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Take The High (Volume) Road: Analyzing The Safety and Speed Effects of High Traffic Volume Road Diets



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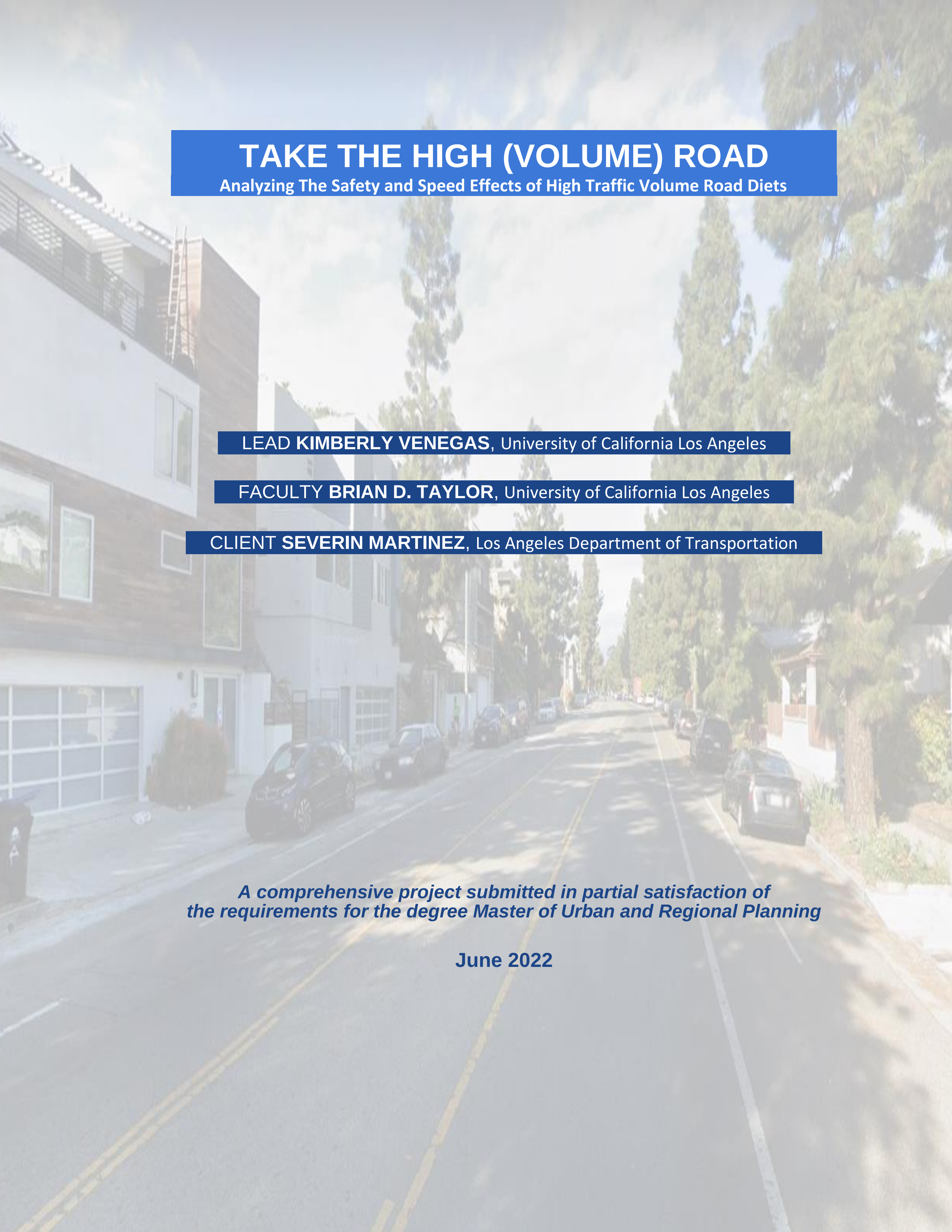

# TAKE THE HIGH (VOLUME) ROAD

## Analyzing The Safety and Speed Effects of High Traffic Volume Road Diets

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***A comprehensive project submitted in partial satisfaction of the requirements for the degree Master of Urban and Regional Planning***

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**16. Abstract**

Los Angeles has adopted a "Vision Zero" policy to eliminate, or at the very least meaningfully reduce, fatal and severe traffic collisions. A road diet, also known as a "lane reconfiguration", consists of converting vehicle travel lanes to other uses in order to serve safety or transportation-related goals. It is a tool that can help achieve the Vision Zero policy goal by discouraging speeding and reducing risky lane changes to improve road safety. This report studies the safety impacts of high ADT road diets to determine whether the existing 20,000 ADT threshold should be revisited. I compared collisions and speeds on five high ADT road diet corridors to 16 similar multi-lane, untreated streets segments in Los Angeles. Collision rates in the high ADT road diet corridors were 44% lower than in the comparison corridors. Fatal injuries were 200% lower and severe injuries were 37% lower. The average vehicle travel time for the comparison corridors was only about 11 seconds faster than in the road diet corridors. Thus, I recommend for the city to consider revisiting the ADT threshold guidelines for road diets in order to implement more high ADT road diets though city initiatives to improve road safety.

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# DISCLAIMER

This report was prepared in partial fulfillment of the requirements for the Master in Urban and Regional Planning degree in the Department of Urban Planning at the University of California, Los Angeles. It was prepared at the direction of the Department and of Los Angeles Department of Transportation, represented by Severin Martinez, as a planning client. The views expressed herein are those of the authors and not necessarily those of the Department, the UCLA Luskin School of Public Affairs, UCLA as a whole, or the client.

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# AWARDS

This capstone was awarded the ITS Capstone Grand Prize, given in recognition of exceptional work on transportation-themed capstones that are relevant to California and federal transportation policy and planning by UCLA ITS.

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# EXECUTIVE SUMMARY

Cities nationwide have adopted "Vision Zero" policies to address growing traffic safety concerns. The common goal of these policies is to eliminate, or at the very least meaningfully reduce, fatal and severe traffic collisions. Los Angeles' Vision Zero policy, adopted in 2015, calls for the elimination of all traffic deaths by 2025. Since then, LADOT has identified 72 Vision Zero Priority Corridors, which are 132 roadway miles long in total, that have received improvements or will be in the future (LADOT Livable Streets n.d.). The projects include a wide range of measures, from real-time speed feedback signs telling drivers how fast they are going, to redesigning intersections, pedestrian crossing islands, and pedestrian–activated yellow flashing beacons, to name a few.

While it is difficult to find anyone opposed to improving safety, one Vision Zero tool stands out because it can be quite polarizing, the so-called "road diet." A road diet, also known as a "lane reconfiguration", consists of converting vehicle travel lanes to other uses in order to serve safety or transportation-related goals, such as slowing driver speeds, reducing collision frequency and severity, and supporting sustainable modes of transportation such as walking and biking. It is a tool that can be used to discourage speeding and reduce risky lane changes to improve road safety and help achieve the Vision Zero policy goal. Road diets are polarizing despite, or perhaps because of, their effectiveness.

The classic road diet converts a four-lane undivided road with average daily traffic (ADT) levels below 20,000 to a three-lane road with one travel lane in each direction and one center two-way left turn lane. According to the Federal Highway Administration (FHWA), this change is a proven safety countermeasure estimated to reduce crashes by about 29 percent on average (Knapp et al. 2014).

Road diets that diverge from this classic road diet design are referred to as unconventional road diets. There is a type of unconventional road diet that follows the same lane conversion as a classic road diet but differs because it is implemented on a road that has an average daily traffic volume that is higher than 20,000. The 20,000 ADT threshold comes from conventional wisdom that implementing road diets on streets with a higher ADT than 20,000 could negatively affect the flow of traffic and possibly create more collisions. However, there has been minimal research on the safety impacts of this type of unconventional road diet, in part because the 20,000 ADT threshold has dissuaded local jurisdictions from implementing road diets on higher volume corridors. This conundrum has yielded two outcomes: fewer road diets are implemented on dangerous streets despite their track record as a proven safety countermeasure, and where they have been implemented on streets with ADT greater than 20,000 their effectiveness is called into question because they exceed the conventional rule of thumb.

