

# 13<sup>th</sup> Avenue Bikeway Performance Analysis



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**Brady Hilgenberg**  
**PPPM399**  
**University of Oregon**  
**November 8<sup>th</sup>, 2021**

# Executive Summary

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The 13<sup>th</sup> Avenue Bikeway was envisioned beginning in 2012 when new student housing was proposed for construction in Downtown Eugene. Concerns were raised about potential vehicle and bike/pedestrian traffic to and from the new 1,200-student housing complex. LiveMove, a transportation advocacy student group at the University of Oregon, created plans for a two-way cycle track connecting Downtown and the UO campus. After years of planning and further analysis by the city and city contractors, the 13<sup>th</sup> Avenue Bikeway was constructed and opened in 2020.

Immediately after opening, the new traffic signals, which included a bikes-only signal phase, were criticized for taking too long to change to green for bikes. The signal timing was adjusted by city officials to increase the speed at which the light changes for cyclists. The purpose of this memo is to

1. Analyze overall usage patterns of the bikeway and draw conclusions about its operation.
2. Analyze the signal operation and identify relationships between signals encountered, travel time, and proportion of riders who run red lights.

I have found that, although red lights are frequently encountered on the bikeway, travel time is only slightly affected (~1-2 additional minutes per trip depending on number of lights encountered). However, rider psychology may overvalue the benefit of going running a red light, leading to a significant proportion riders who do not stop at red lights.

# Part 1: Background

## History and Current Issues

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### History

The community discussion around constructing the 13<sup>th</sup> Avenue Bikeway began in earnest in 2012. **(City of Eugene Transportation Planning Department, 2014)** Capstone Collegiate Communities Development was proposing the development of a new Downtown student housing complex with a 1,200-student capacity. Community members were understandably concerned about increased car traffic, parking, and the lack of robust pedestrian and cycling infrastructure between Downtown and the University of Oregon – two places with an already sizeable population of commuters between them.

In 2013 LiveMove produced a report laying out the specifics of what a bikeway project on 13<sup>th</sup> Avenue would entail. **(LiveMove, 2013)** The concept was very similar to what became the final product; a two-way protected bikeway from Olive Street (the actual build would begin two blocks west at Lincoln Street) to Alder Street (where it intersects with the first two-way bikeway in Eugene, also inspired by a previous student project).



*Figure 1: A segment of LiveMove's original 13th Avenue redesign proposal showing 13<sup>th</sup> Avenue and Pearl Street. (LiveMove, 2013)*

The LiveMove plan spurred more interest in the bikeway project from the community and city officials. Beginning in 2014, the City of Eugene hired a private design consultant, Alta

## Separation Options




<p><b>PAINT AND POSTS</b> \$40,000-\$80,000/Mile</p>  <p><i>Buffer markings and flexible delineators create a separated space at a low cost.</i></p> <p><b>APPLICATION</b> Best for Interim Implementation of bikeways. The low cost design can be deployed rapidly, and can respond quickly to design changes. Works well as Phase 1 prior to permanent Installation.</p> <p><b>CONSIDERATIONS</b> Poor durability and compromised aesthetics make this design unsuitable for long-term Installation.</p>	<p><i>Recommended Option</i></p> <p><b>MEDIAN SEPARATION</b> \$250,000-\$600,000 / Mile</p>  <p><i>Concrete dividing medians offer strong, permanent separation.</i></p> <p><b>APPLICATION</b> Works well for long term permanent Installation. Well suited for wide bikeways where proper maintenance can be assured.</p> <p><b>CONSIDERATIONS</b> Median construction types vary by cost and aesthetics. All constructed medians provide a strong sense of security, and long-term durability. Use of bicycle friendly curb design consisting of a beveled or low curb to reduce opportunity to hit with pedals is important to minimize impacts to people biking.</p>	<p><b>RAISED AND SEPARATED</b> \$3,000,000-\$8,000,000 / Mile</p>  <p><b>APPLICATION</b> A reconstructed edge of the roadway can be raised close to sidewalk level, incorporated with planted or separated medians.</p> <p><b>CONSIDERATIONS</b> Requires significant roadway reconstruction, but allows for the highest quality materials and a higher quality experience in terms of maximizing operating space increased comfort and increased safety.</p>
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Figure 2: Alta Planning's Separation Options proposal drafted for the City of Eugene. (Alta Planning and Design)

Planning and Design, to study alternatives for a protected Downtown to Campus cycling connection. (City of Eugene Transportation Planning Department, 2020) This process identified 13<sup>th</sup> Avenue as the preferred alternative, as well as determined what buffer type would be used; concrete buffers were chosen over paint and bollards (cheaper) as well as a Dutch style curb-height raised bike path (more expensive). (Alta Planning and Design)

Construction began on the 13<sup>th</sup> Avenue Bikeway on April 13<sup>th</sup>, 2020, and an Opening Weekend Celebration was held on the week of October 23<sup>rd</sup>, 2020. **(City of Eugene Transportation Planning Department, 2020)** The final build spanned 0.85 miles through central Eugene and featured signalized, sensor-triggered intersections with a new bikes-only signal phase; this allowed bikes to traverse the intersection without conflicting traffic and turn in any direction. The timing of this new signal phase, however, would become a key concern for both users of the bikeway and of city officials.

