Jacobs

Memorandum

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Subject	**StreetLight Travel Data Analysis**	**Project Name**	Westside Trail and Bridge over US Hwy 26
Attention	Jeannine Rustad, Tualatin Hills Park & Recreation District (THPRD)	**Project No.**	D3314900
From	Scott Richman		
Date	October 2020		
Copies to	Peter Swinton, Liana Harden		

Contents

1. Overview

This memorandum describes analyses the Jacobs project team performed for the Tualatin Hills Park & Recreation District (THPRD) Westside Trail Bridge project. The project team used smart phone data to:

- Better understand how people travel in the area, especially those walking, rolling, and biking.
- Estimate the future use of the bridge based on current travel patterns.
- Study potential equity impacts from the project.

1.1 Project

The Westside Trail Bridge project is exploring design and planning options for a bridge to connect the Westside Trail over US Hwy 26 between NW Cornell Road and NW Murray Boulevard. The existing highway crossings here are 1.2 miles apart. This bridge, proposed in alignment with the future Westside trail to the north and south of the highway, would be approximately midway between these crossings, providing a critical connection to points north and south of the highway, including Sunset High School, Sunset Swim Center, and the THPRD Howard M. Terpenning Recreation Complex.

1.2 Summary of Findings

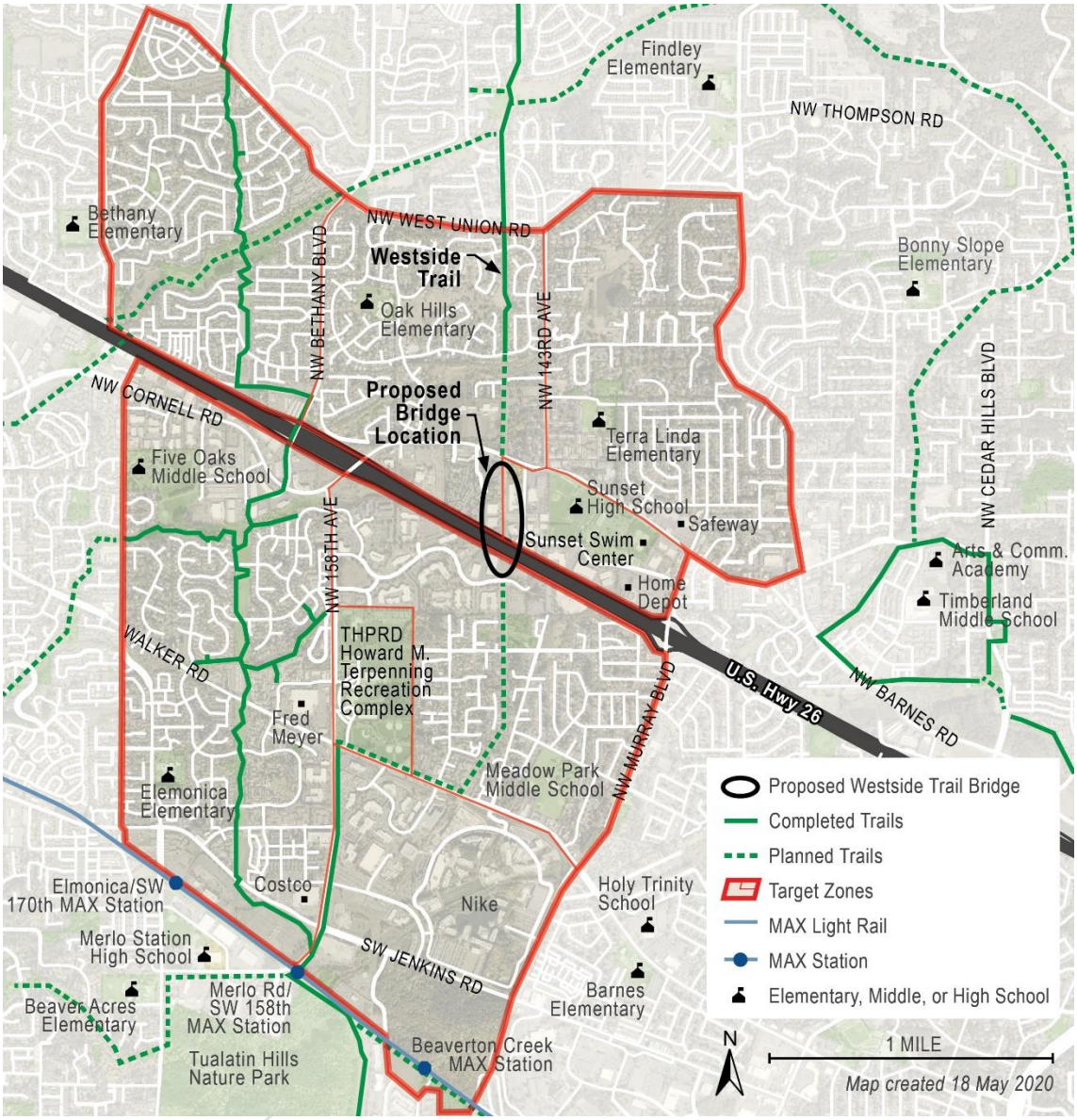
- Many individuals use active transportation – walking, with or without mobility devices, and bicycling - in the project vicinity.
- A relatively small percentage of walking and biking trips cross US Hwy 26. This appears to be because the highway acts as a barrier and requires out-of-the-way travel to get across.
- Many people drive to the other side of the highway, and a large portion of those motor vehicle trips originated from a bikeable distance, less than 3 miles away. A new bridge would create a safe connection for people to comfortably make these trips without driving.

2. Context and Existing Conditions

The Westside Trail is a vital regional asset, connecting neighborhoods and communities across Beaverton and Washington County. THPRD estimates that the trail attracts over 100,000 users a year. The Westside Trail bridge, as shown in Figure 1, would link 25 miles of trail for people walking, running, and biking to reach popular destinations, including housing, schools, jobs, shopping, transit, parks, and recreation complexes. A bridge over US Hwy 26 would also close a gap in Metro's larger regional trails system.

This stretch of US Hwy 26 is a limited access highway. The nearest places to the proposed bridge location that people can cross the highway are the overpasses for NW Murray Boulevard and NW Cornell Road. These overpasses are 1.2 miles apart and are not ideal for people walking and on bikes; they have narrow sidewalks, five motor vehicle travel lanes, and accommodate heavy traffic.

Figure 1: Context of Target Area



3. Methodology

To support planning for the proposed Westside Trail bridge, the team used travel data that provides a precise look at origins, destinations, and trip volumes for active transportation. This data is sourced from cell phones with global positioning system (GPS) capabilities that emit regular pings to register the device geolocations. Known as location-based services (LBS) data, these datasets are scrubbed of all personal information. Historically, active transportation patterns have been difficult to measure and evaluate. LBS data can help understand where people make walking and biking trips.

3.1 Objectives of Analysis

The project team approached the analyses with these objectives:

- Better understand how people travel in the area today, especially those walking, rolling, and biking.
- Estimate the need for the proposed bridge based on current travel patterns.
- Understand the potential impacts to historically disadvantaged communities from the project.

3.2 Data Source

The project team analyzed data provided by a data analytics company called StreetLight. StreetLight uses historical, anonymized location data from smartphones to estimate daily travel behavior by demographic groups.

Although StreetLight's dataset only captures trips from individuals with smartphones, the full dataset is normalized by population data from the U.S. Census to reflect travel patterns within geographic areas. For example, if the dataset includes 500 devices from a census block group with 2,000 residents, and 1,000 devices from another block group with 2,000 residents, StreetLight weights those trips to mitigate sampling bias and more accurately reflect local population patterns. See Appendix for more details on StreetLight data.

The project team customized a StreetLight sample of trips along the following parameters:

- **Timeframe**: January 2018 - December 2018.
- **Modes**: Driving, bicycling, and walking.
- **Geographic area**: (1) Eight neighborhood-sized target zones around the proposed bridge location; and (2) areas within 5 miles of the proposed bridge location. More information on these areas is in Section 3.3, below.

Using these samples, the team ran a series of analyses to disaggregate the data by weekday versus weekend and time of day (morning peak, mid-day, and evening peak).

Unless otherwise noted, all figures and tables use LBS data from StreetLight. Other sources include the American Community Survey, Metro, Mapbox, and OpenStreetMap.

3.3 Geographic Units of Analysis

As shown in Figure 2 and Figure 3, the team analyzed trips starting or ending in the target area and the census block group area.