This report studies the safety impacts of high ADT road diets to determine whether the 20,000 ADT threshold should be revisited. I compared collisions on five high ADT road diet corridors to 16 similar multi-lane, untreated streets segments in Los Angeles.

The measured safety benefits of the high ADT road diets over the comparison corridors are nothing short of dramatic. The overall collision rates in the high ADT road diet corridors were 44 percent lower than in the otherwise similar comparison corridors. Importantly, fatal injuries were 200 percent lower while severe injuries were 37 percent lower. In addition, there were 40 percent fewer collisions with other vehicles, 200 percent fewer collisions with fixed objects and 64 percent fewer sideswipe collisions. There were also 37 percent fewer pedestrian collisions and 41 percent fewer bicycle collisions. However, since the data was normalized based on vehicle miles and not pedestrian and bicyclists counts, it is possible that the actual percentage differences between the high ADT road diet and comparison corridors vary from these measured differences when accounting for changes in bicycle and pedestrian activity. The findings from this high ADT road diet analysis in Los Angeles echo other studies finding that road diets have a range of effectiveness but can typically reduce crashes between 20 and 30 percent.

While focused on collisions, this report also analyzed the effects of high ADT road diets on vehicle speeds. The comparative analysis did reveal that high ADT road diets did have slightly slower vehicle travels speeds across every metric studied. The average vehicle travel time for the comparison corridors was about 11 seconds faster than in the road diet corridors. This translates to about 7 percent slower speeds during peak hours and 9 percent slower speeds during non-peak hours compared to the comparison corridors, so a vehicle traveling an average of 25 MPH in a road diet corridor would travel, on average, about 26.75 MPH in a similar non-road-diet corridor. The analysis also showed that the comparison corridors had a 6 percent higher MPH average "85th percentile" speed, which is the baseline that has historically informed the setting of speed limits.

On net, these analyses show that there is a much greater percentage reduction in collisions, injuries, and deaths between the high ADT road diet and comparison corridors, than the comparatively modest percentage reduction in vehicle speeds in high ADT road diet corridors. Road diets, even in comparatively high traffic volume corridors, appear to be an effective means of improving street safety in Los Angeles.

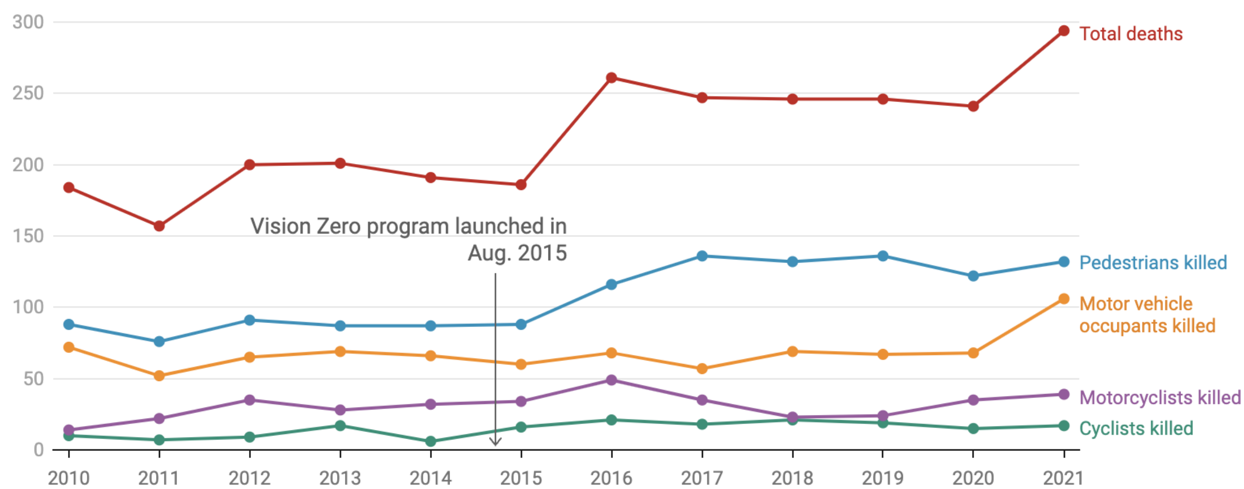
Given these findings I offer two recommendations for the city. The first is to consider revisiting the ADT threshold guidelines for road diets in order to implement more high ADT road diets though city initiatives to improve road safety. The second recommendation is to collect additional data to perform more in-depth analyses of road safety conditions following a high ADT road diet implementation in order to better understand the tradeoffs between safety and vehicular throughput across a range of possible street geometry and traffic conditions.

# CHAPTER 1: INTRODUCTION

## NEED FOR RESEARCH

The City of Los Angeles has one of the highest traffic-related fatality rates in the entire country (Vision Zero 2018). For this reason, in 2015 Los Angeles Mayor Eric Garcetti and the Los Angeles Department of Transportation adopted Vision Zero, an internationally known policy which calls for eliminating all traffic fatalities and severe injuries. The City set a goal to achieve a 20 percent reduction in traffic fatalities in the City by the year 2017, and to fully eliminate traffic fatalities by 2025 (Executive Directive, No. 10, 2015). Despite this goal, the year 2021 marked the highest death toll in Los Angeles in nearly two decades (Fonseca 2022). The continual increase in fatalities is attributed to, according to officials, an increase in speeding and reckless driving, which is likely related at least in part to the Covid-19 pandemic (Fonseca 2022).

**Figure 1.** Fatal Collisions in the City of Los Angeles Between 2010-2021. *Chart source: Ryan Fonseca / LAist. Data source: LAPD and LADOT*




A 2017 Los Angeles Vision Zero Safety Study found that driving speed is a top contributor to collision fatalities. An increase in driving speed from 20 MPH to 40 MPH decreases a person's chance of surviving a crash from 80 percent to 10 percent (Samaro 2018). The study also found that pedestrians are the most vulnerable road users and account for 44 percent of all collision fatalities despite being involved in only 8 percent of collisions (Vision Zero 2018).

While driver behavior certainly accounts for some of the unfortunate trends in crashes, road design can also affect the number of collisions. A nationwide study identified 60 unique hotspot corridors that had the highest rates of crashes involving pedestrians over an eight-year period. The study found that the hotspot corridors all shared common characteristics such as being multi-lane roadways, having a speed limit of 30 mph or higher, and having traffic volumes exceeding 25,000 vehicles per day (Schneider et al. 2021).

By reducing the number of travel lanes, road diets typically reduce unsafe lane changes, separate vehicle turning movements from through travel, and discourage speeding (Tan 2011). Pedestrians and bicyclists benefit from the reprioritization of the road to better allow for multimodal transportation since road diets often provide opportunities for wider sidewalks, more prominent crosswalk amenities such as crossing islands, or dedicated bicycle lanes.

Despite their benefits, many cities are hesitant to implement road diets, particularly on higher volume streets. Road diet guidelines promoted by the Federal Highway Administration (FHWA) advise "roadways with ADT of 20,000 [vehicles per day] or less may be good candidates" for the classic road diet, but that implementing such a road diet on streets with an ADT higher than 20,000 could have negative effects on traffic such as creating congestion and diverting traffic to other streets (Knapp et al. 2014). However, such framing centers potential inconveniences to driving and neglects the underlying motivation for road diets—improving safety. The caution attached to exceeding the 20,000 ADT threshold for road diets predates contemporary Vision Zero policies and has limited the appetite for local agencies to implement them. Accordingly, this report studies the safety impacts of road diets on roads with high ADT to determine whether the ADT threshold should be revisited in the interest of advancing Vision Zero goals.