## **Issues**

Once the bikeway opened, it became clear through observation that many cyclists were ignoring the new traffic signals and running red lights. The primary complaint from users of the bikeway was that it took too long for the signal to turn green for them; many riders complained that “the lights never turn green.”

City traffic engineers took this feedback and adjusted the signal phases along the bikeway in hopes of reducing the amount of time cyclists would spend at red lights. The effectiveness of this new signal timing and the overall usage patterns of the 13<sup>th</sup> Avenue corridor in light of these changes are the primary focus of this memo.

## **Research Questions**

### *Utilization*

Is the bikeway being utilized (how many trips are made on it)? How is it being utilized? What directions are people heading? What destinations are people traveling to? What patterns

can we identify in bikeway usage? What conclusions, if any, can we draw from those patterns about the functioning of the bikeway as a system?

### *Signal Functioning and Rider Behavior*

How is the signaling system functioning? Does the signaling system affect travel time? Does the signaling system provide adequate safety for riders, and is it efficient in moving traffic?

What proportion of riders are encountering red lights, and which if any specific intersections are the most red lights encountered at? How many riders are going running red lights? Do any particular intersections have a higher proportion of riders running red lights than others?



*Figure 3: The completed 13th Avenue Bikeway. (Nelson, 2020)*

# Part 2: Data Collection

## Intersection Observations and Corridor Travel Data

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Undergraduate students and student-workers at the University of Oregon conducted two separate data collection initiatives involving the 13<sup>th</sup> Avenue Bikeway: Intersection Observation Counts and Corridor Travel Trips.

### Intersection Observation Counts

Nine signalized intersections along the 13<sup>th</sup> Avenue corridor were observed for a total of 98 hours. Data gatherers tallied the total number of trips throughout each observation period, along with the direction each trip was headed from and the direction they navigated through the intersection.

The proportion of trips that flowed with the light, stopped at the light, and ran a red light were also recorded for all trips arriving from the West/East.

### Corridor Travel Data

Data gatherers made cycling trips themselves across the entire signalized portion of the Bikeway (Charnelton Street to Alder Street). Each red light encountered was recorded along with the corresponding intersection, as well as the direction of travel and total trip time.

# Part 3: Analysis

## Utilization & Travel Patterns

### Utilization

#### Data Summary –

Over the course of 98 total hours observed, 9441 bicycle trips were recorded along the corridor. This included 289 Northbound trips, 621 Southbound trips, 4984 Eastbound trips, and 1069 Westbound trips.