Target Area. StreetLight allows users to define custom geographic zones of analysis. For this project, the team could define up to eight zones, which they used to create relatively small "target zones" that follow neighborhood boundaries surrounding the proposed location of the new bridge. This allowed them to study trips that begin or end within biking distance of the proposed bridge. Location data is limited to the defined zone; the team can not identify specific origin or destination locations within the zone.

The team defined four areas on the north side of US Hwy 26 and four on the south side:

- **North of US Hwy 26**
  Coleman
  Oak Hills
  Sunset Swim Center
  West Oak Hills
- **South of US Hwy 26**
  Five Oaks
  Marlene Village
  Nike
  THPRD Recreation Complex

Figure 2: Census Block Group Area

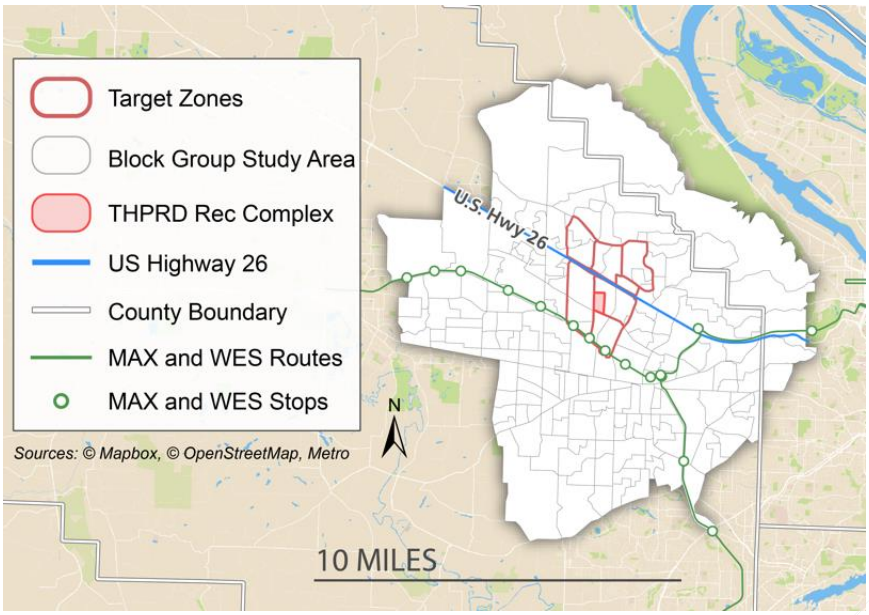
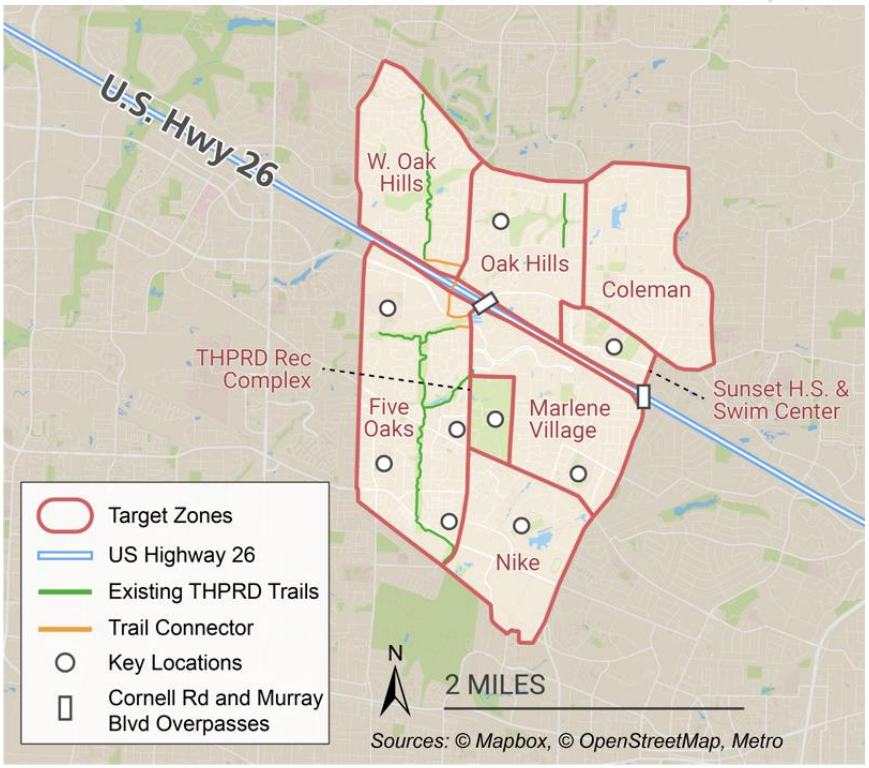


Figure 3: Target Zones



Census Block Group Area. The project team used an area that included 175 block groups within 5 miles of the proposed bridge location. Three block groups at the perimeter were excluded from the analysis because they were large and extended far beyond the 5 mile radius.

4. Analysis

The project team conducted a series of analyses to better understand the need for a Westside Trail bridge and how the bridge might be used. These are:

- **Existing Active Transportation Trips**

  The team looked at the number of active transportation trips in the target area, along with the volume and percentage of active transportation trips crossing the highway. This analysis highlights how US Hwy 26 is a barrier for active transportation trips and key existing active transportation linkages between neighborhoods north and south of US Hwy 26.

- **Trips within Biking Distance**

  The team considered how many people drive into the target areas from a bikeable distance, which they assumed was 5 miles or less. This analysis included total trips into the target area and the subset of total trips that end on the opposite side of US Hwy 26.

- **Equitable Access**

  The project team specifically considered household income and race/ethnicity in the area to understand who may benefit from the bridge.

4.1 Existing Active Transportation Trips

The team calculated the total number of active transportation trips between target zones and the number of trips that cross US Hwy 26. Table 1 shows a summary of active transportation trips within the target area of eight neighborhoods.

Table 1: Pedestrian and Bike Trips within Target Area

	Pedestrian		Bike	
	Number of Trips	Portion of Total	Number of Trips	Portion of Total
Total within target area	60,576		1,358	
Starting in southern zones, and ending in northern zones	890	1.5%	43	3.2%
Starting in northern zones, and ending in southern zones	859	1.4%	42	3.1%

Source: StreetLight

Table 2 disaggregates these trip volumes by neighborhood, and trips that cross the highway. Trip volumes represent the average daily number of trips originating from a particular neighborhood.

Table 2: Pedestrian and Bike Trips by Neighborhood

Northern Neighborhoods	Pedestrian Trips			Bicycle Trips		
	Total	Cross-Highway	Portion Cross-Highway	Total	Cross-Highway	Portion Cross-Highway
Coleman	5,383	187	3.5%	173	5	2.9%
Oak Hills	4,248	250	5.9%	153	20	13.1%
Sunset H.S. & Swim Center	8,055	213	2.6%	119	7	5.9%
West Oak Hills	3,356	266	7.9%	78	10	12.8%

Southern Neighborhoods	Pedestrian Trips			Bicycle Trips		
	Total	Cross-Highway	Portion Cross-Highway	Total	Cross-Highway	Portion Cross-Highway
Five Oaks	21,292	490	2.3%	452	26	5.8%
Marlene Village	7,286	392	5.4%	147	15	10.2%
Nike Campus	9,303	32	0.4%	200	2	1.0%
THPRD Rec Complex	1,653	23	1.4%	36	0	0%

Source: StreetLight

A few high-level trends stand out:

- A small number of trips cross US Hwy 26, relative to total trip volume — 6.3 percent and 2.9 percent of bicycle and pedestrian trips, respectively.
- The Five Oaks neighborhood (south of US Hwy 26) accounts for a large share of bicycle and pedestrian trips within the target area.

- The Nike Campus also produces a large share of trips, relative to other neighborhoods. Further analysis indicated that very few of the trips originating at the Nike campus cross the highway.

4.1.1 Time of Day and Day of Week

Although northern and southern neighborhoods account for a similar total volume of trips that cross the highway, these numbers vary widely by neighborhood, time of day, and day of the week. This appears to be based on population proximity to the highway.

- The Five Oaks and Marlene Village neighborhoods (both on the south side of the highway) produce the largest volume of pedestrian trips that cross the highway on weekdays and during the weekend. These zones abut the south side of the highway.

- Nike and the Recreation Complex (also south of the highway) produce the lowest volume of pedestrian trips that cross the highway, regardless of day or time of day. These zones are furthest from the highway, though within two miles.

- Neighborhoods north of US Hwy 26 show an even distribution of trips that cross the highway and end on the south side. These zones abut the highway.