## PROJECT OUTLINE

This report begins with a review of the literature on road diets including the benefits of road diets, road diet guidelines, and existing research on high ADT road diets. Road diets have been documented as early as the 1970's (Lagerwey and Burden 1999; Knapp et. al 2014) and have been shown to decrease collisions (Harkey et. al 2008). Public agencies and researchers have developed guidelines under which road diets are best suited based on case studies throughout the country (Knapp et. al 2014), and oftentimes those guidelines suggest implementing road diets only on roads with an ADT lower than 20,000. However, there are few studies that examine the effects of road diets on collisions on corridors with an ADT higher than the 20,000 threshold. This may in part be because this threshold has discouraged local jurisdictions from implementing road diets on higher volume corridors, leaving few to analyze.

After reviewing previous studies of road diets, I describe my methodology for selecting my study corridors, collecting data, and evaluating the chosen road diet projects. I identified a set of classic road diets that exceed 23,000 ADT and similar but untreated comparison corridors. There were few road diets that exceeded 23,000 ADT and so I simply selected corridors that met my baseline criteria. For the comparison corridors, I selected streets based on ADT volumes similar to the road diets' and with similar character to the extent possible.

Based on the data available at the time of this study, I conducted a cross-sectional analysis of the five high ADT road diets and a comparison group of otherwise similar street corridors. The comparison group is used to control for general travel and traffic trends along similar streets that did not receive a road diet treatment. I normalized the collision rates per million vehicle miles traveled to control for differences in traffic volumes across my treatment and control corridors. Using this methodology, I display changes in collision rates to see if there are any differences between the road diet corridors and the similar but untreated corridors. I also compare the speeds of the road diets and comparison groups.

The results of the analyses reveal substantially fewer collisions, injuries, and deaths among the road diet projects compared to the comparison corridors. The reduction in overall crashes closely mirrors the results from studies cited by the FHWA. The speeds of the road diets were slightly slower than the comparison groups. However, the magnitude of the differences in speed is much smaller than observed differences in safety. Based on both the literature review and the results from my analysis, I recommend the city to revisit the ADT threshold governing the implementation of road diets in order to implement more road diets to increase road safety. I further recommend additional study of the safety effects of road diets in Los Angeles across a variety of road geometries and traffic levels to better inform road diet implementation.

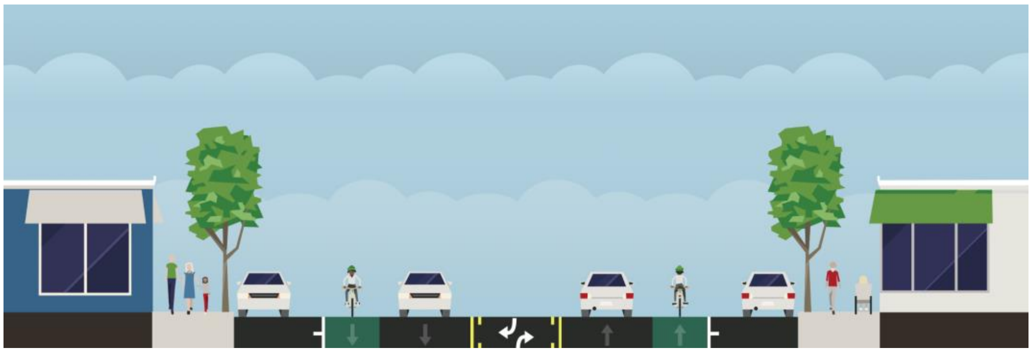
# CHAPTER 2: BACKGROUND

## DEFINING A ROAD DIET

A road diet is a through-traffic lane reduction that is used to improve safety, mobility, and access for all roadway users at a low cost by replacing some through-traffic lanes with space for parking, bike lanes, pedestrian infrastructure, and roadway medians or center turn lanes (Martinez 2016). Road diets have a record of making roads safer for pedestrians and bicyclists, calming traffic, and reducing the overall number of collisions (Logg 2019). The most common, or "classic," road diet converts a four-lane, undivided roadway with two travel lanes on each side to a three-lane roadway consisting of two travel lanes (one running in each direction) and a center, two-way left-turn lane (Russell and Mandavilli 2003). Sometimes this type of conversion provides additional space like bike lanes (Jouliot 2018). While a road diet can technically refer to any situation where a street reduces the number of lanes for cars, in this report I focus on the classic road diet.

**Figure 2.** Typical Configuration Before A Classic Road Diet is Implemented. *Source: Streetmix*

**Figure 3.** Typical Configuration After a Classic Road Diet is Implemented. *Source: Streetmix*



# CHAPTER 3: LITERATURE REVIEW

In this section, I detail the history, benefits, guidelines, and existing research of road diets.

## ORIGIN OF ROAD DIETS IN THE U.S.

The classic road diet was developed as a method to address the safety issues that arose from a practice from the 1950s and 1960s of adding travel lanes to streets in order to increase their traffic capacity. The term “road diet” was first used by Dan Burden and Peter Lagerway in 1996 to describe converting wider, dangerous roads to smaller, safer roads by removing a traffic lane (Burden and Lagerway 1999).

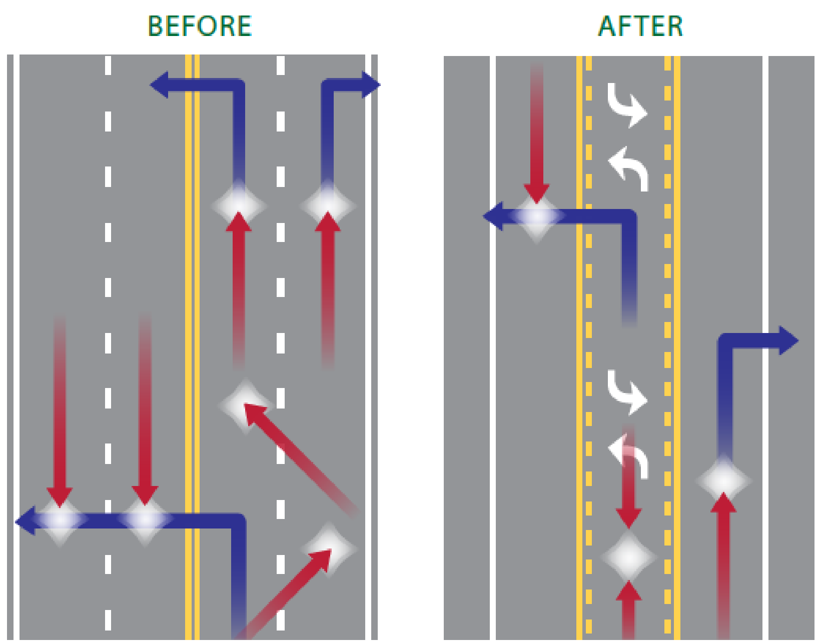
The City of Seattle is often credited with implementing the first U.S. road diet in 1972 (Burden and Lagerway 1999). Although the ADT of the road increased from 19,400 to 20,274 after the road diet, the collisions on the road decreased by 48.9 percent. Los Angeles implemented its first known road diet in 1979 on 98th street. The project converted general travel lanes to bike lanes on a 0.35 mile stretch of 98th street between Western Avenue and Halldale Avenue.

Surprisingly, it took until 1999 for the first comprehensive road diet safety and traffic analysis to be conducted (Burden et al. 1999; Welch 1999). Burden and Lagerway studied 17 road diet projects from six U.S. cities and in Toronto, Canada that followed the 4-to-3-lane formula and found that they improved both mobility and safety. In 1999, traffic engineer Thomas Welch conducted a before-and-after study of one Minnesota road diet and nine Seattle road diet corridors. He found that the Minnesota road diet reduced collisions by 28 percent, and the Seattle road diets reduced collisions by 34 percent. Although he found that some road diets increased traffic delays, he concluded that road diets were beneficial overall (Welch 1999). Since the first characterization and studies of road diets in the 1990s, their implementation and prevalence has expanded in the decades following.