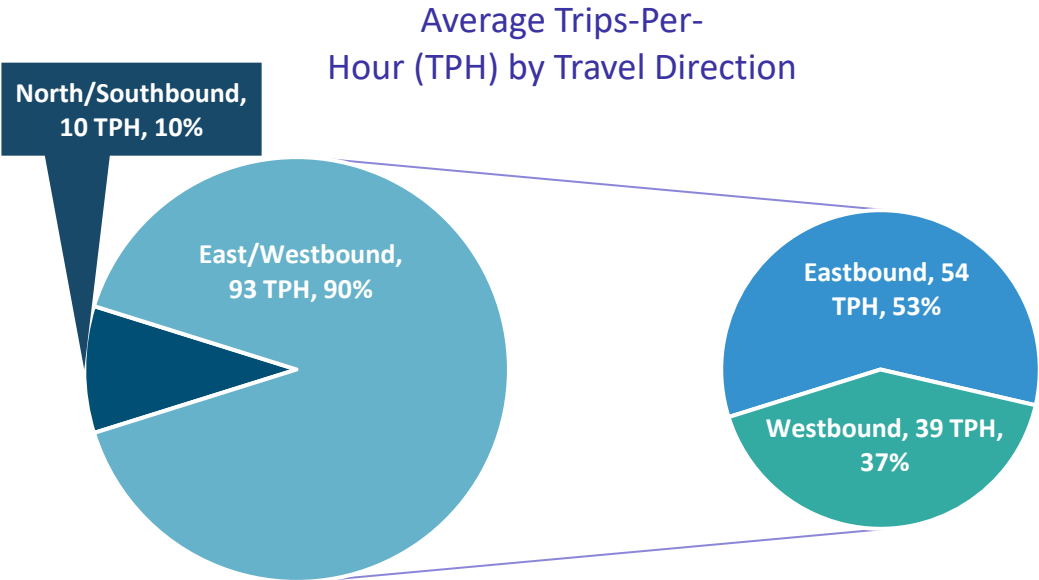


Figure 4

East/Westbound trips (those approaching the intersection from the 13<sup>th</sup> Avenue Bikeway) accounted for 90% of total trips and 93 trips-per-hour (TPH), compared to North/Southbound trips at 10% of total trips and 10 TPH. Eastbound trips were somewhat more

common than Westbound trips; Eastbound trips accounted for 53% of total trips and 32 TPH, while Westbound trips were calculated at 37% of total trips and 22 TPH (~35% fewer TPH than Eastbound).

*Data Analysis –*

North/Southbound trips (10%) are dwarfed by East/Westbound trips (90%). This may be due to a few factors. Firstly, there are no trip destinations to the North and South of 13<sup>th</sup> Avenue that are comparable to the University of Oregon and Downtown Eugene in the East and West (respectively). These two places act synergistically to create a corridor of student commuters, 69% of whom said they walk or bike to class in 2019. **(Association for the Advancement of Sustainability in Higher Education, 2020)**

The second possible reason for this discrepancy could be that the increased safety and comfort of the two-way cycle track has attracted more riders who would have otherwise used 14<sup>th</sup>, 12<sup>th</sup>, or other Streets to traverse East/West through Downtown. Upgrading cycling infrastructure has been shown to significantly draw traffic from adjacent corridors. **(Skov-Petersen, Jacobsen, Vedel, Thomas Alexander, & Rask, 2017)**

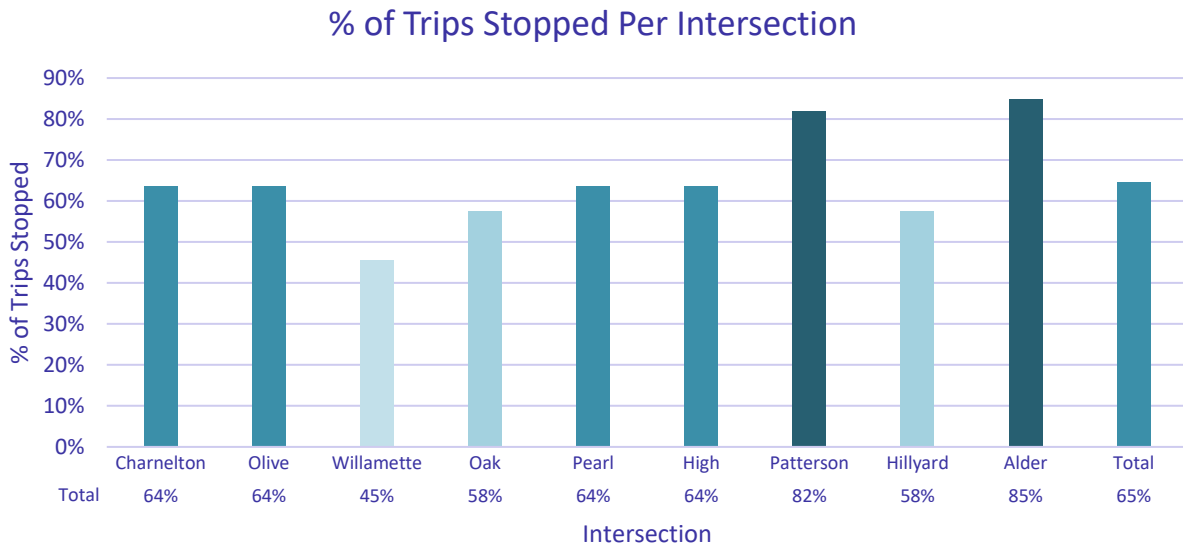
There may also be entirely new riders who only now feel confident enough to ride their bike through the corridor. This phenomenon is known as induced demand – new trips or trips that would not have otherwise been made by bicycle when infrastructure is created to support it. Induced demand has typically been applied to infrastructure improvements for auto traffic, but studies have shown that the concept appears to apply to cycling infrastructure as well to some degree. **(Skov-Petersen, Jacobsen, Vedel, Thomas Alexander, & Rask, 2017)** None of the

streets that intersect with the Bikeway have buffered bike lanes (except for Alder) and some do not have bike lanes at all, possibly leading to a lack of ridership among unconfident cyclists in comparison to 13<sup>th</sup>.