- Similar dynamics are evident for bicycle trips that cross the highway, although Oak Hills (north of the highway) stands out more prominently for producing a higher number of these bicycle trips. shows these analyses by day of the week and by time of day.

Figure 4: Average volume of bicycle trips that cross US Hwy 26 (by Day of Week and Origin Neighborhood)

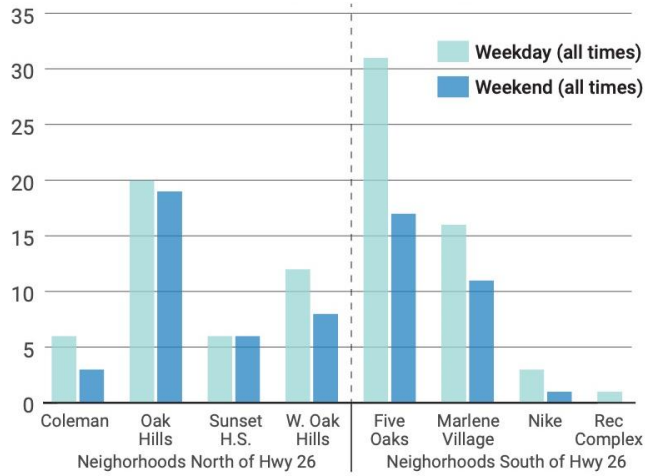


Figure 5: Average Volume of Pedestrian Trips that Cross US Hwy 26 (by Day of Week and Origin Neighborhood)

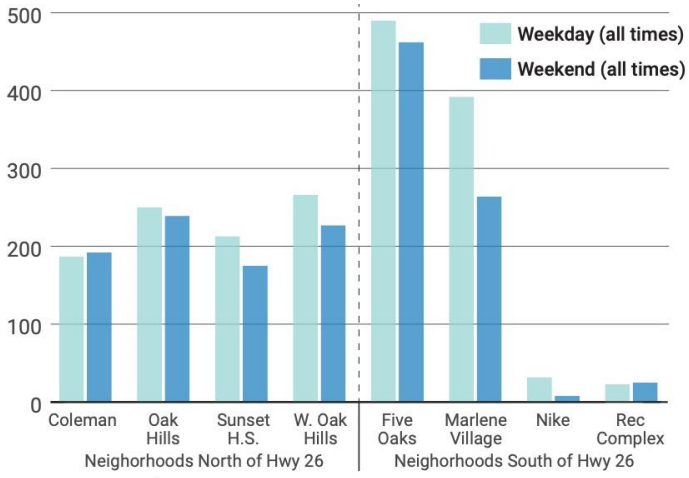


Figure 6: Average Volume of Bicycle Trips that Cross US Hwy 26 (by Time of Day and Origin Neighborhood)

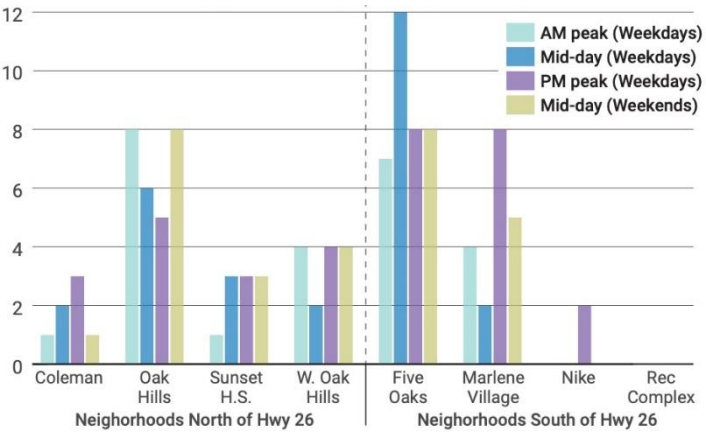
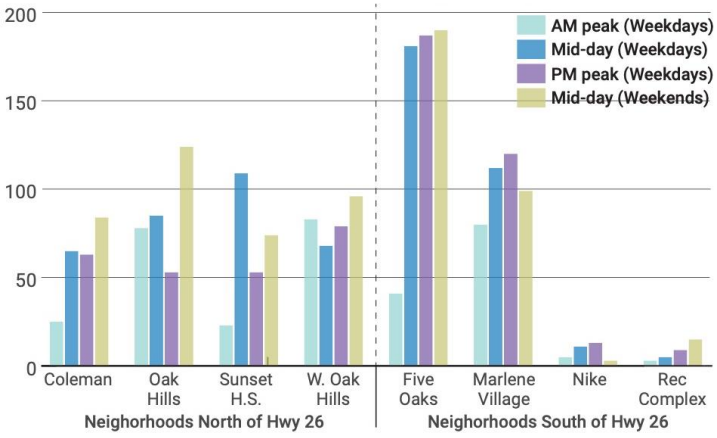


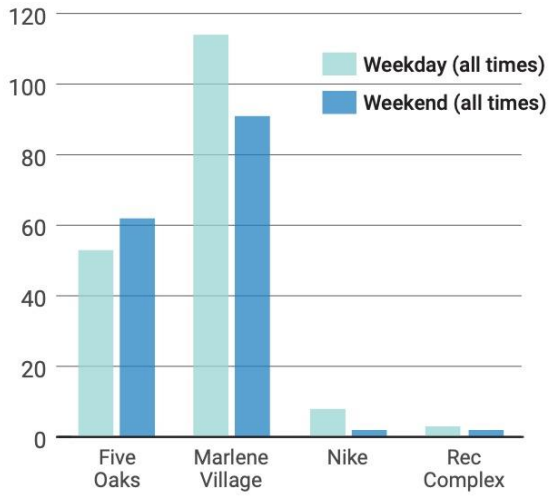
Figure 7: Average Volume of Pedestrian Trips that Cross US Hwy 26 (by Time of Day and Origin Neighborhood)



Active transportation trips are generally higher during peak periods on weekdays and vary by neighborhood. For example, Coleman, Oak Hills, and West Oak Hills (north of US Hwy 26) all had the highest average volume of cross-highway pedestrians during the peak period on weekends. All target areas had higher volumes of trips crossing the highway during the week. Marlene Village (for pedestrian travel) and Five Oaks (for bicycle travel) have the largest gap between weekday and weekend trips. This gap could reflect the degree to which nearby schools (Sunset High School and Five Oaks Middle Schools) are significant generators of bicycling and walking trips.

The Nike Campus produced few active transportation trips that crossed the highway, regardless of day or time period. The THPRD Recreation Complex generated few active transportation trips. Pedestrian trips accounted for almost all of these trips from the Recreation Complex.

Figure 8: Average Volume of Pedestrian Trips that End at Sunset H.S. / Swim Center (from Neighborhoods South of US Hwy 26)



4.1.2 Neighborhood Links

The team also analyzed trips between neighborhoods for pedestrians by analyzing the volume of trips that crossed the highway and ended in either the Sunset High School & Swim Center or Five Oaks zones. These two areas are significant because they have a unique set of destinations relative to the rest of the target area (high school, swim center, Costco, Fred Meyer), are near existing trails or trail spurs, and produce somewhat different trip patterns, as seen in Figures 8 and 9.

Almost all of the cross-highway pedestrians trips that end at Sunset High School & Swim Center come from Marlene Village and Five Oaks. Marlene Village's weekday/weekend split suggests that high school students, school employees, and other weekday users of the on-site athletic facilities may comprise a portion of these trips. Meanwhile, the volume of pedestrian trips from Five Oaks increases during the weekend, perhaps reflecting increased use of the swim center and athletic facilities, or shopping trips.

Sunset High School is a major destination for people in nearby neighborhoods with over 2,000 students in grades 9 through 12. The student attendance area spans the north and south sides of US Hwy 26, as seen in Figure 10. Sunset High School's campus is less than a quarter mile from the proposed bridge location.