## BENEFITS OF ROAD DIETS

The United States Department of Transportation’s (USDOT’s) Federal Highway Administration recognizes road diets as a proven safety countermeasure. According to the FHWA’s Proven Safety Countermeasure webpage, classic road diets reduce collisions by 19 to 47 percent, slow vehicle speeds, improve mobility and access by all road users, and increase in quality of life through the better integration of roadways into surrounding uses. The wide range in the percentage reduction in collisions cited by the FHWA comes from a 2008 synthesis report by Harkey, et al. That 2008 report says that collisions are reduced in road diet corridors by replacing a travel lane with a center turn lane that reduces the conflict created by cars changing lanes or waiting to turn from a travel lane and blocking the traffic behind them. Welch echoes the Harkey, et al. findings and says that replacing travel lanes with a center turn lane simplifies driving by reducing the number of decisions people have to make (Welch 1999). The simplified street layout is also viewed as friendlier for elderly drivers (Welch 1999).

**Figure 4.** Comparison of Possible Collisions Between a Four–Lane Undivided Facility and a Road Diet. *Source: Federal Highway Administration*




There is little research on how much classic road diets improve safety for cyclists and pedestrians because there is not much data available for bicycle and pedestrian involved collisions, as noted by Gudz et al (Gudz et al. 2017). However, a study based on data from Davis, California showed that a road diet conversion that added five- to seven-foot bike lanes in each direction increased the number cyclists present on the road by 243 percent (Gudz et al. 2017). This study suggests that people feel safer riding a bicycle on streets where road diets give them access to bicycle-only infrastructure. Additionally, a 2016 UCLA Urban Planning research project by then-student Ryan Taylor-Gratzer called “To Live and Ride in LA,” analyzed the safety of bike lanes created through road diets by looking at the changes in crashes after accounting for increased bike volumes. When he controlled for changes in bicycle ridership, he found that the rate of cycling collisions fell by 44 percent. While not exhaustive, the limited research available suggests that the classic road diet may, in addition to reducing vehicle collisions, improve safety for people walking and bicycling as well.

## ROAD DIET GUIDELINES

The ADT of a road is the average number of vehicles that travel on a given road segment per day, or Average Daily Traffic (ADT). According to the FHWA, a three-lane roadway can carry as much traffic as a four-lane roadway without increasing travel times or diverting traffic to other streets if the average daily traffic counts do not exceed 20,000 (FHWA n.d.). Several studies of classic road diets with average daily traffic counts that do not exceed 20,000 have supported that the level of service remains the same.

Welch found that four lane roads without a designated turn lane have the most peak traffic on the outer travel lanes because drivers go there to avoid getting stuck behind other people waiting to turn left in the inner travel lanes. When classic road diets remove a travel lane, and replace it with a center turn lane, they manage to reduce such conflicts and balance out any throughput capacity lost from removing the lane (Welch 1999).

A 2003 study by Russell and Mandavilli examined an intersection of a classic road diet that converted a four-lane, undivided roadway to a three-lane roadway with a two-way center turn lane and bike lanes on both sides of the roadway. The study found no significant increase in traffic or the change in average intersection delay for the three-lane versus the four-lane configuration. The study did find a significant decrease in the proportion of vehicles stopped and the average line of cars on the roadway. Thus, the study concluded that the classic road diet maintained a nearly equal operational performance as the previous four-lane, undivided roadway configuration.

Another study by Gudz et al. found that the travel times on the classic road diet they examined did not increase and perhaps even decreased. However, the study results were ultimately inconclusive because they did not control for the possibility of automobile traffic diverting from the road diet corridor to other nearby parallel roads (Gudz et al. 2017).

## EXISTING RESEARCH ON ROAD DIET THRESHOLD

In their article, Burden and Lagerwey stated that after looking at over 20 four-to-three lane road diet conversions they found that, "the upper comfort range for arterial conversions appears to be between 20-25,000 ADT. Higher numbers have been achieved. Santa Monica officials feel most comfortable capping at 20,000, although they have hit 25,000" (Burden et. al., 1999, p.4). They also said that "Researchers do not have enough knowledge to say where and how peaks are reached, but many feel comfortable with 20-23,000 ADT's. Each community must set its own upper limits" (Burden et al. 1999, p.6). Welch's 1999 article references a study published in 1998 by Preston, an engineer from the Minnesota Department of Transportation. The study found some three-lane roadways with ADT's "as high as 20,000 VPD [vehicles per day]" that still functioned (Welch 1999, p.4). Welch includes a quotation from Preston saying that he would convert most four-lane, undivided urban roadways with ADT's less than 20,000 to three-lane roadways "in a heartbeat" (Welch 1999, p.4).

A 2006 study concludes that road diets with four-to-three lane conversions are most effective when ADT does not exceed 17,500 (Gates et al. 2007). There have been several four-to-three lane road diets implemented on roads with ADT's higher than 20,000, including in Los Angeles, and on at least two roads with an ADT over 30,000 either before or after implementation (Rosales 2007). A study from 2011 says the ADT can be as high as 23,000 for those types of conversions (Stamatiadis et al. 2011). There was another study published in 2013 by Thomas that confirmed the success of road diets with an ADT of up to 23,000 in reducing collisions. Thomas said there should be case-by-case evaluations of potential road diet projects based on crash patterns and operations to confirm that it is the appropriate approach for the scenario (Thomas 2013).

In 2014, the FHWA published the Road Diet Informational Guide that compiled guidelines from local agencies that provided information on specific ADT thresholds they used to determine the suitability of roadways for four-to-three lane road diet conversions. The study looked at road diets in Genesee County, Michigan and the cities of Chicago and Seattle, and found that the upper ADT limit ranged from 18,000 to 25,000. High Street in Oakland, California had an ADT ranging from 22,000 to 24,000 and experienced a 17 percent reduction in collisions after a conventional 4-to-3 road diet (Knapp et al. 2014). The road diet was done to slow traffic to improve safety for pedestrians and bicyclists (e.g. City of Portland Traffic Department 2014).

Foster Road in Portland, Oregon carries about 30,000 vehicles a day and yet it received a four-to-three lane road diet conversion (Law 2016). Williams studied a road diet on La Jolla Boulevard in San Diego, California, which had a 25,000 ADT before the road diet, that converted a four-lane road to a two-lane road and included roundabouts. The road diet was shown to reduce speeding and maintained a similar road capacity to the original street design (Williams 2017).

## TAKEAWAYS FROM LITERATURE

These case studies show that there is a substantial body of research demonstrating the safety benefits of road diets on roads below 20,000 ADT. However, there are only a few studies that examine the effects of road diets on collisions and speeds on corridors with an ADT higher than the 20,000 threshold. This may in part be because this threshold has discouraged local jurisdictions from implementing road diets on higher volume corridors. Accordingly, this report attempts to fill this gap by focusing on existing high ADT road diets in Los Angeles.

# CHAPTER 4: Methodology

My research analyzes the safety impacts of road diets on streets and roads with high traffic volumes to determine whether the 20,000 ADT threshold should be adjusted upward.

For road diet evaluations at a local level, the FHWA recommends pursuing a before-and-after analysis of changes in collision rates of road diet corridors and untreated comparison corridors to account for changes in collision rates in the nearby road network that may have occurred for reasons unrelated to a road diet. However, the Statewide Integrated Traffic Records System, or SWITRS, only has collision data available between 2009 to 2020 and several of the road diets I want to study are older than that. Thus, rather than conduct a before-and-after analysis, I conducted a cross-sectional analysis of treatment corridors and control groups. Specifically, I selected five high ADT road diet treatments and a group of nearby non-road-diet sites that are otherwise similar in many ways. To do this, I looked at collision data between 2017 to 2019 for all of the corridors.

As a first step, I identified a minimum threshold for my definition of a high volume road diet. I chose 23,000 ADT so that the corridors I analyzed had a substantially and consistently higher ADT than the 20,000 ADT recommended threshold recommended by the FHWA. This also ensured my minimum was greater than the maximum threshold identified in my literature review. I derived ADT estimates using StreetLight Data, a web platform that provides travel pattern data using Bluetooth signals from devices.

