PARKS HIGHWAY

Alternative Corridor PEL Study

ORIGIN-DESTINATION

STUDY REPORT

March 2022

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EXECUTIVE SUMMARY

The Origin-Destination (O-D) Study for the Parks Highway Alternative Corridor Planning and Environmental Linkages (PEL) Study seeks to analyze and understand travel patterns of drivers that currently use the Parks Highway, in terms of where they are coming from and where they are going to. This O-D study evaluates potential locations for future interchanges that result in the highest shift of traffic from the existing Parks Highway to an alternative corridor and estimates the magnitude of this shift, when assuming the alternative corridor would be built in the current year. This study does not consider future conditions that may impact the magnitude of shift and how interchange locations affect the shift, such as changes in population, land use and development, or travel mode distribution.

The study uses “big data”, which are collected by third-party vendors through smartphone applications and in-vehicle GPS systems. The use of “big data” is desirable as it is much less expensive and quicker to obtain than alternatives such as roadside interviews or license plate studies for the same volume of data. The data are scrubbed of personally identifiable information before use. When calibrated against known traffic volumes in the study area, “big data” provides an accurate and precise picture of existing traffic volumes and O-D patterns.

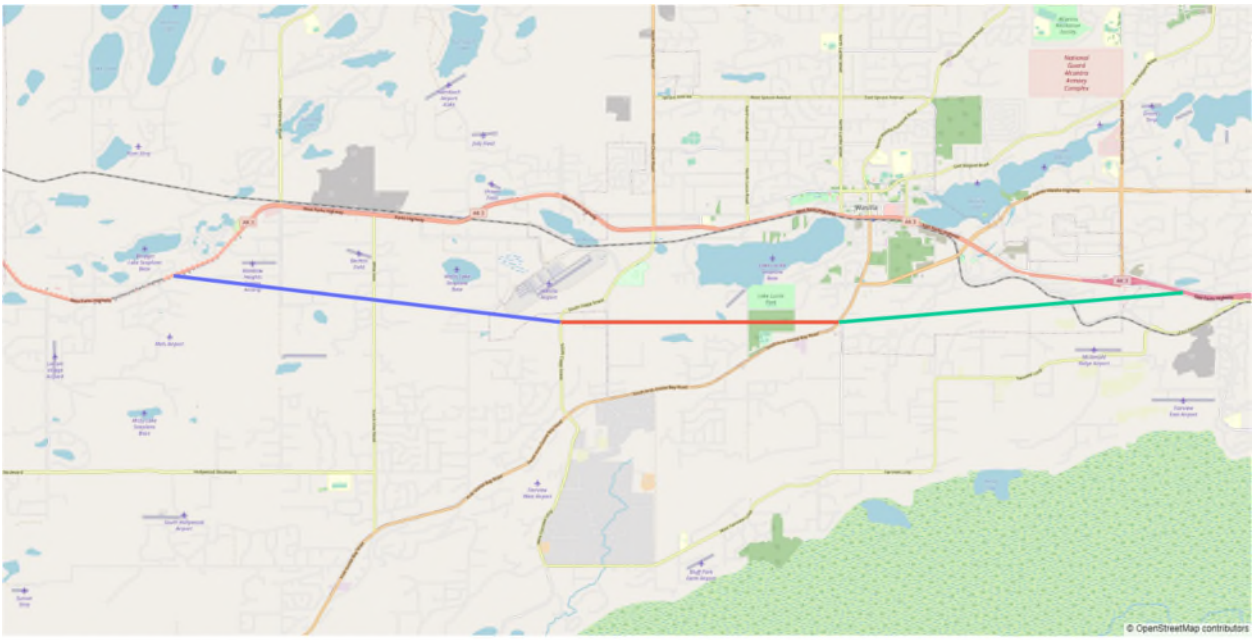
The data include trips throughout the entirety of May 2021 and June 2021 that at some point traveled across or along the Parks Highway within the study area. Both non-commercial and commercial trips are included. Additional data from May 2019 was obtained to verify traffic patterns did not change substantially before and after the onset of the COVID-19 pandemic. The May and June of 2021 data contain over 100 million location points, 900 thousand trips, and 17 million trip miles. The data only include trips that at one point traversed the Parks Highway within the study area.