Figure 9: Average Volume of Pedestrian Trips that End in Five Oaks (from Neighborhoods North of US Hwy 26)

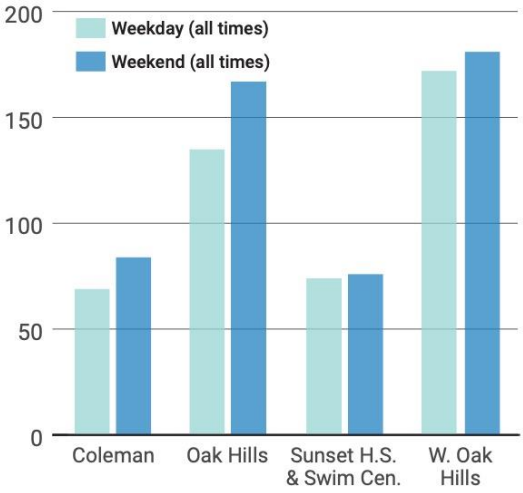
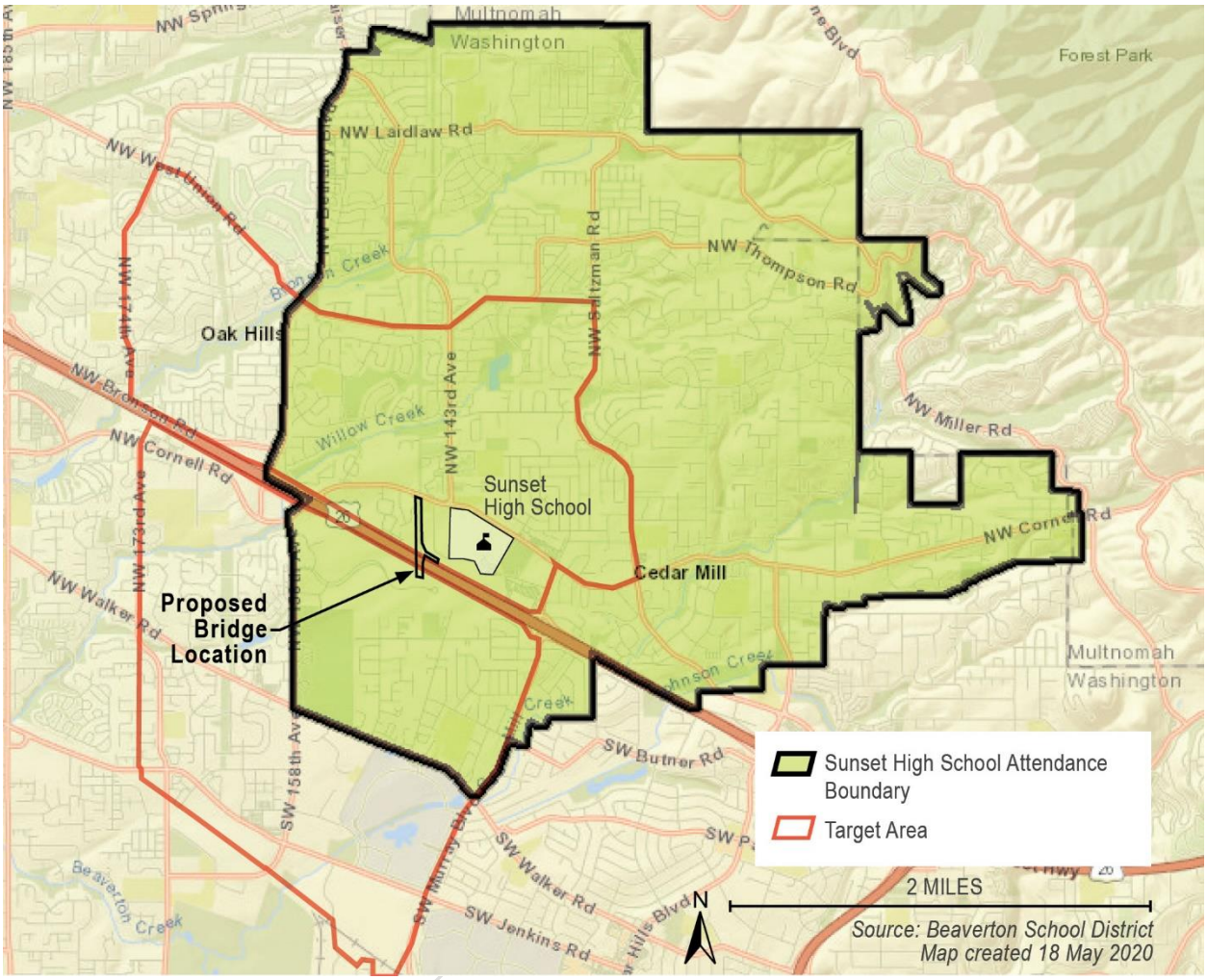


Figure 10: Sunset High School Attendance Boundary



Figures 11 through 14 visualize the destination zones for all walking and biking trips. Most trips that start on the north side of the highway also end on the north side of the highway. Of the small fraction of trips from northern areas that cross the highway, most of them end in Five Oaks. An even a smaller fraction of trips from southern zones cross the highway.

Figure 11: Pedestrian Trip Destinations from North Zones

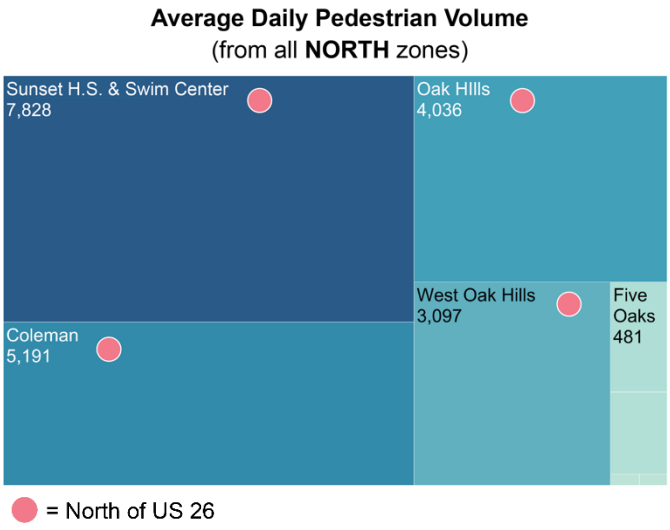


Figure 12: Bicycle Trip Destinations from North Zones

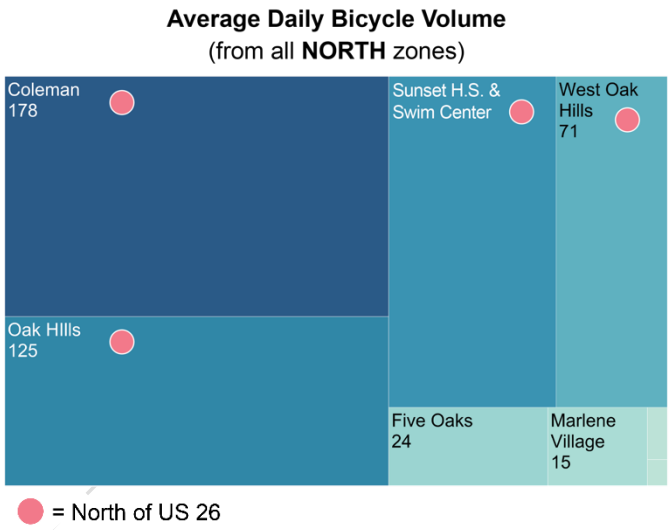


Figure 13: Pedestrian Trip Destinations from South Zones

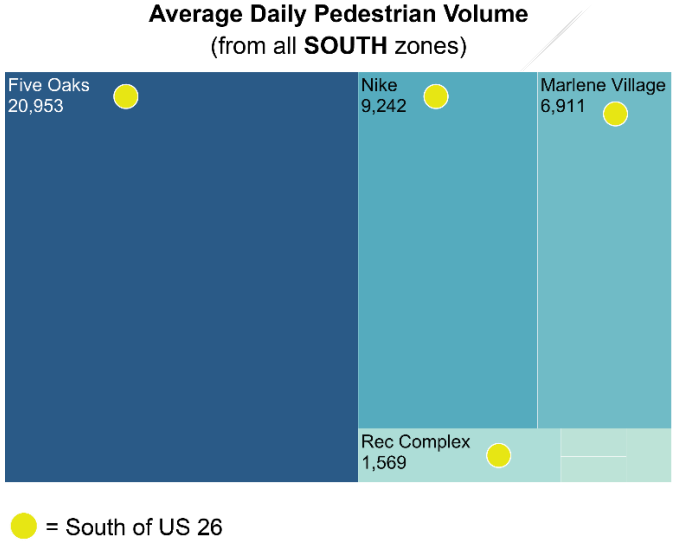
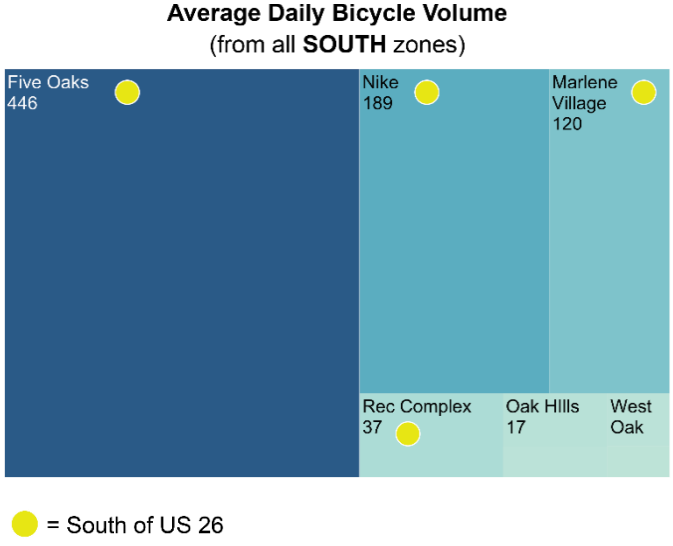


Figure 14: Bicycle Trip Destinations from South Zones



Figures 15 and 16 visualize bicycle and pedestrian cross-highway trips as a percentage of total trips from each of the eight target zones. Each zone is colored based on the percentage of trips starting there and ending in any of the zones on the opposite side of US Hwy 26.