With this criteria in mind, I proceeded with the following steps to determine what corridors to study:

1. Review full list of known road diets implemented since 1979
2. Filter list to limit it to streets that operated with a single lane of travel post-road diet implementation
3. Assess ADT data to determine which corridors qualify as "high volume" based on my working definition
4. Eliminate corridors that were too new or too short to have any meaningful data
5. Remaining list of corridors were included in study

Through this process, there were only eight road diets total that exceeded 23,000 ADT. However, when accounting for corridors suitable for study based on data availability, three corridors were eliminated from consideration—two were implemented after 2020 and one corridor was only two blocks long. For the remaining five high ADT corridors there were no barriers to including them in my analysis. With the five corridors in hand, I chose a group of nearby comparison corridors based on their similarity in road configuration and ADT count to the road diets' original configuration prior to any changes taking place.

Next, I defined metrics to assess traffic safety. I wanted to use categories of collisions that speak to general areas of interest but also speak to the goals of Vision Zero and/or the potential effects of a road diet. The collision data I analyzed were:

- Overall crashes
- Fatal and severe injuries
- Collisions with other vehicles
- Collisions with fixed objects (such as parked cars, buildings, or streetlights)
- Collisions with pedestrians
- Collisions with bicyclists
- Sideswipe collisions (collision type generally associated multi-vehicle lane conditions)

I obtained the collision data for the most recent pre-pandemic year, 2019, using the Transportation Injury Mapping System (TIMS) created by the Safe Transportation Research and Education Center (SAFETREC) at UC Berkeley. Since the corridors were all different lengths, I normalized the collisions to be collisions per million vehicle miles of travel. The pedestrian and bicycle collisions are not optimally normalized because they were normalized by vehicle miles. Ideally, the pedestrian and bicycle data would be normalized by pedestrian and bicycle counts, but such data was not available. Once I normalized the incident rates, I found the percent difference between, for example, the road diet collisions and the corridor collisions.

I obtained the speed data from StreetLight for the date range between January 1st, 2019 to December 31, 2019 for all the days of the week, all day. I studied:

- Travel Times: The time it takes to travel corridor from end to end
- 85th Percentile: A baseline that has historically informed how speed limits are set in California
- Average Speed: Overall average speed
- Peak Hour Average Speed: Average speed during traditionally busy times of day when there is more traffic
- Peak Hour Average speed: Average speeds during non-busy times when traffic delays are rarer

I calculated the travel time myself by converting the speed data into the number of seconds required to traverse a one mile segment of each corridor. The road diets from Table 1 are matched with at least four times their length in untreated corridors in the same general geographic region. The comparison corridors I selected for the road diets are found in Tables 2 through 6, and the location of both the high ADT road diets and the comparison corridors are displayed in Figure 5.

**Table 1:** Overview of Road Diets

| Road Diet Street | Design | Limit 1 | Limit 2 | Length (mi) | ADT Estimate | Year Implemented |
|---|---|---|---|---|---|---|
| Silver Lake Blvd 1 | 4 lanes to 2 with center turn lane | Reservoir St | Berkeley Ave | 0.3 | 28,215 | 1999 |
| Virgil Ave | 4 lanes to 2 with center turn lane | Santa Monica Blvd | Melrose Ave | 0.5 | 26,735 | 2014 |
| Silver Lake Blvd 2 | 4 lanes to 2 with no turn lane | Berkeley Ave | Van Pelt Pl | 0.4 | 26,562 | 1999 |
| York Blvd | 4 lanes to 2 with center turn lane | Eagle Rock Blvd | Ave 55 | 1.3 | 25,481 | 2006 |
| Rowena Ave | 4 lanes to 2 with center turn lane | Hyperion Ave | Glendale Blvd | 0.5 | 23,789 | 2013 |

**Table 2:** Silver Lake Blvd 1 Comparison Group

| Comparison Group | Limit 1 | Limit 2 | Length (mi) | ADT Estimate |
|---|---|---|---|---|
| Central Ave | 41st St | Slauson Ave | 1.4 | 30,664 |
| Glendale Blvd | Farwell Ave | Lakewood Ave | 0.2 | 28,993 |
| Coldwater Canyon Blvd 1 | Riverside Dr | Magnolia Blvd | 0.5 | 28,331 |
| Daly St | Main St | Pasadena Ave | 0.7 | 27,388 |
| Vermont Ave | Los Feliz Blvd | Prospect Ave | 0.6 | 26,836 |

**Table 3:** Virgil Ave Comparison Group

| Comparison Group | Limit 1 | Limit 2 | Length (mi) | ADT Estimate |
|---|---|---|---|---|
| Virgil Ave | 1st St | 6th St | 0.7 | 29,304 |
| Pico Blvd | Hoover St | Crenshaw Blvd | 2.4 | 28,448 |

**Table 4:** Silver Lake Blvd 2 Comparison Group

| Comparison Group | Limit 1 | Limit 2 | Length (mi) | ADT Estimate |
|---|---|---|---|---|
| Gage Ave | Western Ave | Figueroa St | 1.5 | 25,717 |
| Soto St | Wabash Ave | 7th St | 1.6 | 25,501 |

