City Exploration #2 – Why Is Bike Riding Still Dangerous? An Analysis of Infrastructure and Risk Areas

Seungyeon Kim

Background

Throughout the previous units, my questions have stemmed from a curiosity about what makes one station more popular than another. During the city exploration assignment in Seoul, I observed that bike infrastructure plays a critical role in ridership, as cyclists tend to feel safer and more comfortable when designated lanes are available.

Road safety is particularly important for cyclists, much like it is for pedestrians, as they lack the protection afforded by a vehicle. Moreover, many bicycle-related accidents involve motorcycles, highlighting the need for safer infrastructure.

Building on these observations, I aim to examine the characteristics of Bluebike stations with the highest and lowest accident rates and explore the surrounding infrastructure and environmental factors that may contribute to variations in cyclist safety.

Before proceeding with the analysis, I reviewed the Vision Zero traffic accident records from 2015 and 2024, published by the City of Boston, to understand trends in bike-related accidents over time.

Analysis

First, I reviewed the Vision Zero Boston's Injury Crash Map. In 2015, there were 502 reported bike injuries, including three fatalities. By 2024, the number of reported injuries had declined to 366.
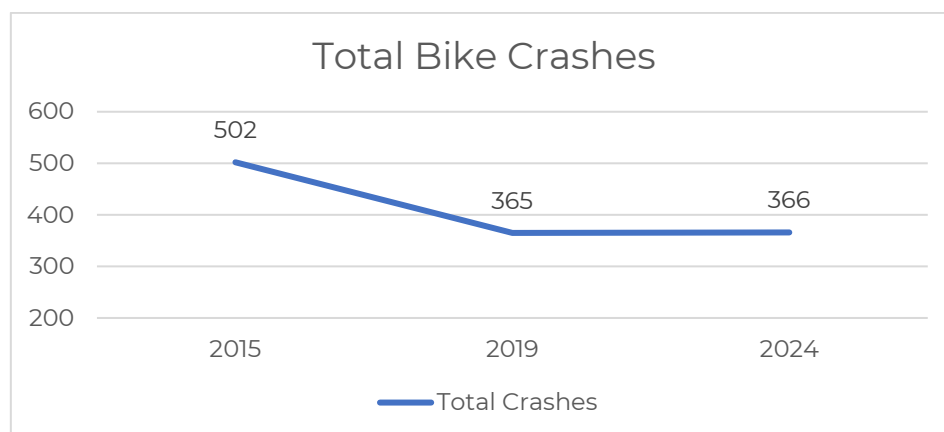
Source: Recreated based on Vision Zero data

Based on the data, I decided to match the Vision Zero records with Bluebike station locations to estimate the number of accidents that occurred in proximity to each station and to explore the surrounding environment.

To do this, I extracted station names and geographic information from the 2015 and 2024 Bluebike datasets. I then used the *st_is_within_distance* function to link each year's Vision Zero accident data to nearby stations and calculate the number of incidents within a certain distance.

Between 2015 and 2024, the number of Bluebike stations increased significantly, from 156 to 491. Therefore, I applied different distance thresholds to define "nearby" accidents: 0.24 miles for 2015 and 0.16 miles for 2024, in order to better match the actual number of reported cases.