Figure 15: Pedestrian Trips Crossing US Hwy 26

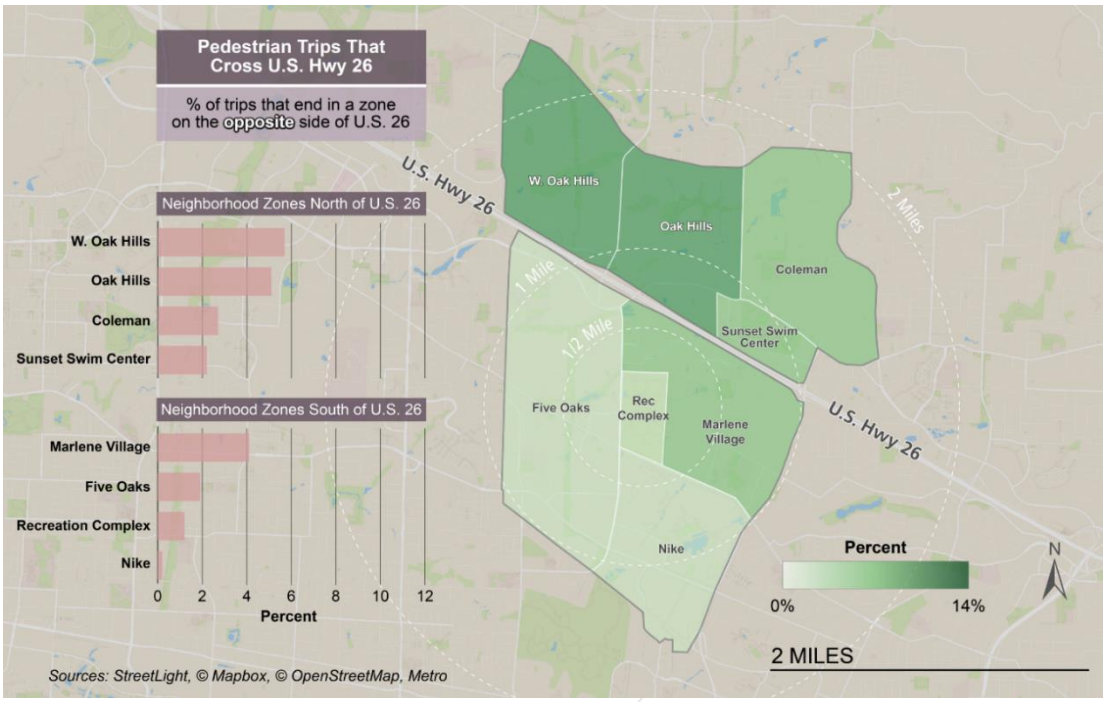
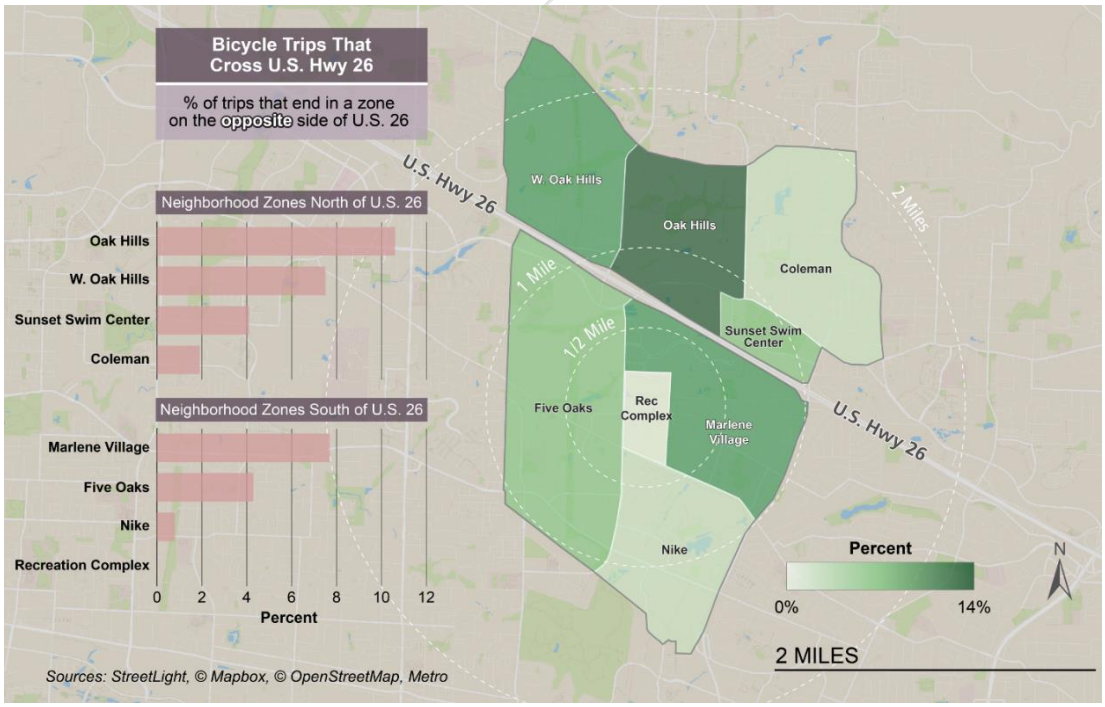


Figure 16: Bicycle Trips Crossing US Hwy 26



Figures 17 and 18 show bicycle and pedestrian trips from census block groups within 5 miles of the proposed bridge that cross the highway, and Table 3 summarizes the quantities of trips. Of the nearly 70,000 pedestrian trips made in the area, five percent cross US Hwy 26. Seven percent of the 1,709 bike trips cross the highway