Existing travel patterns were extracted from the data to identify trips that would likely shift to an alternate corridor. The analysis included an investigation of where and at what time trips occur, which origin-destination pairs are most common, and which routes traffic takes between origins and destinations. In the AM peak period, most trips flow from the outer regions of the study area to the downtown Wasilla area between Lucille Street and the Seward Meridian Highway, with reverse flows seen in the PM peak period. Internal-internal, internal-external, and external-external origin-destination pairs accounted for 67 percent, 31 percent, and 3 percent of all trips, respectively. Origin-destination tables are shown in Appendix A. The most heavily used routes between frequent origin-destination pairs were the Parks Highway, Knik-Goose Bay Road, the Palmer-Wasilla Highway, and the Seward Meridian Highway.

The study also developed a trip assignment model which assigned trips to the existing Parks Highway, the alternative corridor, or other high-volume routes by computing the least travel time path, with several scenarios of interchange locations. The model showed interchanges at Fern Street and Clapp Street are likely to result in the highest shift to the alternative corridor, assuming existing conditions. While adding an interchange at Vine Road did result in more trips shifting, the additional shift was marginal. The model estimated 28 percent of all-day trips and 29 percent of PM peak trips would shift to the alternative corridor, with 2021 existing conditions assumed. Estimated 2021 average annual daily traffic and PM peak volumes are shown in the table and map below.

Expected Trips on Alternative Corridor by Segment, 2021 Existing Conditions

Alternative Corridor Segment	Expected 2021 Annual Average Daily Traffic	Expected 2021 PM Peak Traffic
Alternative Corridor East Terminus to Fern Street Interchange	18,600 veh/day	1,910 veh/hr
Fern Street Interchange to Clapp Street Interchange	18,200 veh/day	1,810 veh/hr
Clapp Street Interchange to Alternative Corridor West Terminus	15,300 veh/day	1,540 veh/hr



1.0 INTRODUCTION

The origin-destination (O-D) study aims to provide insights into how much current traffic is expected to use an alternative corridor, and which cross streets at interchanges are expected to experience the highest traffic use, for an alternative corridor to the George Parks Highway (Parks Highway) through Wasilla, Alaska. The study only considers 2021 existing conditions and does not account for future changes in population, land use and development, travel mode distribution, or other characteristic changes that may impact travel patterns.

The Parks Highway Alternative Corridor Planning & Environmental Linkage (PEL) Study will plan for the development of an alternative highway corridor that is needed to provide a through traffic alternative to maintain the functionality of the Parks Highway, significantly alleviate congestion through downtown Wasilla, and help create a more functional and livable downtown in Wasilla. The Alaska Department of Transportation and Public Facilities (DOT&PF) is proposing to create a new national highway system controlled-access connection south of the existing Parks Highway beginning near the Hyer Road interchange and returning to the Parks Highway west of Pittman Road. (Figure 1).

An alternative corridor is expected to pull traffic volumes away from the existing corridor and become the primary route for non-local traffic traveling through Wasilla and local east-west traffic traveling within Wasilla. The O-D study uses probe data (a type of “big data”) gathered from in-vehicle GPS and mobile phone applications to analyze traffic patterns on the existing Parks Highway, quantify the traffic volumes that are expected to use the alternative corridor, and predict which cross streets would be in highest demand for interchange locations.

Figure 1. Parks Highway Alternative Corridor Study Area

2.0 METHODOLOGY

This section outlines the methodology for collecting the data sample, using transportation analysis zones (TAZ), analyzing travel patterns on the existing Parks Highway corridor, and estimating expected travel patterns on the alternative corridor.