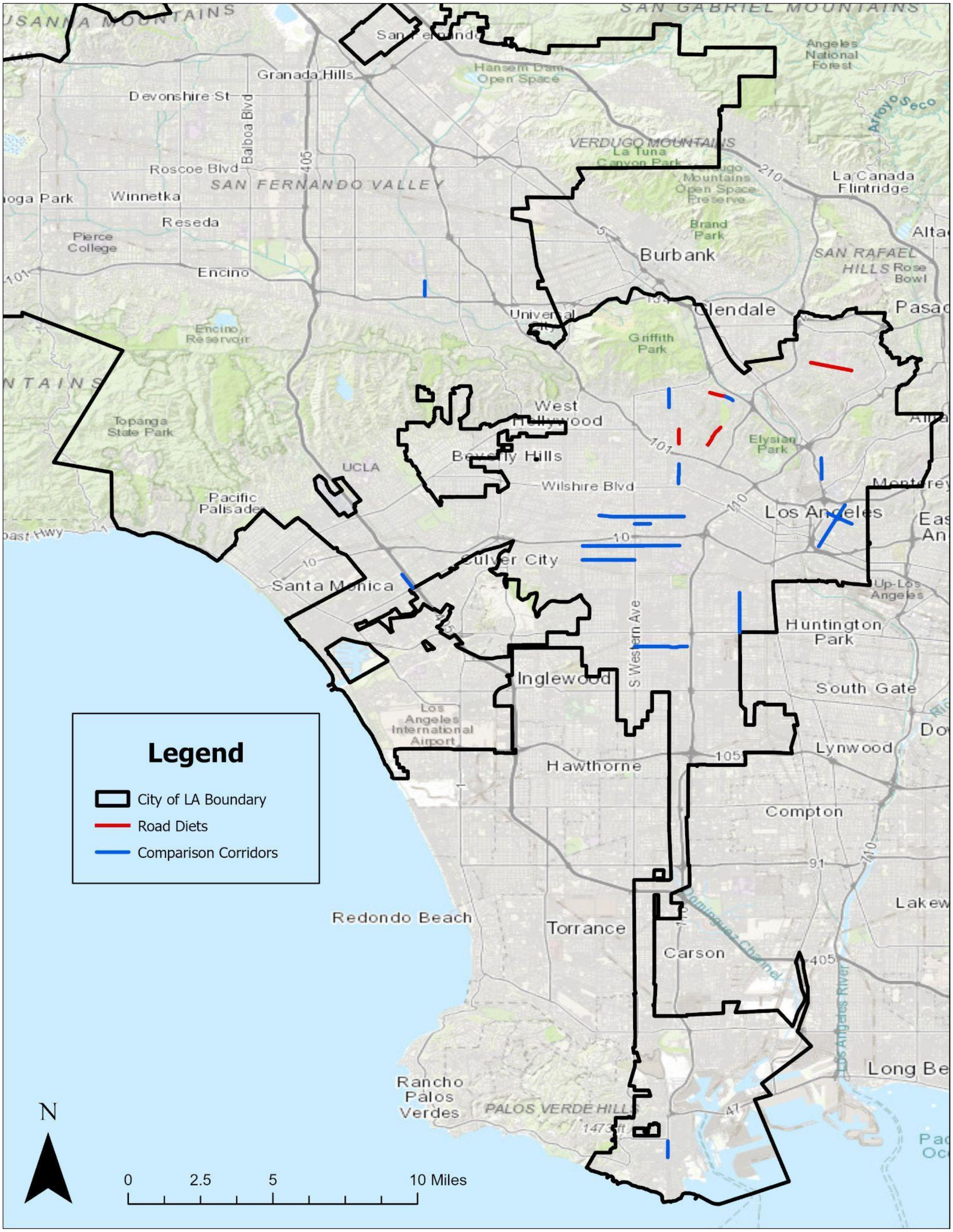
**Table 5:** York Blvd Comparison Group

| Comparison Group | Limit 1 | Limit 2 | Length (mi) | ADT Estimate |
|---|---|---|---|---|
| Gaffey St | 19th St | 10th St | 0.6 | 25,981 |
| Coldwater Canyon Blvd 2 | Vanowen Ave | Victory Blvd | 0.5 | 25,686 |
| Cesar Chavez Ave | Cummings St | Evergreen Ave | 0.8 | 25,477 |
| Venice Blvd | Western Ave | Normandie Ave | 0.5 | 24,617 |
| Adams Blvd | Crenshaw Blvd | Magnolia Ave | 2.8 | 23,244 |

**Table 6:** Rowena Ave Comparison Group

| Comparison Group | Limit 1 | Limit 2 | Length (mi) | ADT Estimate |
|---|---|---|---|---|
| Sawtelle Blvd | Palms Blvd | Venice Blvd | 0.6 | 23,841 |
| Jefferson Blvd | Western Ave | Crenshaw Blvd | 1.5 | 23,021 |

**Figure 5**: Map of The Road Diets and Comparison Corridors



# CHAPTER 5: FINDINGS

The analyses presented below measure the differences in collisions, injuries, fatalities, and speeds between the high ADT road diets and comparison corridors studied.

## COLLISIONS

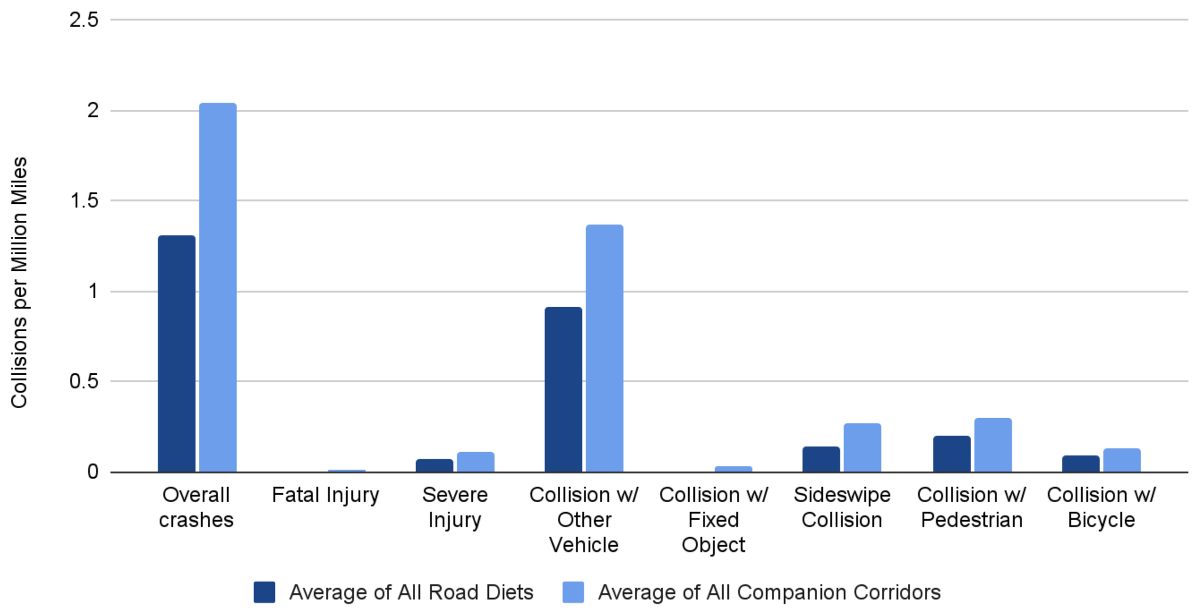
I found that the road diets performed better with respect to vehicle collisions than their comparison groups in all the metrics studied. The overall collisions for the road diets were 44 percent lower than the comparison corridors. This is consistent, although even better, than the findings reported by the FHWA that road diets can generally be expected to reduce crashes by about 29 percent. Collisions that resulted in fatal and severe injuries were also lower by 200 percent and 37 percent, respectively. There were 40 percent fewer collisions with other vehicles, 200 percent fewer involving fixed objects, and 64 percent fewer sideswipe collisions. There were also 37 percent fewer pedestrian collisions and 41 percent fewer bicycle collisions. However, since the data was normalized based on vehicle miles and not pedestrian and bicyclists counts, it is possible that the percentage differences may underestimate the improvements in pedestrian and cycling safety rates, if bicycle and pedestrian activity increased with the addition of the road diets, which is suggested by the literature (Gudz et al. 2017; Taylor-Gratzer 2016).

**Table 7:** Comparison of Average Collisions, Between All Road Diets and All Comparison Corridors

| Measure | All Road Diets Average (collisions/million miles) | All Comparison Corridors Average (collisions/million miles) | Difference | Percent Difference |
|---|---|---|---|---|
| **Overall crashes** | 1.313 | 2.043 | 0.731 | 44% |
| **Fatal Injury** | 0.000 | 0.014 | 0.014 | 200% |
| **Severe Injury** | 0.075 | 0.109 | 0.034 | 37% |
| **Collision w/ Other Vehicle** | 0.915 | 1.372 | 0.457 | 40% |
| **Collision w/ Fixed Object** | 0.000 | 0.032 | 0.032 | 200% |
| **Sideswipe Collision** | 0.140 | 0.271 | 0.131 | 64% |

| | | | | |
|---|---|---|---|---|
| **Collision w/ Pedestrian** | 0.203 | 0.296 | 0.092 | 37% |
| **Collision w/ Bicycle** | 0.087 | 0.133 | 0.045 | 41% |

**Figure 6:** Comparison of Average Collisions, Between All Road Diets and All Comparison Shows That The Road Diets Performed Better in Every Case