Figure 17: Pedestrian that Cross US Hwy 26 and End in the Target Area

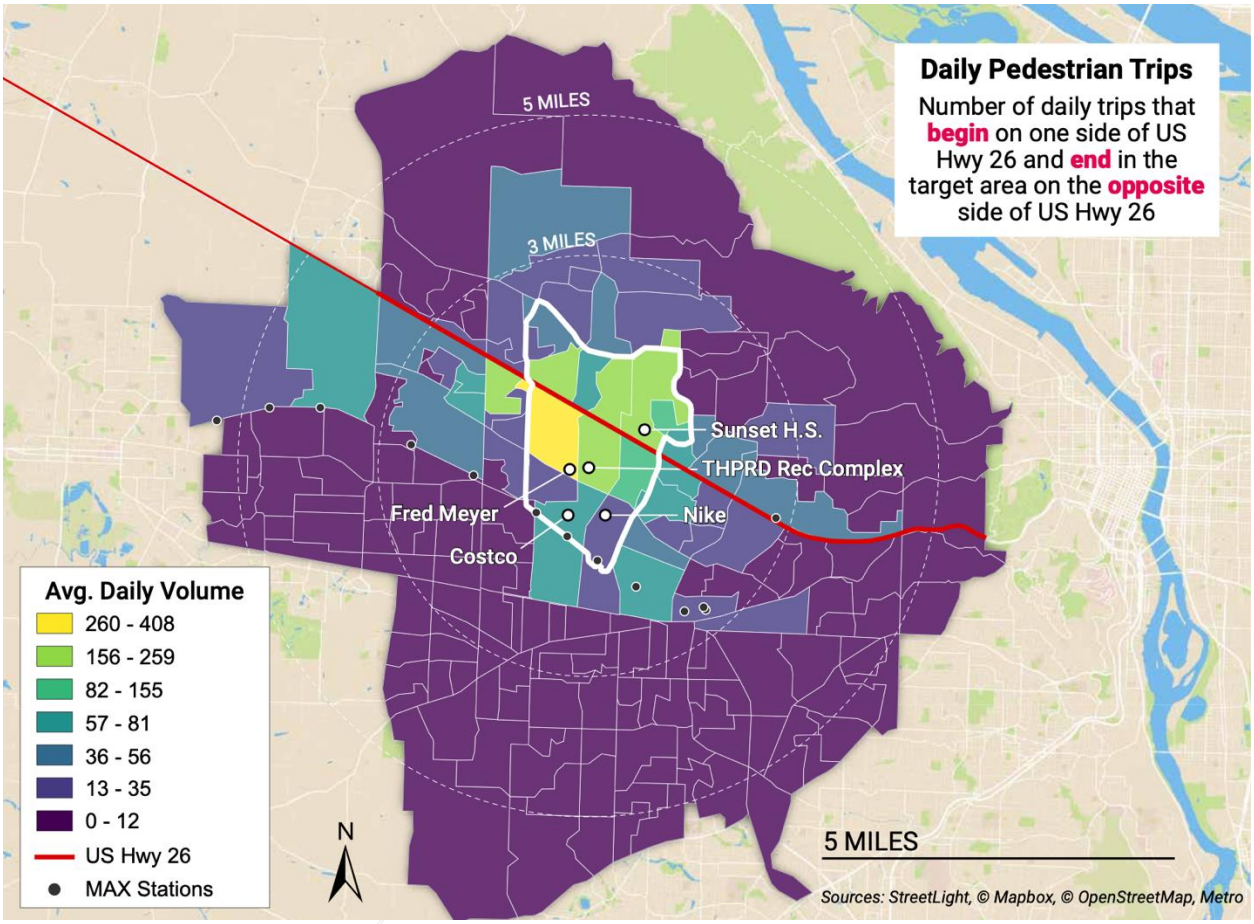


Figure 18: Bicycle Trips that Cross US Hwy 26 and End in the Target Area

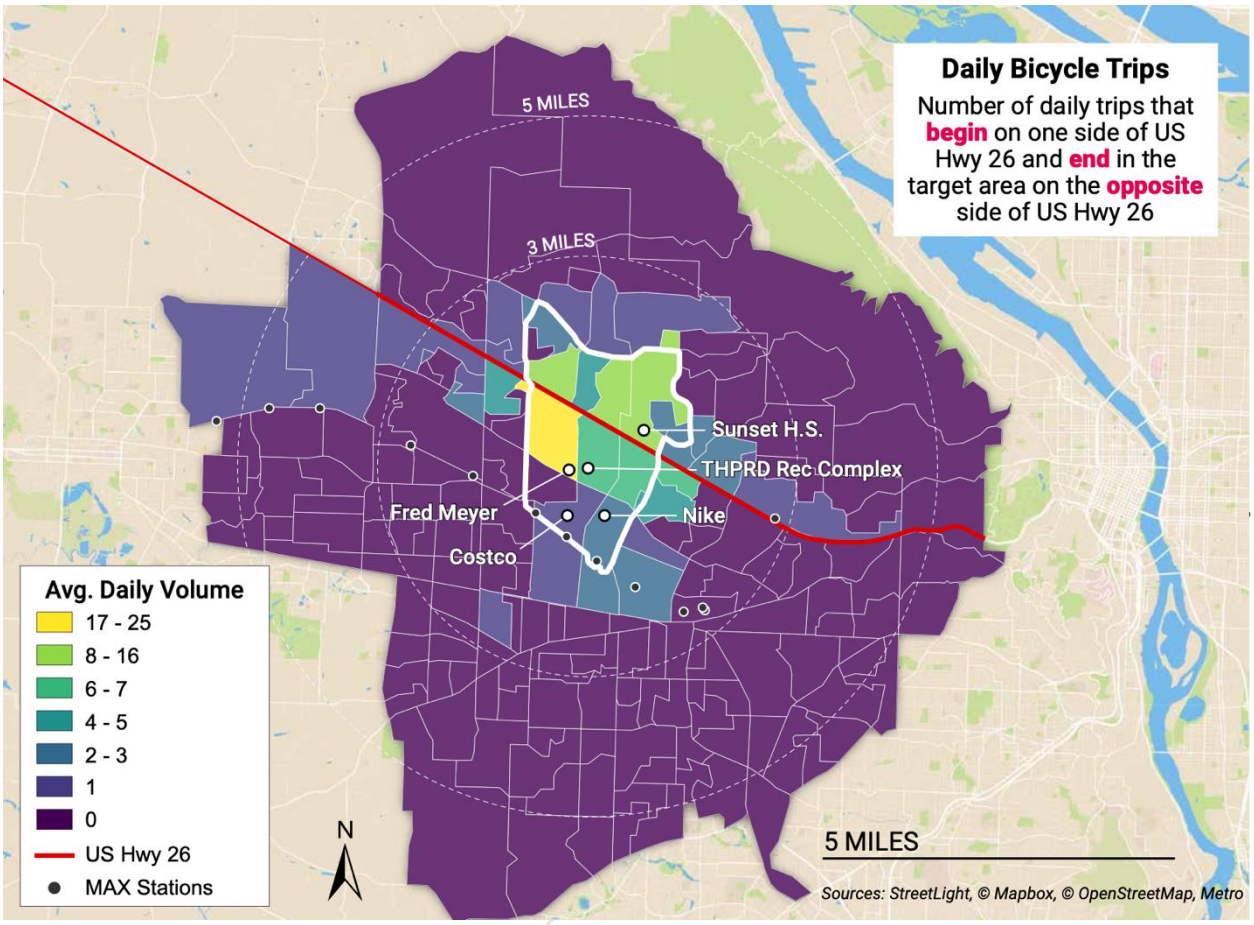


Table 3: Pedestrian and Bike Trips to Target Area from Block Groups within 5 Miles

	Pedestrian Trips			Bicycle Trips		
Location of Origin Block Group	**Total**	**Cross-Highway**	**Portion Cross-Highway**	**Total**	**Cross-Highway**	**Portion Cross-Highway**
North of US Hwy 26	24,038	1,511	6.3%	679	56	8.2%
South of US Hwy 26	45,534	2,114	4.6%	1,030	68	6.6%
Total	**69,572**	**3,625**	**5.2%**	**1,709**	**124**	**7.3%**

Source: StreetLight

4.1.3 Key Findings — Active Transportation Trips

- StreetLight data suggests there were nearly 70,000 pedestrian trips and over 1,700 bike trips every day, on average, that end within the target area and start within five miles.
- Relatively few of these pedestrian and cycling trips crossed US Hwy 26: 5.2 percent of pedestrian trips and 7.3 percent of bike trips.
- Pedestrian and bicycle trip volumes vary by neighborhood target zone, time of day, and day of week.

4.2 Motor Vehicle Trips within Biking Distance

A bridge could overcome the highway as a barrier, making active transportation more attractive. This analysis looks at how many and how people currently drive to the area. This analysis seeks to identify potential opportunities for mode shift to active transportation if people had a safe and direct route over the highway. The project team analyzed motor vehicle trips originating within 5 miles of the target area that crossed US Hwy 26, as seen in Table 4. These nearby origins have higher opportunity to shift to active transportation if a new bicycle and pedestrian bridge was constructed because the distance can be typically made by bike within 30 minutes on flat terrain. Nearly 25,000 motor vehicles drive from a nearby block group and cross US Hwy 26. As seen in Figure 19, most of these trips start from block groups within 3 miles of the study area.