2.1 Collecting and Calibrating the Data Sample

This O-D study used probe data (i.e., "big data") from a traffic data vendor that collects vehicle location data from in-vehicle global positioning system (GPS) navigation and location-based mobile phone applications. These data consist of location data for each vehicle every three to five seconds, which are anonymized and removed of any personal information before being made available for purchase. Probe data were selected as it provided a larger sample size, routing details, and vehicle type classification (Figure 2). Data collection methods were evaluated previously in the "Parks Highway Alternative Corridor PEL Study Origin-Designation Methods" memorandum (refer to Appendix B).

Because some of the trips in the dataset are based on data generated by in-vehicle GPS systems, the dataset may be skewed toward travel patterns of newer vehicles with these systems installed. This could result in deriving findings that are biased towards drivers with means of purchasing newer vehicles. However, 60 percent of the trips in the dataset were generated from data in smartphone apps, which do not directly correspond to the vehicle model year and are owned by a much broader segment of the population. This particular dataset was selected because of the combination of both data generation methods that result in capturing a sample that is closely representative of all trips that occur on the Parks Highway.

Figure 2. Benefits of Using "Big Data" for Origin-Destination Study

Each trip in the O-D dataset contains data for the origin, destination, date and time of the beginning of the trip, distance traveled, travel time, mean speed, and vehicle type (i.e., commercial or non-commercial). The O-D data consist of all vehicle trips that included a part of the Parks Highway within the study area (i.e., Hyer Road to Hawk Lane) during May 2019, May 2021, and June 2021. May 2021 was selected to account for travel patterns during the school year (the first half of the month) while June 2021 was selected to account for non-school year travel patterns. May 2019 was included to consider whether changes in travel patterns had occurred concurrent with the COVID-19 pandemic. Because only 7-15 percent of all vehicles are recorded, the magnitude of the data sample traffic volumes was calibrated by comparing

them to traffic volumes collected by DOT&PF permanent traffic recorders, which record vehicles using a combination of piezoelectric strips, inductance loops, and radar detection.[1]

2.2 Transportation Analysis Zones

Anchorage Metropolitan Transportation Solutions (AMATS), the metropolitan planning organization in Anchorage, developed a travel demand model (TDM) as part of the 2040 Metropolitan Transportation Plan[2] that includes the Matanuska-Susitna (Mat-Su) Borough. The AMATS TDM includes projections for the year 2040 for characteristics related to travel demand such as total population, school enrollment, and employment. The AMATS TDM projects these data by TAZ, which are developed as subsets of United States Census Bureau block groups and have uniform levels of population and employment across the area. This study analyzes travel patterns geospatially by grouping data according to the TAZs. While the Mat-Su Borough also has a travel demand model for the region, the same AMATS TAZs are used for that model, and the AMATS model, as part of the Metropolitan Transportation Plan, meets Federal Highway Administration approval requirements.

The AMATS TDM has a total of 917 TAZs. Many of the TAZs fall outside of the vicinity of the study area. TAZs were categorized into the following three “external regions”.

- Northwest External Region: all TAZs north of Houston (16 TAZs)
- Northeast External Region: all TAZs east of North Trunk Road and north of the Knik River (55 TAZs)
- South External Region: all TAZs south of the Knik River (664 TAZs)

The remaining 182 TAZs are considered internal TAZs. To simplify the analysis process, internal TAZs were grouped into 27 “TAZ regions” that are likely to have similar entry points onto the existing Parks Highway. The grouping process considered traffic volumes, available access, and O-D patterns analyzed for the existing Parks Highway. TAZs by region are shown in Figure 3.

[1] *Methodology Behind Traffic Data Collection and Statistics.* Alaska Department of Transportation and Public Facilities. 2020. https://dot.alaska.gov/stwdplng/transdata/pub/Methodology-Traffic-Data-June-2020.pdf

[2] *Metropolitan Transportation Plan 2040.* Anchorage Metropolitan Transportation Solutions. 2020. https://www.muni.org/departments/ocpd/planning/amats/mtp/2040/final_fhwa_fta_approved/2040_mtp_final_approved.pdf