## SPEEDS

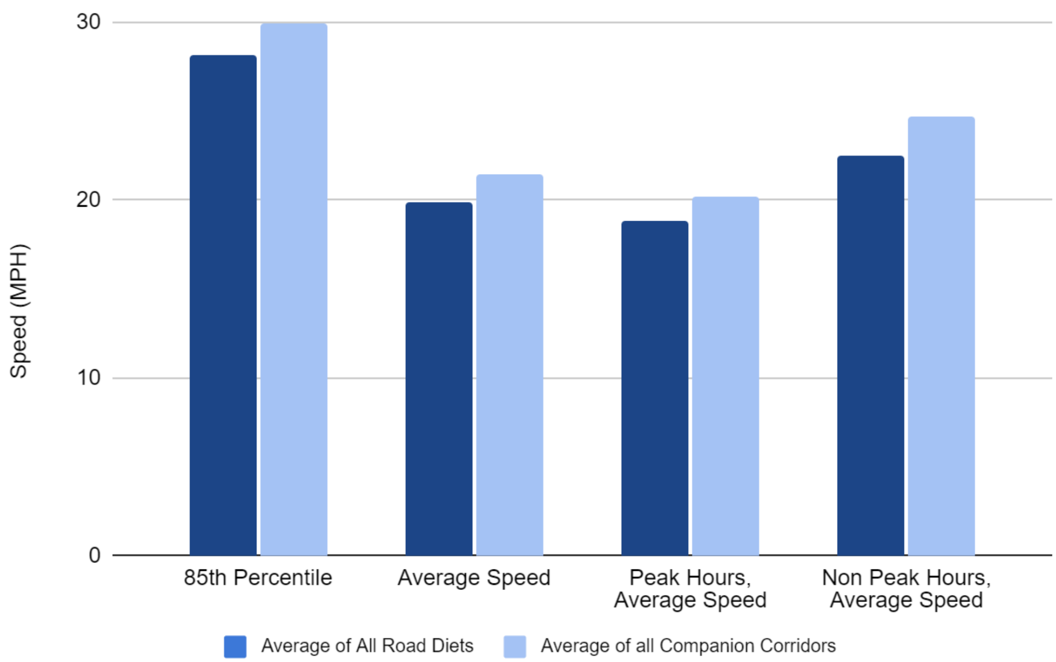
The dramatic safety improvements occasioned by these high ADT road diets were associated with small reductions in average speeds. However, the observed differences in collision, injury, and death rates are much greater than the differences in average speeds. One of the major concerns that drivers and the officials they help to elect express regarding road diets is that they will substantially increase vehicle travel times. While the observed travel times are indeed longer in the road diet vis-a-vis comparison corridors, the difference averaged just 11 seconds per mile. Similarly, another common argument is that there are more traffic delays in road diets corridors during peak hours because of the reduction in through-traffic lanes. The data does indicate that average speeds are 7 percent lower in the treatment compared with the control corridors, and a 9 percent lower during non-peak hours. This means that a vehicle traveling an average of 25 MPH in a road diet corridor would, on average, travel at about 26.75 MPH in a similar non-road-diet corridor.

The 85th percentile speeds indicate the average speed at which about 15 percent of the vehicles in an uncongested traffic stream travel faster and 85 percent travel slower. This speed has been commonly used to set speed limits, rounded to the nearest 5 MPH. Although AB 43, passed in 2021, largely repealed the so-called "85th percentile rule," it is still a metric commonly used in traffic engineering. My analysis shows that the comparison corridors had an 85th percentile speed that was about 6 percent greater, on average, than the high ADT road diet corridors examined here.

**Table 8:** Comparison of Speeds, Between All Road Diets and All Comparison Corridors

| Measure | All Road Diets Average | All Comparison Corridors Average | Difference | Percent Difference |
|---|---|---|---|---|
| **Travel Time (sec)** | 181.80 | 171.24 | -10.56 | 6% |
| **85th Percentile (mph)** | 28.13 | 29.88 | 1.75 | 6% |
| **Average Speed (mph)** | 19.88 | 21.42 | 1.55 | 7% |
| **Peak Hours, Average Speed (mph)** | 18.78 | 20.16 | 1.38 | 7% |
| **Non Peak Hours, Average Speed (mph)** | 22.48 | 24.68 | 2.20 | 9% |

**Figure 7:** Comparison of Speeds, Between All Road Diets and All Comparison Corridor Showing That The Road Diets had Slightly Slower Speeds in Every Category




## TAKEAWAYS

The results of these analyses reveal minor differences in speed between the high ADT road diet and control corridors, compared with much greater differences in safety. The collision, injury, and fatality findings mirror similar estimates compiled by the FHWA, suggesting that road diets in high traffic corridors have dramatically improved safety in the City of Los Angeles. While the average speeds in the road diet corridors are slightly slower, they are not substantially slower as road diet critics claim, and many drivers fear. Overall, road diets appear very effective in achieving better safety outcomes with minimal travel delays, even when the traffic volumes substantially exceed the 20,000 ADT threshold. While safety improvements are the primary goals of road diets, they are not the only ones. For example, this analysis does not account for other potential benefits of road diets, such as increasing the number of people walking and bicycling along the now-safer streets.

# CHAPTER 6: RECOMMENDATIONS

Research suggests that road diets might be a more cost-effective way to increase safety than most other safety measures because it relies primarily on repainting streets, a low-cost activity. Furthermore, road diets have the potential to promote walking and bicycling, enhance businesses along a corridor, and make space for landscaping (Knapp et. al. 2014).

The findings of this report suggest that high ADT road diets have substantially increased safety in Los Angeles. While it is not clear from this research precisely what characteristics of the high ADT road diets are responsible for which types of safety improvements, it suggests that the high ADT road diets can meet conventional road diet goals. While strongly suggestive, this research entails data on five high ADT road diets in one city, and so is not conclusive. Given these findings, I recommend the following:

## CONSIDER ADDITIONAL HIGH ADT ROAD DIETS

Vision Zero has not adequately addressed road safety and Los Angeles' streets have become increasingly dangerous spaces, particularly during the pandemic. Thus, it is imperative that the City consider all available strategies for improving traffic safety in Los Angeles. I recommend that city agencies should consider implementing more road diets even if they have a high ADT to encourage safer driving speeds and increase street space dedicated for alternative modes of travel. Furthermore, I recommend that the current traffic thresholds for road diets should be revisited and that instead of relying on fixed ADT thresholds, road diets should be developed based on a holistic and context-sensitive design approach that takes into account the City's transportation, sustainability, and climate goals while balancing and accommodating local conditions.

## EXPAND DATA COLLECTION AND ANALYSES

I further recommend conducting additional analyses of high ADT road diets on bicycle and pedestrian collisions by normalizing the data using bicycle and pedestrian counts. Studies show that the number of people traveling by active transportation modes tends to increase after road diets are put in place and so it is necessary to accommodate for this change when analyzing collision rates. If road diets in Los Angeles are promoting increased biking and walking, then the pedestrian and cyclist safety improvements associated with road diets in this analysis are likely even greater.

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# APPENDIX

## COLLISIONS

### Comparison of Collisions, Between Silver Lake Blvd 1 and Comparison Group Average

| Measure | Road Diet (collisions/million miles) | Comparison Group Average (collisions/million miles) | Difference | Percent Difference |
|---|---|---|---|---|
| **Overall crashes** | 0.76 | 2.67 | 1.92 | 112% |
| **Collision w/ Other Vehicle** | 0.76 | 1.71 | 0.95 | 77% |
| **Collision w/ Pedestrian** | 0.00 | 0.34 | 0.34 | 200% |
| **Collision w/ Bicycle** | 0.00 | 0.19 | 0.19 | 200% |
| **Collision w/ Fixed Object** | 0.00 | 0.01 | 0.01 | 200% |
| **Not Stated** | 0.00 | 0.02 | 0.02 | 200% |
| **All others** | 0.00 | 0.41 | 0.41 | 200% |
| **Fatal Injury** | 0.00 | 0.01 | 0.01 | 200% |
| **Severe Injury** | 0.00 | 0.22 | 0.22 | 200% |
| **All others** | 0.76 | 2.53 | 1.77 | 108% |
| **Sideswipe Collision** | 0.00 | 0.53 | 0.53 | 200% |
| **Not Stated** | 0.00 | 0.05 | 0.05 | 200% |
| **All others** | 0.76 | 2.09 | 1.34 | 94% |

### Comparison of Collisions, Between Virgil Ave and Comparison Group Average

| Measure | Road Diet (collisions/million miles) | Comparison Group Average (collisions/million miles) | Difference | Percent Difference |
|---|---|---|---|---|
| **Overall crashes** | 2.05 | 1.95 | -0.10 | 5% |

| | | | | |
|---|---|---|---|---|
| **Collision w/ Other Vehicle** | 1.37 | 1.37 | 0.01 | 1% |
| **Collision w/ Pedestrian** | 0.41 | 0.30 | -0.11 | 31% |
| **Collision w/ Bicycle** | 0.14 | 0.14 | 0.00 | 1% |
| **Collision w/ Fixed Object** | 0.00 | 0.01 | 0.01 | 200% |
| **Not Stated** | 0.07 | 0.01 | -0.06 | 163% |
| **All others** | 0.07 | 0.13 | 0.06 | 62% |
| **Fatal Injury** | 0.00 | 0.04 | 0.04 | 200% |
| **Severe Injury** | 0.21 | 0.11 | -0.10 | 61% |
| **All others** | 1.85 | 1.80 | -0.04 | 2% |
| **Sideswipe Collision** | 0.41 | 0.23 | -0.18 | 57% |
| **Not Stated** | 0.07 | 0.03 | -0.04 | 86% |
| **All others** | 1.57 | 1.70 | 0.13 | 8% |