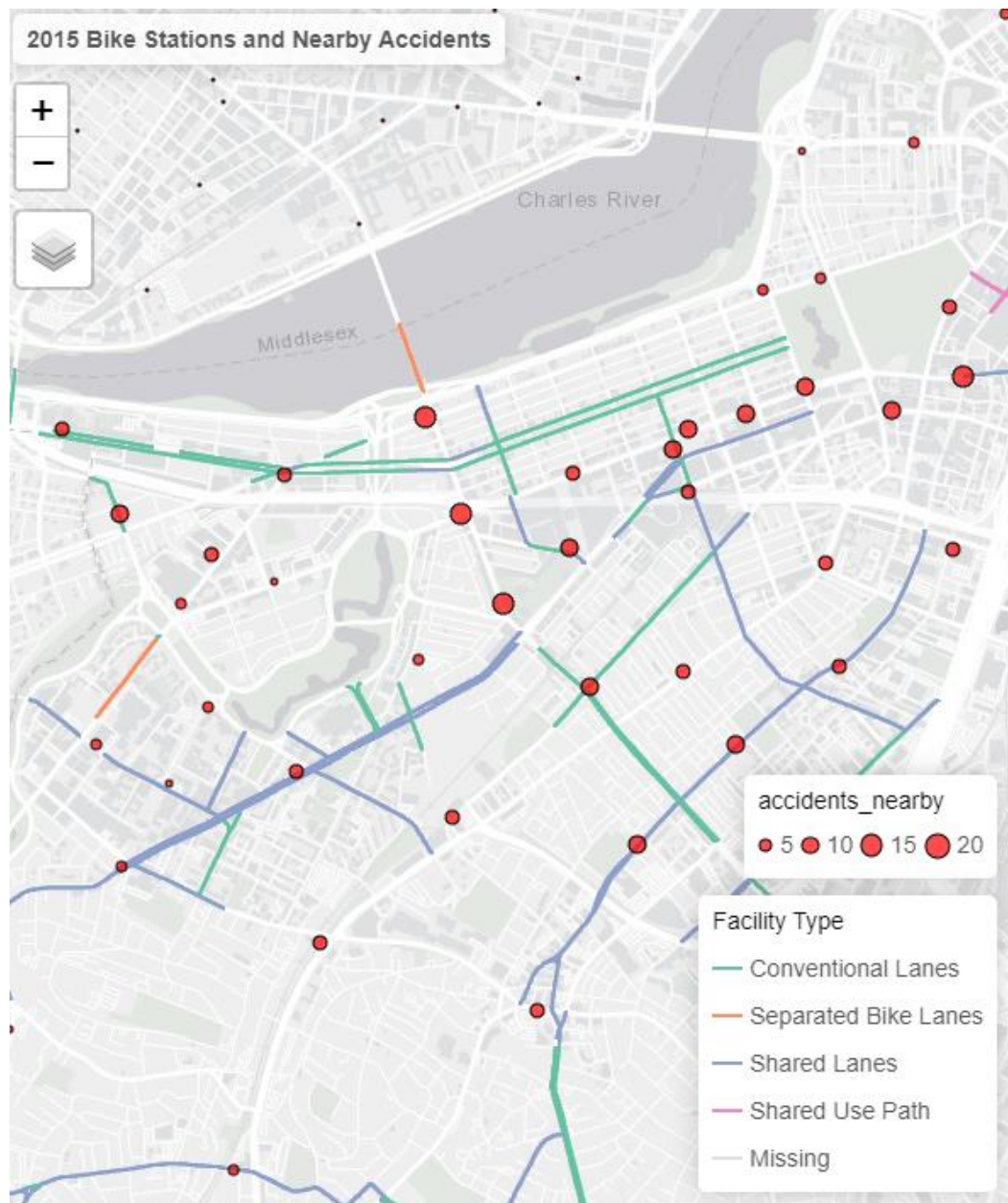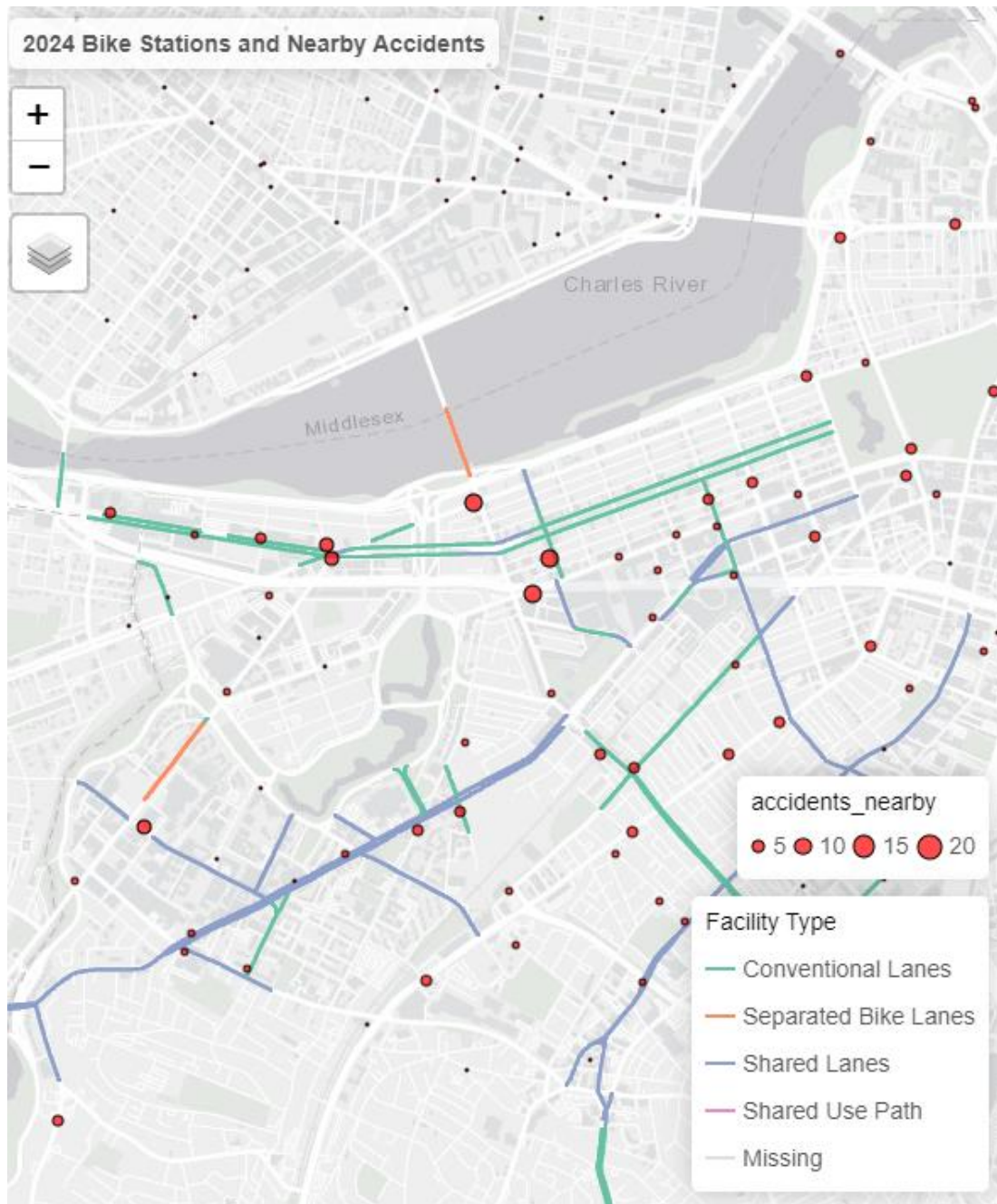The top five stations with the highest number of accidents are identified as follows:

<Top 5 Stations with the Highest Number of Accidents 2015>

Station Name	Number of Accidents nearby
Newbury St / Hereford St	23
Beacon St / Mass Ave	17
Boylston / Mass Ave	15
Christian Science Plaza	13
Boylston St / Washington St	13

<Top 5 Stations with the Highest Number of Accidents 2024>

Station Name	Number of Accidents nearby
Boylston St at Massachusetts Ave	12
Newbury St at Hereford St	11
Beacon St at Massachusetts Ave	10
Kenmore Square	6
Deerfield St at Commonwealth Ave	6

To assess whether there have been improvements in bike infrastructure at high-risk Bluebike stations, I created maps by joining station data with bike network data installed up to 2015 and through 2024. *tmap()* However, the bike networks in both 2015 and 2024 primarily consisted of conventional lanes or shared lanes, with little substantial improvement in physical protection for cyclists.

2024 Bike Stations and Nearby Accidents

accidents_nearby
● 5 ● 10 ● 15 ● 20

Facility Type
— Conventional Lanes
— Separated Bike Lanes
— Shared Lanes
— Shared Use Path
— Missing

Although the overall bike infrastructure—including both stations and networks—has improved significantly over the past decade, likely contributing to the reduction in accident numbers, certain stations consistently appeared on both lists and remained surrounded by similar environments. These include **Newbury St / Hereford St, Beacon St / Mass Ave,** and **Boylston St at Massachusetts Avenue.**

I decided to further explore these areas to better understand the underlying factors.

City Exploration

By identifying the top five stations with the highest number of accidents in 2024, I found that three of the stations, which also appeared on the 2015 list, are located close to one another.

The three stations highlighted in the purple box were identified in both years, while the two stations on the left side of the map are also situated near each other. **Using Google Maps, I observed that all five stations are located near major vehicle lanes.**

Based on these observations, I decided to examine whether the bike infrastructure in these areas is sufficiently equipped and safe for cyclists riding alongside vehicular traffic.