Figure 19: Motor Vehicle Trips that Cross US Hwy 26 and End in the Target Area

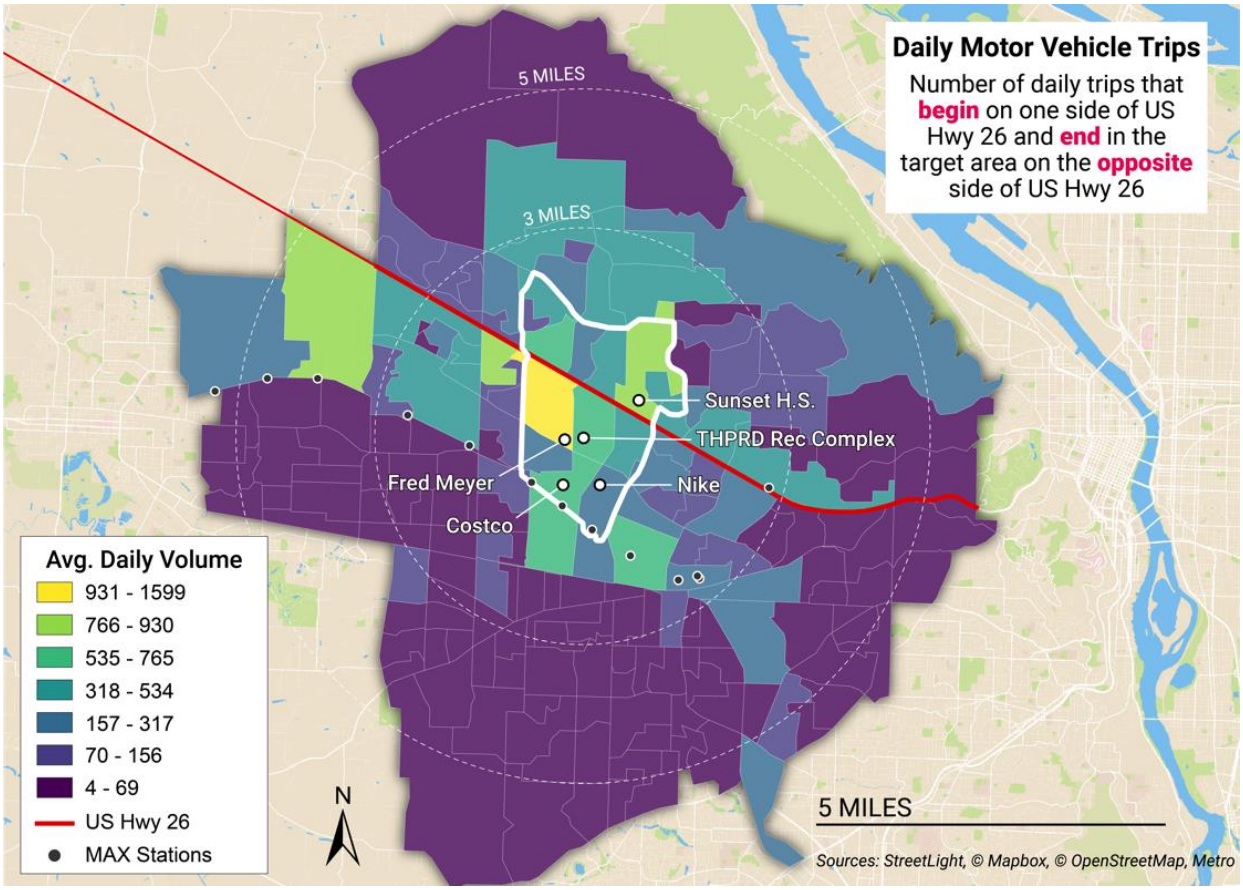


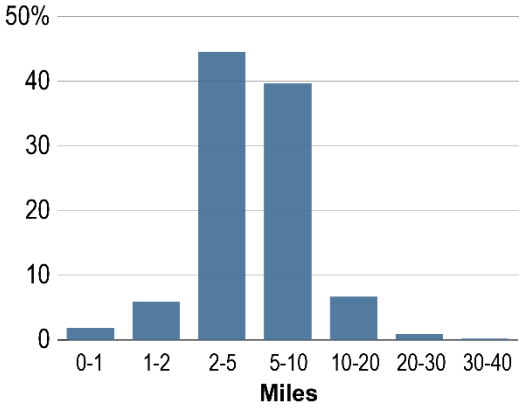
Table 4: Motor Vehicle Trips to Target Area from Block Groups within 5 Miles

Location of Origin Block Group	Total	Cross- Highway	Portion Cross- Highway
North of U.S. Hwy 26	25,638	9,912	38.7%
South of U.S. Hwy 26	48,341	15,070	31.2%
Total	**73,979**	**24,982**	**33.8%**

Source: StreetLight

The project team analyzed trip distances for people driving to the Recreation Complex. Figure 20 shows the distribution of motor vehicle trip distances to the Recreation Complex. This represents trips that start on both sides of US Hwy 26. More than half (52.4 percent) are less than 5 miles.

Figure 20: Distribution of Motor Vehicle Trip Distance to the Recreation Complex



4.2.1 Key Findings — Trips within Biking Distance

- Of the motor vehicle trips that end in the target area, 75,000 originate from a block group within 5 miles. Nearly 25,000 of these cross US Hwy 26.
- This portion of motor vehicle trips that cross the highway (33.8%) is far greater than the portion of pedestrian and biking trips that cross the highway (5.2% and 7.3%, respectively), suggesting the highway acts as a barrier for people walking and biking.
- Five Oaks produced the most motor vehicle trips that crossed the highway, followed by Sunset H.S. & Swim Center.
- THPRD's recreational facilities produced a substantial number of trips that crossed the highway and ended within one of the four northern target zones. These individuals might be interested in shifting to active transportation with a safer and more direct route over the highway because it would allow a bike ride, walk, or run to the facility as part of their recreational activity.

4.3 Equitable Access

The project team studied the demographics of people traveling in the target area to better understand who would likely benefit from the proposed bridge. The team was especially interested in how the bridge would affect historically underserved communities, including people of color and people with low incomes.

4.3.1 Potential Benefits

The bridge offers potentially substantial benefits. Safe facilities for walking and biking can improve access to jobs, services, and resources. They provide inexpensive ways to travel, especially important for people with low incomes. Walking and biking can improve the health of individuals by increasing physical activity, and for the community by reducing air pollution and the safety hazards of automobile traffic.

4.3.2 StreetLight's Demographic Capabilities

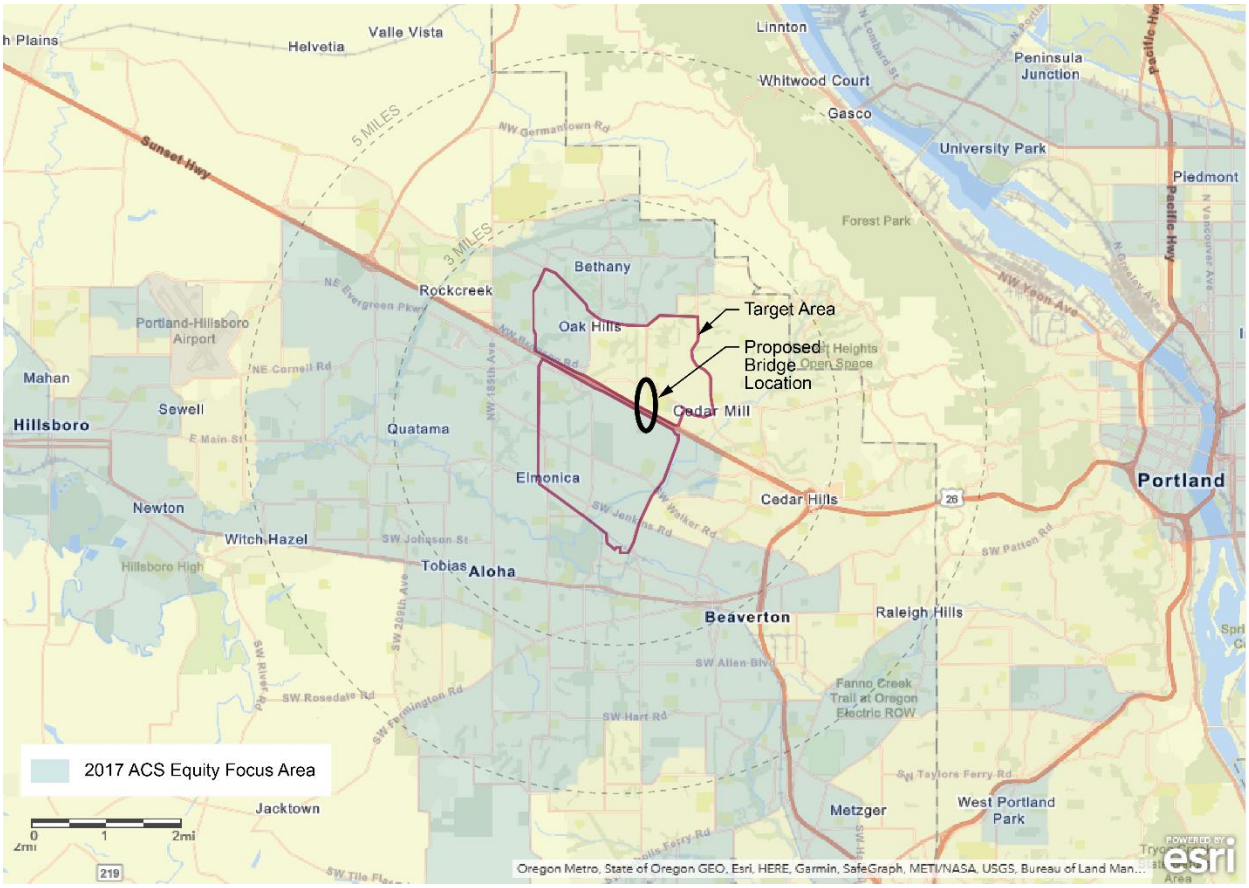
StreetLight's demographic capabilities are limited for a few reasons. First, demographic information is not directly derived from mobile devices or from personal information related to devices. Instead, StreetLight uses device locations to infer the location of the owner's home, and assigns demographic characteristics based on the home location census block group. Second, demographic data are based on the 2010 Decennial Census for race/ethnicity and the 2010 American Community Survey Estimate for income,[1] which are now nearly a decade old. And finally, StreetLight calculates trip data differently for each mode and therefore warns against comparing across modes. See Appendix for more details. Due to these limitations, the project team used Oregon Metro equity focus areas, based on the American Community Survey (ACS) 2017 5-year estimates, instead of StreetLight's demographic output.