### Comparison of Collisions, Between Silver Lake Blvd 2 and Comparison Group Average

| Measure | Road Diet (collisions/million miles) | Comparison Group Average (collisions/million miles) | Difference | Percent Difference |
|---|---|---|---|---|
| **Overall crashes** | 1.12 | 1.82 | 0.71 | 48% |
| **Collision w/ Other Vehicle** | 0.60 | 1.20 | 0.60 | 67% |
| **Collision w/ Pedestrian** | 0.17 | 0.31 | 0.14 | 56% |
| **Collision w/ Bicycle** | 0.09 | 0.07 | -0.02 | 22% |
| **Collision w/ Fixed Object** | 0.00 | 0.01 | 0.01 | 200% |
| **Not Stated** | 0.09 | 0.07 | -0.02 | 22% |
| **All others** | 0.17 | 0.16 | -0.01 | 6% |
| **Fatal Injury** | 0.00 | 0.00 | 0.00 | 0% |

| | | | | |
|---|---|---|---|---|
| Severe Injury | 0.09 | 0.14 | 0.05 | 46% |
| All others | 1.03 | 1.69 | 0.65 | 48% |
| Sideswipe Collision | 0.00 | 0.29 | 0.29 | 200% |
| Not Stated | 0.00 | 0.04 | 0.04 | 200% |
| All others | 1.12 | 1.50 | 0.38 | 29% |

### Comparison of Collisions, Between York Blvd and Comparison Group Average

| Measure | Road Diet (collisions/million miles) | Comparison Group Average (collisions/million miles) | Difference | Percent Difference |
|---|---|---|---|---|
| Overall crashes | 1.49 | 2.55 | 1.06 | 53% |
| Collision w/ Other Vehicle | 0.86 | 1.76 | 0.90 | 69% |
| Collision w/ Pedestrian | 0.36 | 0.36 | 0.01 | 2% |
| Collision w/ Bicycle | 0.14 | 0.06 | -0.08 | 80% |
| Collision w/ Fixed Object | 0.00 | 0.09 | 0.09 | 200% |
| Not Stated | 0.00 | 0.03 | 0.03 | 200% |
| All others | 0.14 | 0.25 | 0.11 | 57% |
| Fatal Injury | 0.00 | 0.03 | 0.03 | 200% |
| Severe Injury | 0.08 | 0.13 | 0.05 | 44% |
| All others | 1.41 | 2.39 | 0.99 | 52% |
| Sideswipe Collision | 0.14 | 0.25 | 0.12 | 59% |
| Not Stated | 0.06 | 0.04 | -0.02 | 42% |
| All others | 1.30 | 2.26 | 0.97 | 54% |

### Comparison of Collisions, Between Rowena Ave and Comparison Group Average

| Measure | Road Diet (collisions/million miles) | Comparison Group Average (collisions/million miles) | Difference | Percent Difference |
|---|---|---|---|---|
| **Overall crashes** | 1.15 | 1.54 | 0.39 | 29% |
| **Collision w/ Other Vehicle** | 1.00 | 1.11 | 0.11 | 10% |
| **Collision w/ Pedestrian** | 0.08 | 0.17 | 0.10 | 76% |
| **Collision w/ Bicycle** | 0.08 | 0.08 | 0.00 | 3% |
| **Collision w/ Fixed Object** | 0.00 | 0.03 | 0.03 | 200% |
| **Not Stated** | 0.00 | 0.05 | 0.05 | 200% |
| **All others** | 0.00 | 0.11 | 0.11 | 200% |
| **Fatal Injury** | 0.00 | 0.01 | 0.01 | 200% |
| **Severe Injury** | 0.00 | 0.04 | 0.04 | 200% |
| **All others** | 1.15 | 1.49 | 0.34 | 25% |
| **Sideswipe Collision** | 0.15 | 0.21 | 0.06 | 30% |
| **Not Stated** | 0.00 | 0.01 | 0.01 | 200% |
| **All others** | 1.00 | 1.32 | 0.32 | 28% |

## SPEEDS

### Comparison of Speeds, Between Silver Lake Blvd 1 and Comparison Group Average

| Measure | Road Diet | Comparison Group Average | Difference | Percent Difference |
|---|---|---|---|---|
| **Travel Time (sec)** | 180.00 | 163.36 | -16.64 | 10% |
| **85th Percentile (mph)** | 30.00 | 31.20 | 1.20 | 4% |
| **Average Speed (mph)** | 20.00 | 22.47 | 2.47 | 12% |

| | | | | |
|---|---|---|---|---|
| **Peak Hours, Average Speed (mph)** | 19.25 | 21.06 | 1.81 | 9% |
| **Non Peak Hours, Average Speed (mph)** | 23.83 | 25.88 | 2.05 | 8% |

### Comparison of Speeds, Between Virgil Ave and Comparison Group Average

| Measure | Road Diet | Comparison Group Average | Difference | Percent Difference |
|---|---|---|---|---|
| **Travel Time (sec)** | 189.47 | 194.74 | 5.26 | 3% |
| **85th Percentile (mph)** | 27.00 | 26.00 | -1.00 | 4% |
| **Average Speed (mph)** | 19.00 | 18.50 | -0.50 | 3% |
| **Peak Hours, Average Speed (mph)** | 18.00 | 17.50 | -0.50 | 3% |
| **Non Peak Hours, Average Speed (mph)** | 19.00 | 21.50 | 2.50 | 12% |

### Comparison of Speeds, Between Silver Lake Blvd 2 and Comparison Group Average

| Measure | Road Diet | Comparison Group Average | Difference | Percent Difference |
|---|---|---|---|---|
| **Travel Time (sec)** | 189.47 | 167.53 | -21.94 | 12% |
| **85th Percentile (mph)** | 27.00 | 30.00 | 3.00 | 11% |
| **Average Speed (mph)** | 19.00 | 21.50 | 2.50 | 12% |
| **Peak Hours, Average Speed (mph)** | 18.00 | 20.50 | 2.50 | 13% |
| **Non Peak Hours, Average Speed (mph)** | 22.00 | 24.50 | 2.50 | 11% |

### Comparison of Speeds, Between York Blvd and Comparison Group Average

| Measure | Road Diet | Comparison Group Average | Difference | Percent Difference |
|---|---|---|---|---|
| **Travel Time (sec)** | 180.00 | 169.19 | -10.81 | 6% |
| **85th Percentile (mph)** | 27.00 | 30.60 | 3.60 | 13% |
| **Average Speed (mph)** | 20.00 | 21.40 | 1.40 | 7% |

| | | | | |
|---|---|---|---|---|
| **Peak Hours, Average Speed (mph)** | 20.00 | 20.40 | 0.40 | 2% |
| **Non Peak Hours, Average Speed (mph)** | 22.00 | 24.00 | 2.00 | 9% |

### Comparison of Speeds, Between Rowena Ave and Comparison Group Average

| Measure | Road Diet | Comparison Group Average | Difference | Percent Difference |
|---|---|---|---|---|
| **Travel Time (sec)** | 180.00 | 151.05 | -28.95 | 17% |
| **85th Percentile (mph)** | 29.00 | 34.00 | 5.00 | 16% |
| **Average Speed (mph)** | 20.00 | 24.00 | 4.00 | 18% |
| **Peak Hours, Average Speed (mph)** | 19.00 | 23.00 | 4.00 | 19% |
| **Non Peak Hours, Average Speed (mph)** | 23.00 | 27.50 | 4.50 | 18% |