<Top 5 Stations with the Highest Number of Nearby Accidents 2024 >
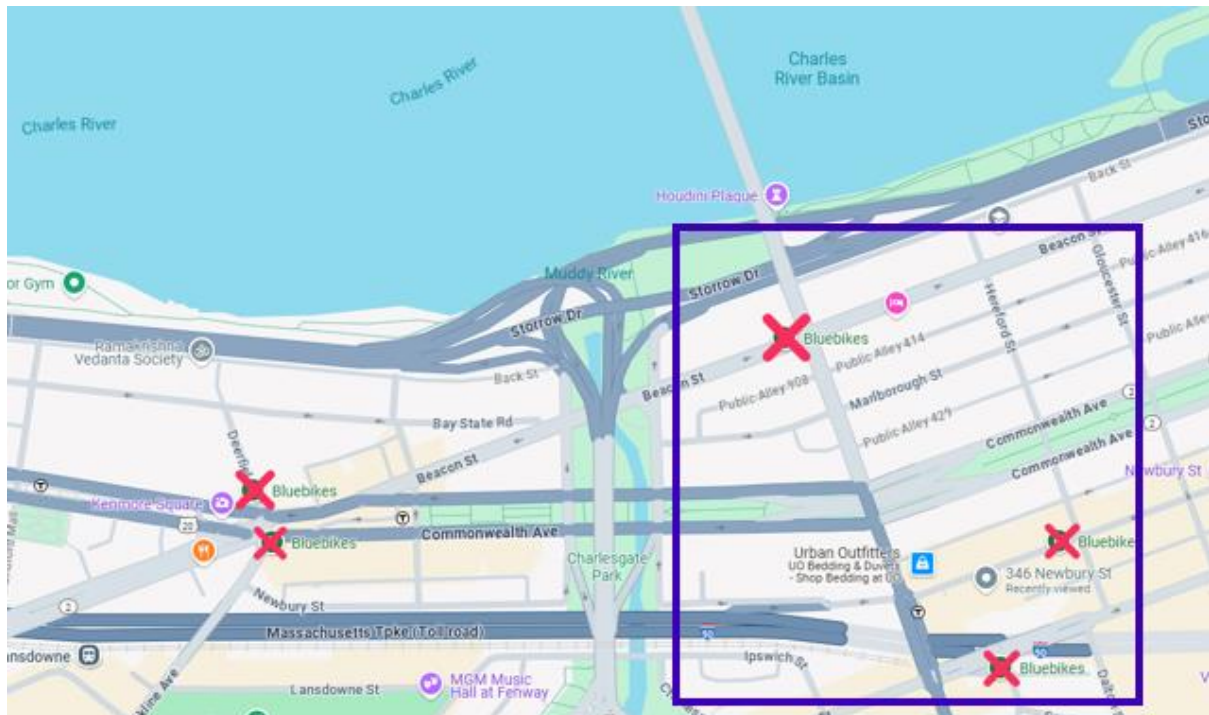
1. **Boylston St at Massachusetts Ave (listed both in 2015 and 2024)**

