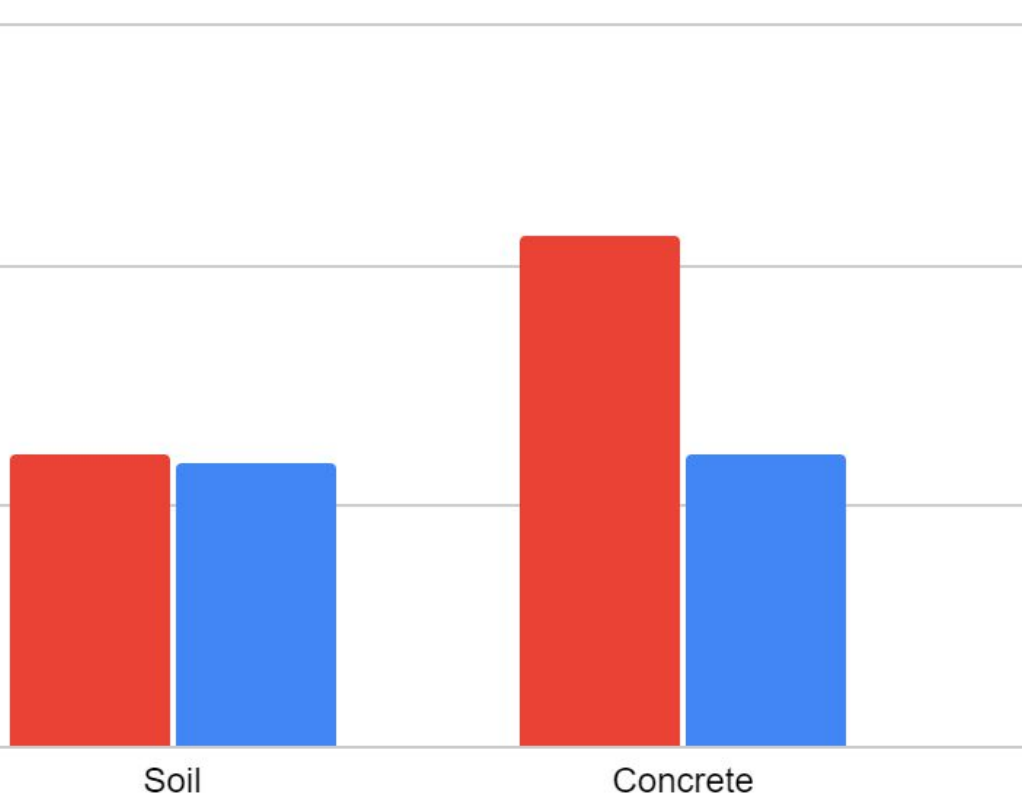
AQI PM1

18

AQI PM2.5

22

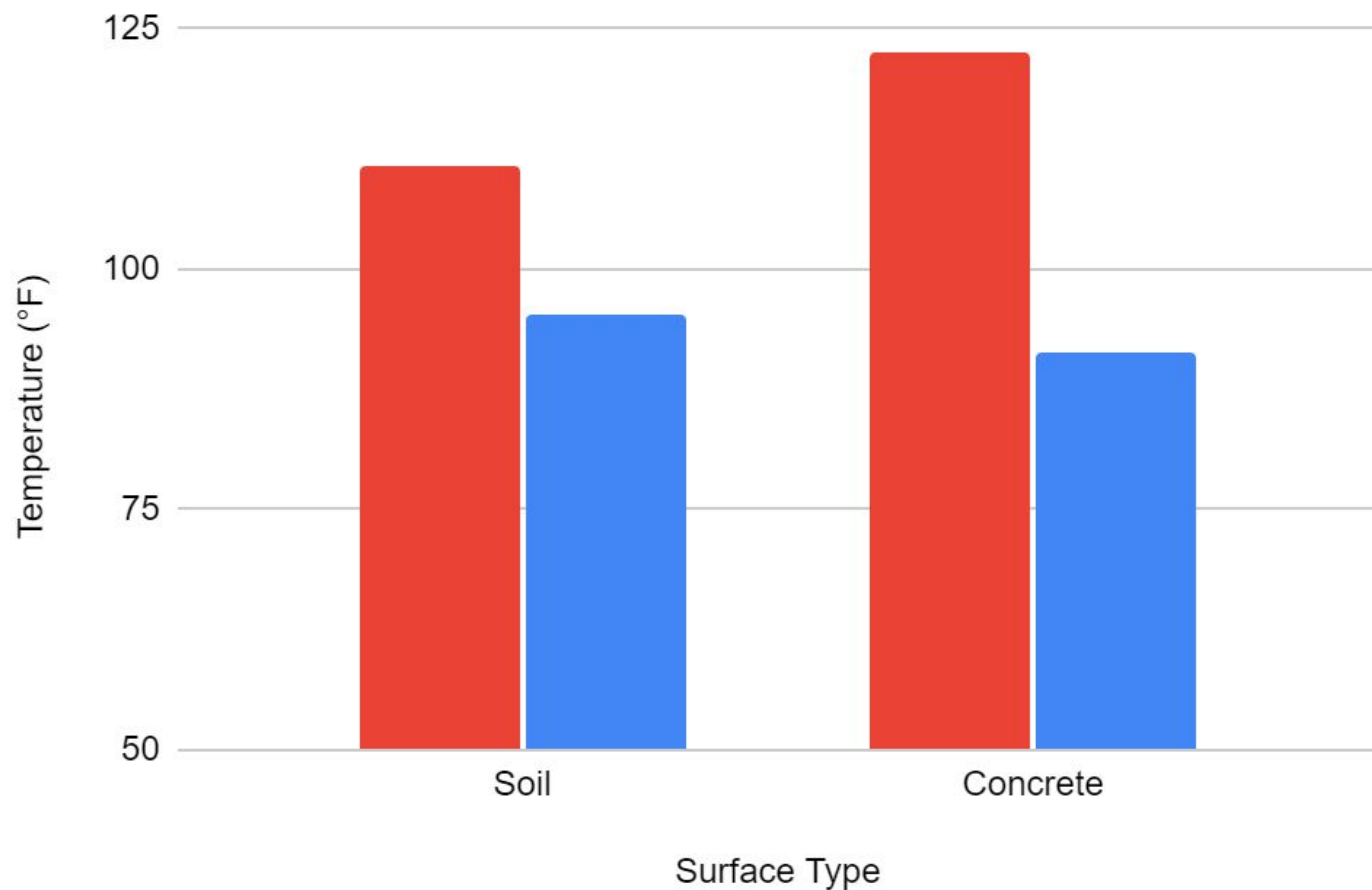
AQI PM10



Unshaded vs Shaded Surface Temp at 49th St (4 PM)

Unshaded

Shaded



94 Air Temperature

50 Relative Humidity

20 AQI PM1

22 AQI PM2.5

26 AQI PM10

Possible Errors & Discrepancies in Data

→ Weather

7/18/23, 12:00 PM - Rain did not allow for accurate measuring of shade coverage. Possibly affected latter readings at Grand Av as temperatures cooled as well as reduced foot traffic.

7/20/23, 12:00 PM - Persistent cloud coverage at Grand Av site affected shade percentage, but likely had little to no effect on surface temperature

7/25/23, 12:00 PM - Measurements at Grand Av were recollected due to previous conditions

7/25/23, 4:00 PM - Severe and lasting thunderstorms prevented us from traveling to the study zone for Tuesday measurements. Foot traffic measurements were collected instead on Wednesday, 7/26/23 at 4:00 PM

7/27/23, 4:00 PM - Measurements collected in heatwave conditions, which may not accurately portray normal IBZ temperatures and humidity

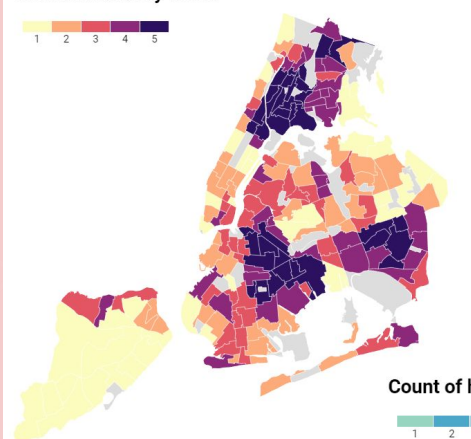
A scenic view of the New York City skyline across a body of water, with a semi-transparent text box in the center. The skyline includes the Empire State Building and other skyscrapers. In the foreground, there are industrial structures and a body of water.

DISCUSSION & CONCLUSIONS

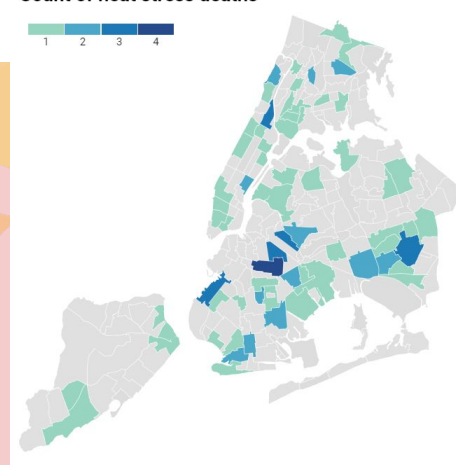
HEAT IS DEADLY!

- ~2% of warm-month deaths caused by exposure to heat or heat-related illnesses in New York City⁵
- Extreme heat events kill more people in NYC than any other extreme weather event⁶