### Signal Timing and Travel Time

#### Data Summary –

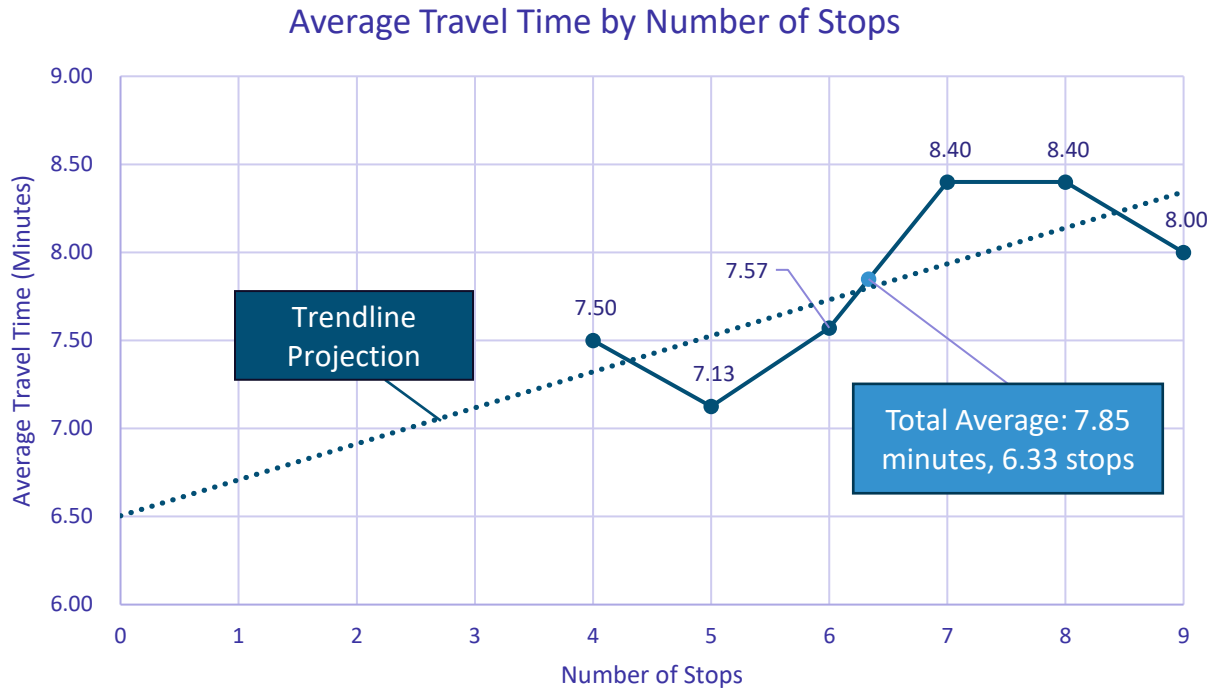
During the 33 trips taken across the entire Bikeway, nine signalized intersections were crossed 297 times in total. Red lights were encountered an average of 65% of the time; the highest frequency of stops was Alder Street (85% red), and the lowest was Willamette Street (45%).



The average travel time for all trips across the entire corridor was 7.85 minutes, and the average number of stops was 6.33. The relationship between number of stops and length of trip was ~0.25 minutes per stop. No trips with fewer than four stops were recorded during data gathering.

*Data Analysis –*

While there was a direct relationship between the number of stops and the length of trip, the observed amount was relatively small – about one minute was saved between four and