Boylston St at Massachusetts Ave is located along Boylston Street, where bike lanes are shared with vehicle lanes. The bike infrastructure is designated for cyclists only; however, it consists solely of **painted markings without any physical buffers or protective barriers.**
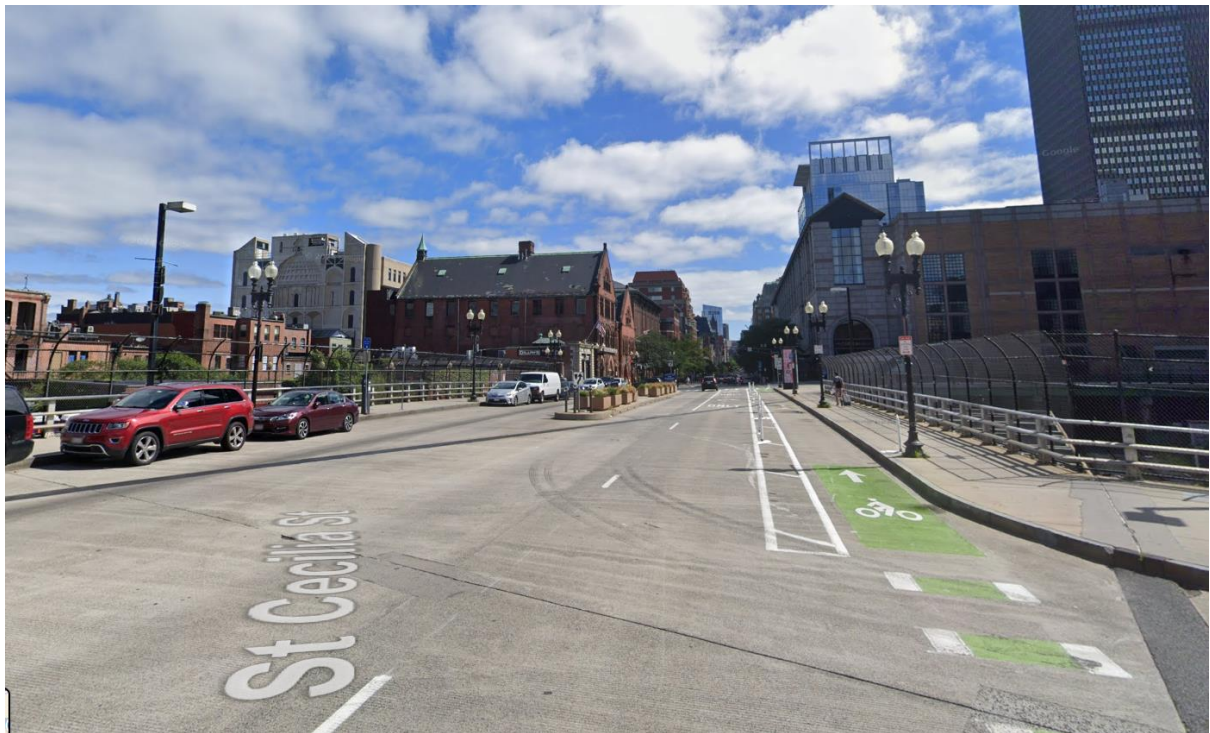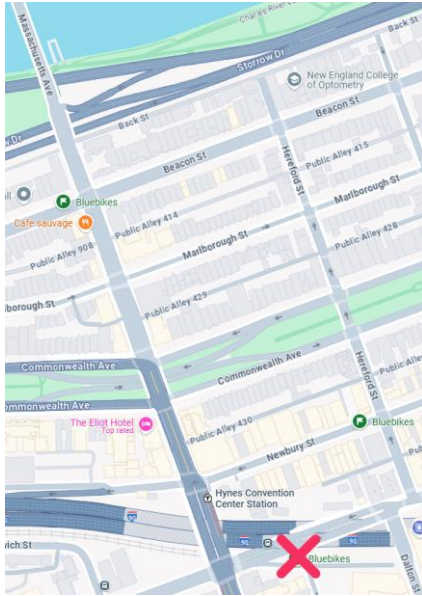
In this photo, **the bike lane can be seen squeezed between traffic lanes and parking zones**, leaving cyclists with minimal space and putting them at greater risk of collisions with vehicles.

2. **Newbury St at Hereford St (listed both in 2015 and 2024)**

Newbury St at Hereford St is located along narrow roads in a mixed commercial and residential area. Unlike other top accident locations, this site is not situated near major vehicle lanes; however, **it lacks any designated bike infrastructure. Only pedestrian sidewalks and vehicle lanes are present, with no dedicated space for cyclists.** Observations from Google Maps show several riders using the vehicle lanes to navigate the area.
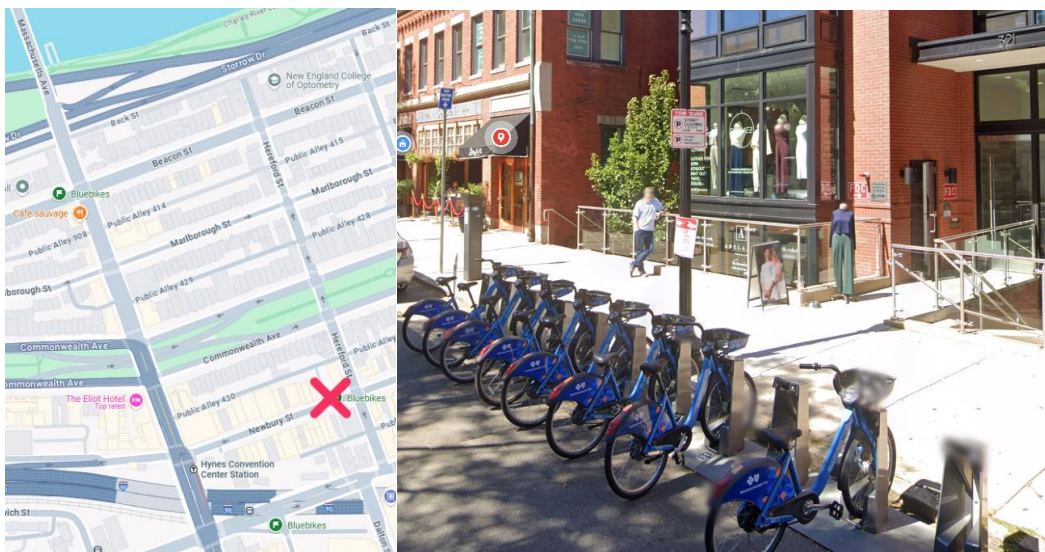
3. Beacon St at Massachusetts Ave (listed both in 2015 and 2024)