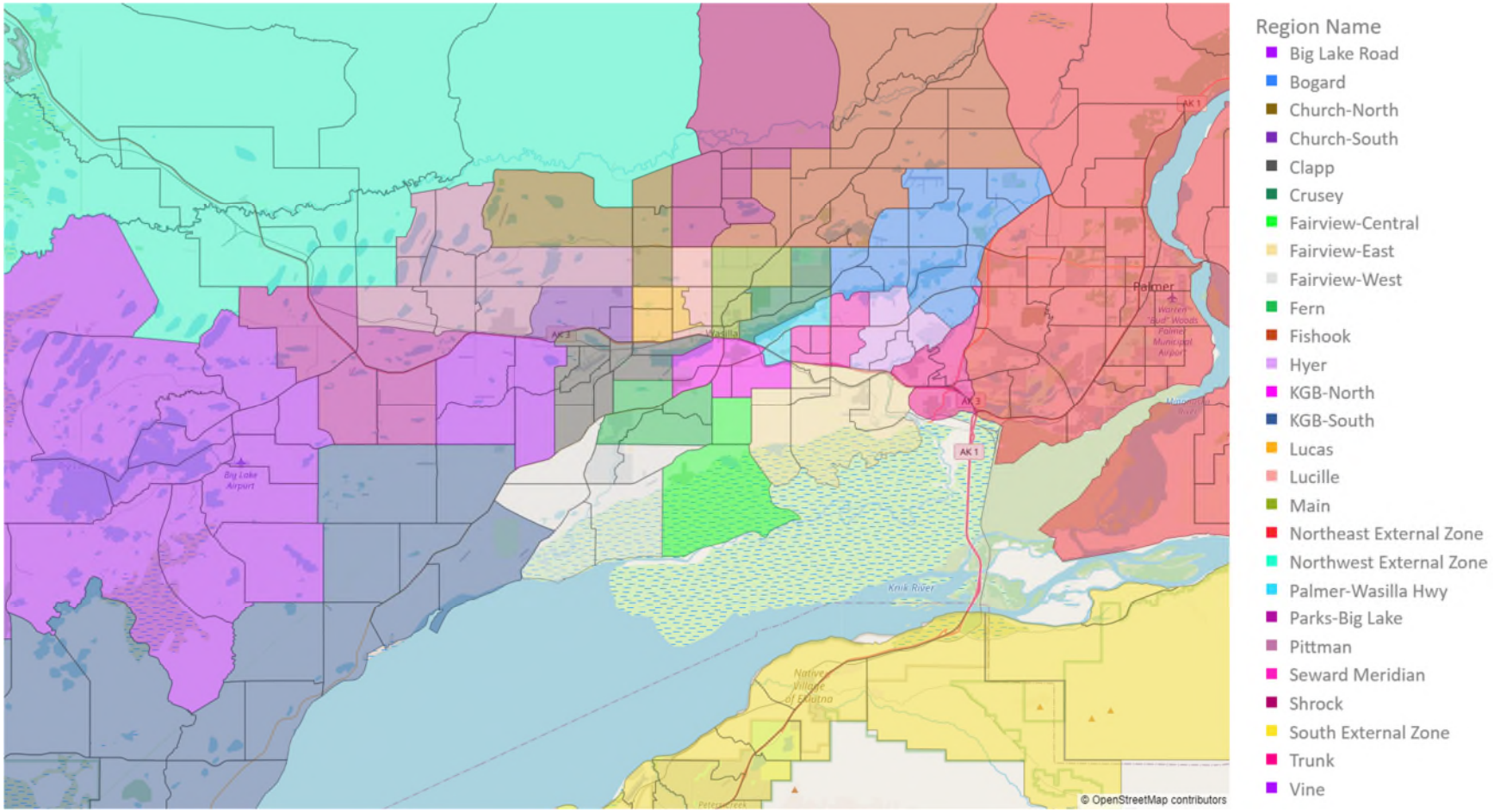


Figure 3. TAZ Regions

2.3 Travel Patterns on the Existing Parks Highway Corridor

To analyze travel patterns on the existing Parks Highway corridor, this analysis used a vendor-supplied analytics platform. The web-based platform stores and processes the large amount of probe data collected, provides instant and automated visualizations and data summaries, and allows for varied query capabilities based on geographic locations and other attributes of the data. For travel patterns on the existing corridor, we gathered insights on the three questions shown in Figure 4, using combinations of trip distribution histograms, map views of trips by TAZ region, analyses by time of day, and grouping of trips by internal and external regions.