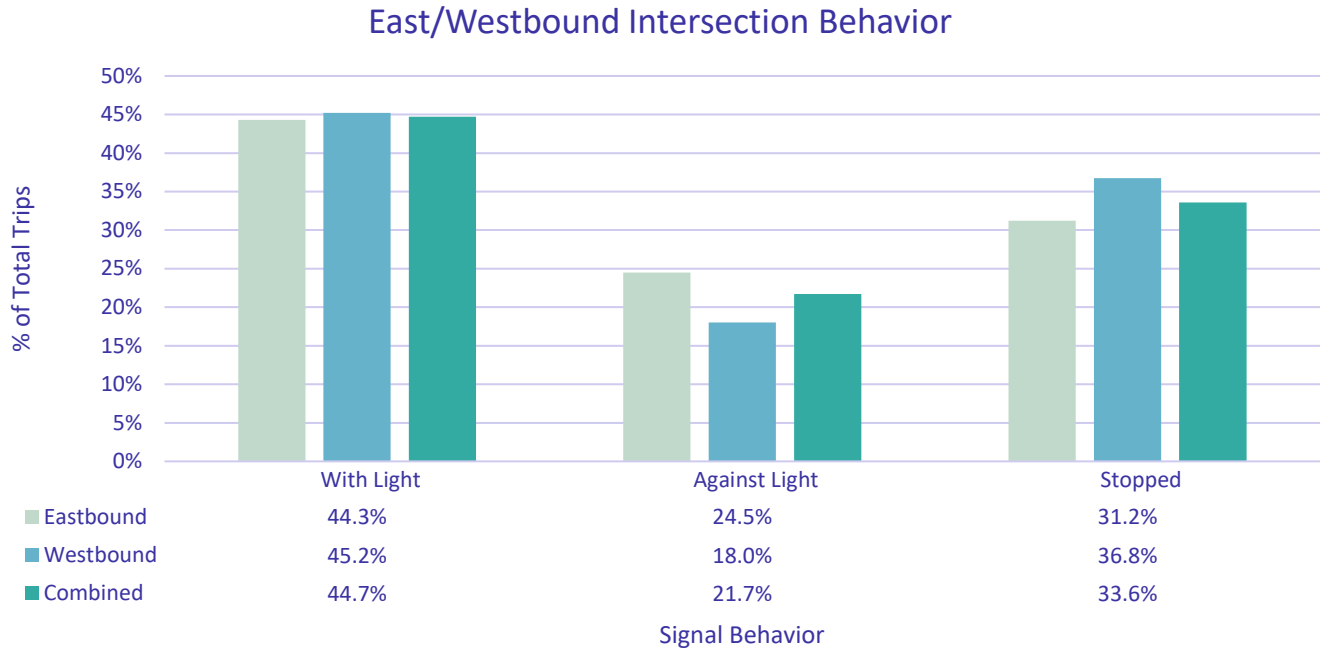
nine stops. The strength of the dataset is not particularly strong either; there are no recorded trips with fewer than four stops. Despite the negligible time difference, rider psychology may overvalue the benefit of running the light (especially as vehicular traffic flows without them) leading to increased instances of red light running.

**Rider Behavior at Signals**

*Data Summary –*

On East/Westbound trips, riders encountered a green light an average of 44.7% of the time. The difference between West/Eastbound green lights was statistically insignificant (<1%). Out of the remaining 55.3% of trips where red lights were encountered, 33.6% of riders

stopped at the light while 21.7% ran the red. More riders ran a red light going Eastbound (24.5%) than Westbound (18%).



*Data Analysis –*

Riders ran red lights in nearly 40% of instances they encountered them. As previously mentioned, this could be due to the psychological overvaluing of the time savings of running the light.

There were 6.5% more instances of running red lights on Eastbound trips than there were on Westbound trips. One hypothesis for this is that students are more likely to run a red light on their way to class (a time-sensitive destination) than when they are going home from school to Downtown.

# Part 4: Conclusion

## Summary & Alternatives

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### Key Takeaways

- Bikeway traffic on 13<sup>th</sup> Avenue is much larger than North/South traffic along the corridor.
- Red lights are frequently encountered by cyclists. While travel time is only increased by a small amount per light, rider behavior and psychology are obviously involved in overvaluing the benefits of running the red. Plus, small increments of time add up over weeks and months of commuting.
- Almost half of riders run red lights when they encounter them.
- All-in-all, traffic along the bikeway is generally at healthy levels (~1 trip per minute)

### Alternatives

- Adjust signal priority to have bikes flow with vehicle and pedestrian traffic.
  - o Downside – Safety. Bikes currently have their own exclusive signal phase, so mixing bikes with other traffic would increase conflicts at the intersection.
- Increase enforcement of bikeway signal violations
  - o Downside – Safety and Equity. (Traffic stops are disproportionately targeted at marginalized communities and people of color and are more likely to end with the officer turning violent towards them. Cyclists are on average less wealthy and from more diverse backgrounds than drivers and therefore would be

affected disproportionately by fines or punishments). **(Kimley-Horn Planning and Design Consultants, 2020)**

- Does not address the root of the problem – the traffic signal phase design.
- Create a more robust sensor system that gives riders a “green wave” across the corridor.
  - Downside – Implementation time, cost, and technical complexity. Research is in the early phases of identifying whether smartphone data could be used to create new signal timings along bikeways. Would require investment in unproven technology by the city. **(National Institute for Transportation and Communities, 2021)**

All-in-all, bikeway is very utilized (~1 bike per minute), and I would anticipate ridership growing as the bike network increases and more people switch modes to take advantage of it. As ridership hopefully increases, we will see if there is increased pressure from to adjust the signal phases and timing.

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