This station is located at the intersection of Beacon Street and Massachusetts Avenue, connecting to the Harvard Bridge leading into Cambridge. Among the top stations, it is connected to the largest and busiest vehicle lanes.

Upon reviewing the area, it was evident that the bike lane shares the roadway with vehicle traffic. **Most of the nearby bike infrastructure consists of painted markings, with occasional buffers provided when the bike lane overlaps with bus lanes.**
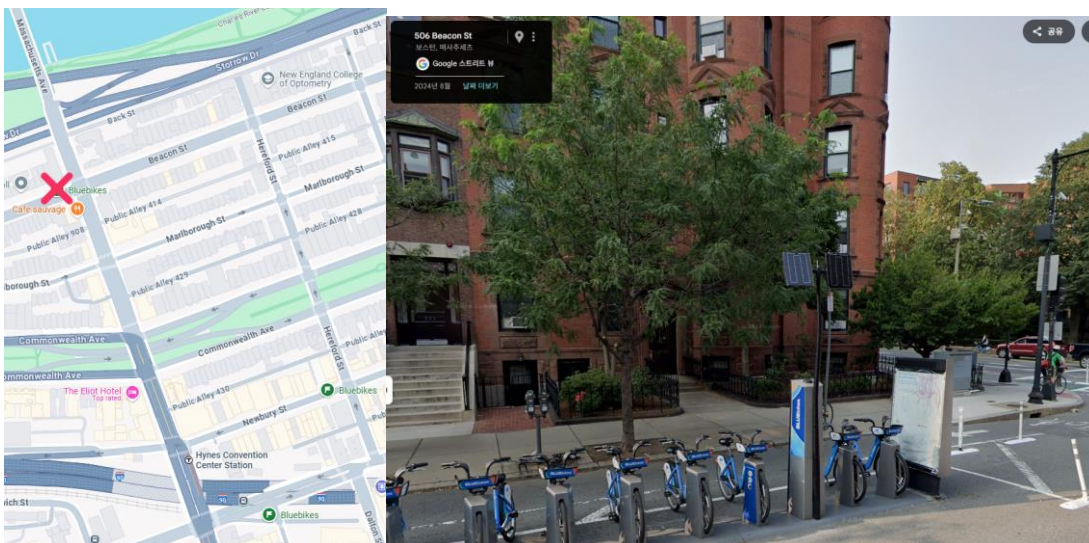
4. Deerfield St at Commonwealth Ave station and Kenmore Square station (Top station from 2024)