Figure 4. Overview of Analysis of Travel Patterns on Existing Parks Highway

2.4 Expected Travel Patterns on an Alternative Parks Highway Corridor

Travel patterns on the alternative corridor were predicted using a qualitative analysis and trip assignment modeling.

2.4.1 Qualitative Analysis

The qualitative analysis builds off analysis findings for O-D pairs and route choice with the existing Parks Highway alignment. By understanding existing patterns, we evaluated which O-D pairs would be most likely to use the alternative corridor based on the assumption that traffic selects the route with the shortest travel time. This was determined by the number of interchange segments the trip entails and whether it exceeds identified thresholds for various scenarios.

2.4.2 Trip Assignment Modeling

In addition to the qualitative assessment, we predicted expected travel patterns on the alternative corridor through a quantitative approach by developing a study-specific traffic distribution and trip assignment model (TAM) using the scripting language Python.[3] Whereas the qualitative analysis provides a range of values to be expected based on high-level assumptions, the alternative corridor TAM takes a more in-depth look at how patterns may

[3] *Python.* Python Software Foundation. Accessed 2022. https://www.python.org/

change by accounting for more precise distance traveled, nodal delay, and speeds on the two routes. The trip assignment modeling methodology is shown in Figure 5.

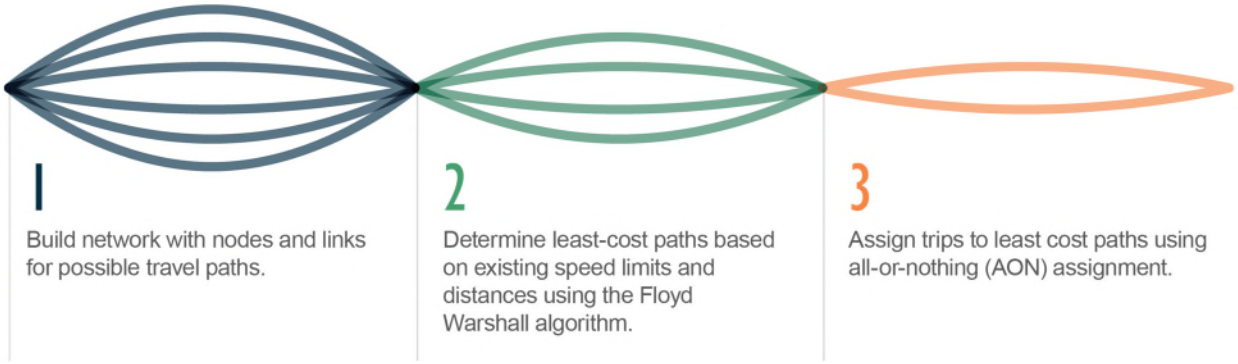


Figure 5. Overview of Trip Assignment Modeling Methodology

3.0 DATA SAMPLE, FACTORS, AND ANALYSIS PERIODS

Once the probe data had been collected, we summarized the data, compared the sample traffic volumes to population volumes, and calibrated the data sample.

3.1 Summary of Data Sample

To understand the size of the data sample, Figure 6 shows the total data points, total trips, total trip time, and total trip distance for the three months, for all hours and the AM and PM peak periods.