- Heart strain, increases risk of heart attacks and cardiac arrest⁹
- Sweaty palms, dizziness, and fogged safety glasses affect work quality and safety¹⁰
- Exacerbation of respiratory conditions like asthma and Chronic Obstructive Pulmonary Disease (COPD)⁷ which at greater rates among industry workers⁸

Heat vulnerability index



Count of heat stress deaths



NYCCAS. 2022 New York City Heat-Related Mortality Report, 2022.

Iranian City Hits 129 Degrees, Hottest Ever Recorded

Heat waves are more easily attributable to climate change.

Phoenix Hits 25 Straight Days Above 110 Degrees: Here's Where Else Daily Records Have Fallen

Heat Records Are Broken Around the Globe as Earth Warms, Fast

NYC preparing for year's first official heat wave, with temps over 100 degrees: 'Just stay indoors'

 NBC NEWS

Like a hot tub: Water temperatures off Florida soar over 100 degrees

MAIN TAKEAWAYS

- Heat is a pressing threat that requires immediate response
- In the city, our abundance of dark, barren surfaces intensify heat
- Integrating shade and canopy coverage in industrial areas is vital to protecting the health of workers and pedestrians
- Our 3 sites are prime examples of opportunities to incorporate green space in Maspeth IBZ

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12. NYC Street Tree Map. (n.d.). NYC Parks. <https://tree-map.nycgovparks.org/>
13. Streamlit. (n.d.). Metrics.mta.info. <https://metrics.mta.info/>

Link to Data Spreadsheet:

<https://docs.google.com/spreadsheets/d/1hsW6x5LWZa7K7SQ7ss6qknq-ePCBucuHuZWVYfkjZpQ/edit?usp=sharing>

Link to Folder with Pictures:

https://drive.google.com/drive/folders/1G_ycnMYHmN-jegXL9_DFACKKHQZhvO80?usp=drive_link