I also reviewed the two stations that appeared only in the top five list from 2024 to see if there were any exceptions. However, these stations similarly lacked separated bike lanes and offered no physical protection for cyclists.
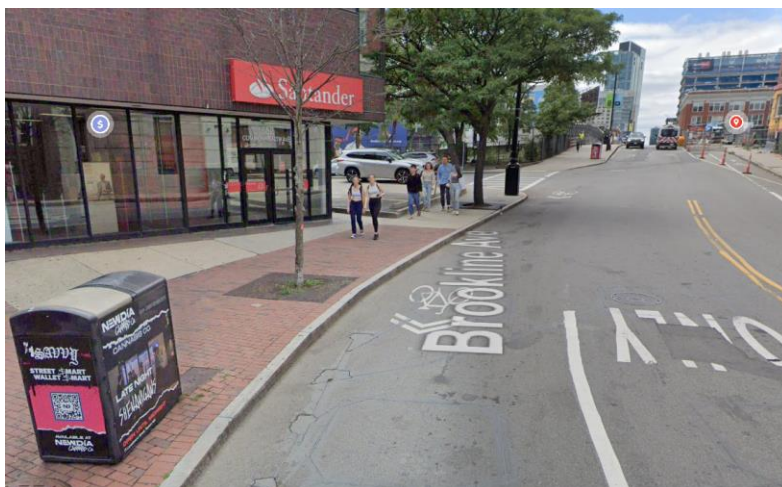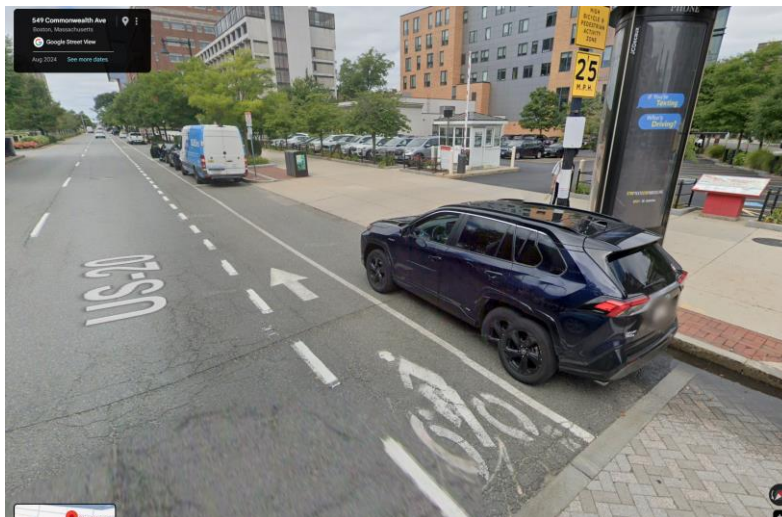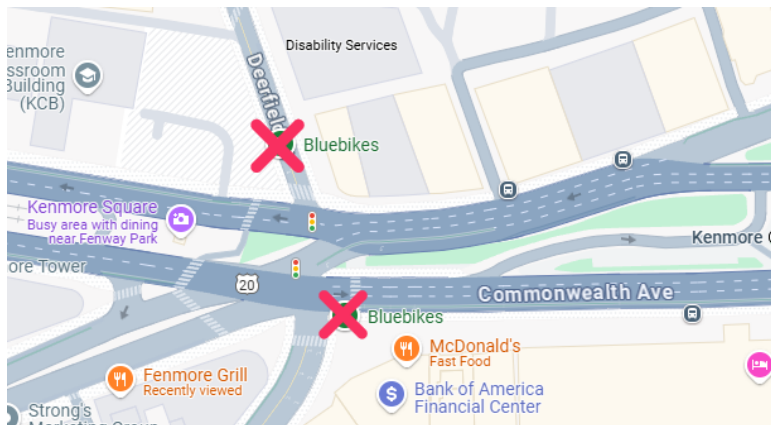
Conclusion

By examining the infrastructure, it became clear that the absence of separated or protected bike lanes, and the need for cyclists to share roads with vehicles, was a critical and common contributor to the high number of traffic accidents in these areas.

Additionally, I found that the City of Boston is actively gathering public feedback on transportation infrastructure through the Vision Zero Safety Concerns platform. From this map, it was evident that I am not the only one who noticed these issues. Boston residents have already submitted concerns regarding the identified roads, often marking them with comments such as "bike facilities don't exist or need improvement."

Some of the comments include:

- *"It needs physical separation, including hard vertical elements, to prevent cars from parking in the bike lane. If cars are physically able to do so, they will block the bike lane on this stretch, so it is crucial to make sure they are physically incapable of doing so."*
- *"Cars are in the bike lane every time."*

From this city exploration, it is evident that improving the bike network requires not only expansion in terms of distance and coverage, but also significant enhancements in quality to better protect cyclists. Urban planners should carefully consider both public feedback and data on high-risk areas to more effectively improve the city's bike infrastructure.

<**Vision Zero Safety Concerns Map**>