4.3.3 Demographic Results

Oregon Metro defines equity focus areas based on how each census tract compares with the regional average for race, limited English proficiency (LEP), and income.[2] A large portion of the target area and the surrounding vicinity within a 3-mile radius is an equity focus area, as seen in Figure 21. This includes much of the area south of US Hwy 26 and east of the proposed bridge location. It also includes the Bethany area, north of the target area.

The proposed bridge would help improve access to destinations on the opposite side of US Hwy 26 for communities in these equity focus areas. It would help connect people to nearby schools, such as Sunset High School, Terra Linda Elementary School, and Meadow Park Middle School. It would also help people reach businesses, like Columbia Sportswear, and services, like LifeWorks NW, on the north side of US Hwy 26.

Figure 21: Oregon Metro 2017 Equity Focus Area



4.3.4 Key Findings — Equitable Access

- Much of the area that would be served by the bridge is considered an equity focus area for its combination of high populations of people of color, people with limited English proficiency, and people with low incomes.

5. Conclusion

The Jacobs project team analyzed location data from travelers in the area. The data purchased from StreetLight, allowed the team to study how people walk, bike, and drive in the area. Analyses are based on 2018 trip data.

The data indicate that an active transportation bridge in the study area could offer a valuable transportation asset. Many trips in the area are already made by walking and biking, showing that people do use active transportation. Very few active transportation trips crossed the highway, however. Many of the motor vehicle trips originated from less than 3 miles from the destination. Given the population density on both sides of the highway, and the high number of work, shopping and recreational opportunities in the study area, the team expected more trips by walking and biking. The highway may therefore be a barrier for people making non-motorized trips.

An active transportation link across US Hwy 26 could create a safer, more comfortable connection, allowing people who already walk and bike to easily go north and south. By making a more direct connection, the bridge may also attract other people who would have otherwise driven between origins and destinations north and south of the highway. The available trail network, recreational facilities, schools and commercial districts near and in the study area are other indicators that a connected and safe active transportation network could increase people's propensity to make active transportation choices.

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[1] Kimberly Gische, "What types of location and contextual data do you use to create metrics?," StreetLight Data Support, May 15, 2019, https://support.streetlightdata.com/hc/en-us/articles/360018543692-What-types-of-location-and-contextual-data-do-you-use-to-create-metrics-

[2] Oregon Metro, "2017 ACS Equity Focus Areas," September 2019, https://www.arcgis.com/home/item.html?id=84f7268ab78d41899b449ff6640cce1c

Appendix: StreetLight Data

StreetLight Data Considerations

StreetLight calibrates motor vehicle estimates with observed traffic counts. It does not calibrate data for other modes like walking and biking. Mode-specific estimates can't be directly compared, but help understand relative differences.

LBS data is different than other methods of quantifying travel behavior. Travel surveys, such as the Oregon Household Activity Survey, gather information about people's trips, including walking and biking[1] and produce a representative sample of the target population. Surveys typically include adjustments for sampling bias. Travel survey limitations include:

- Survey data may be outdated. Surveys are implemented infrequently and processing the results can delay when the data is available.
- Some surveys do not provide accurate information for specific timeframes, locations, and routes, since they rely on retroactive self-reporting of travel behavior, rather than real-time location reporting.

Traffic counts are another means to understand active transportation behavior. Traffic counts require a labor-intensive, on-the-ground effort that is expensive for large areas.

StreetLight LBS data analysis should be applied with the following information in mind:

- StreetLight only knows location data for each device. Other information, like demographic data, is inferred by trip starting and ending locations.
- Travel mode is inferred by travel speed and route choice.
- Demographic information is inferred from 2010 Census data at the block group level. For example where a device overnights and weekends is used to infer income and race/ethnicity distribution of a block group.
- Trip volumes are normalized, which means they do not represent unique trips.
- Bicycle and walking trips are not calibrated, so they can not be compared to one another or to motor vehicle trips
- There may be sample bias such as income, age, and mode choice, since device ownership and when people use GPS apps varies.[2]
- StreetLight does not differentiate transit from other motor vehicle trips. The StreetLight data for this project includes motor vehicles (including transit and freight trucks), bicycles, and pedestrians.

StreetLight's Demographic Capabilities

StreetLight allows analyses to quantify traveler demographics. Demographic information is not directly derived from mobile devices or from personal information related to devices. StreetLight cannot access personal information. To provide demographics, StreetLight uses device locations to infer the location of

the owner's home, and assigns demographic characteristics based on the Decennial Census and American Community Survey make up of the home location census block group.

This demographic study explores StreetLight's capabilities and limitations. The technology is new and, as the project team discovered, has consequential caveats, including:

- Demographic data is based on the 2010 Decennial Census for race/ethnicity and the 2010 American Community Survey Estimate for income.[3] Much had changed in the region between 2010 and 2018, when the travel patterns were measured, including people moving to and away, new residential and commercial developments, and economic recovery following the Great Recession. In fact, the median annual household income for Washington County rose 19 percent between 2010 and 2018, from 69,815 to 83,068 (in 2018 inflation-adjusted dollars).[4] These changes are not reflected in the analysis and call into question the value of the results. StreetLight plans to update demographic data when 2020 Decennial Census results are available.

- StreetLight warns that trip volumes are not comparable across modes.[5] StreetLight calculates trips for each mode differently and does not adjust them to relate. One example of this difference is how StreetLight can adjust volumes of motor vehicle trips based on observed traffic counts and known population counts. This calibrates the detected LBS trips with actual trip volumes. However, bike and pedestrian trips are not adjusted in this way and only reflect detected LBS device movement.[6] Data do not account for different rates of device use across demographics and geographies. In other words, the data undercounts bike and pedestrian trips, especially for demographics and areas with lower smartphone use. For better comparability, this analysis uses the non-adjusted motor vehicle trip results to match the bike and pedestrian results, and only reports estimates of the demographic make-ups for each mode.

- People traveling on buses are included in motor vehicle counts.[7] StreetLight is unable to isolate car trips or transit trips.

For these reasons, the project team advises against using StreetLight demographic results for decision-making purposes.

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[1] Stacey G. Bricka, *Personal Travel in Oregon: A Snapshot of Daily Household Travel Patterns*, August 2019, https://www.oregon.gov/ODOT/Planning/Documents/OHAS-Daily-Travel-In-Oregon-Report.pdf

[2] Emily A. Vogels, "Millennials stand out for their technology use, but older generations also embrace digital life," Pew Research Center FactTank, September 9, 2019, https://www.pewresearch.org/fact-tank/2019/09/09/us-generations-technology-use/

[3] Kimberly Gische, "What types of location and contextual data do you use to create metrics?," StreetLight Data Support, May 15, 2019, https://support.streetlightdata.com/hc/en-us/articles/360018543692-What-types-of-location-and-contextual-data-do-you-use-to-create-metrics-

[4] American Community Survey 1-Year Estimates, as reported by Social Explorer.

[5] Kimberly Gische, "StreetLight Index," StreetLight Data Support, September 13, 2019, https://support.streetlightdata.com/hc/en-us/articles/360018552772-StreetLight-Index?flash_digest=2acf6f800a58c245fd3a825e6292e0b5a2da650e

[6] Claire Douglass, "Multimode Methodology," StreetLight Data Support, March 3, 2019, https://support.streetlightdata.com/hc/en-us/articles/360029489351-Multimode-Methodology
[7] Angela Rae, "All about 'All Vehicles,'" StreetLight Data Support, May 13, 2020, https://support.streetlightdata.com/hc/en-us/articles/360039264211