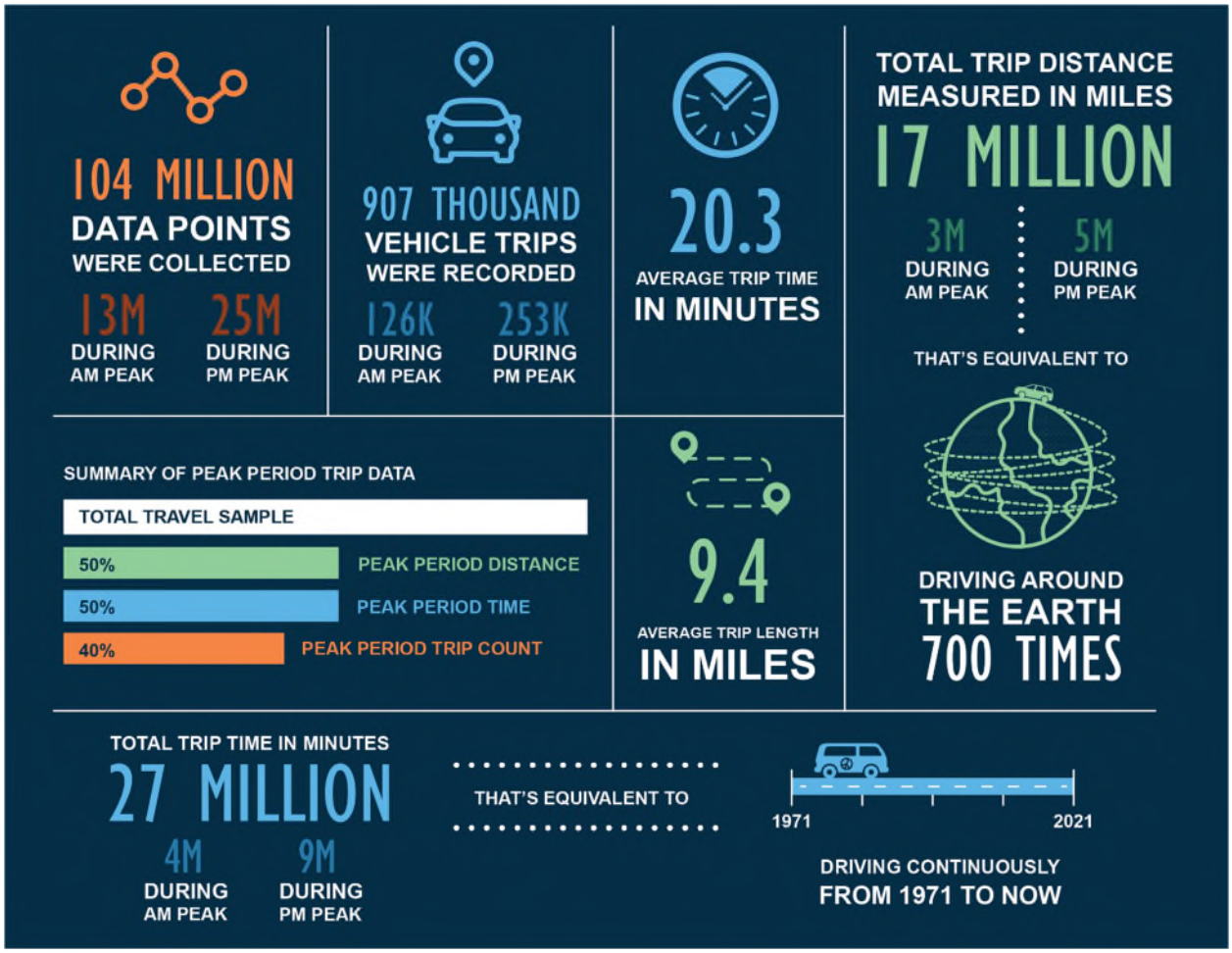


Figure 6. Origin-Destination Data Sample

Figure 7 shows the proportion of trips by distance, for trips less than 100 miles. The figure shows two distinct groups of drivers, one with travel distances below 10 miles and another between 40 and 55 miles. The first peak is representative of local trips, while the second peak represents commuters between the Mat-Su Borough and Anchorage metropolitan area.

Figure 8 shows the proportion of trips by travel time, for trips under 100 minutes. Unlike Figure 7, only a single peak occurs between five and 25 minutes for local traffic, and no distinct second peak is present for commuters. The near-constant frequency between 40 and 50 minutes in an otherwise decreasing frequency trend demonstrates how trips of similar distance (Mat-Su to Anchorage metropolitan area) can have a wide range of trip durations based upon congestion and delay.

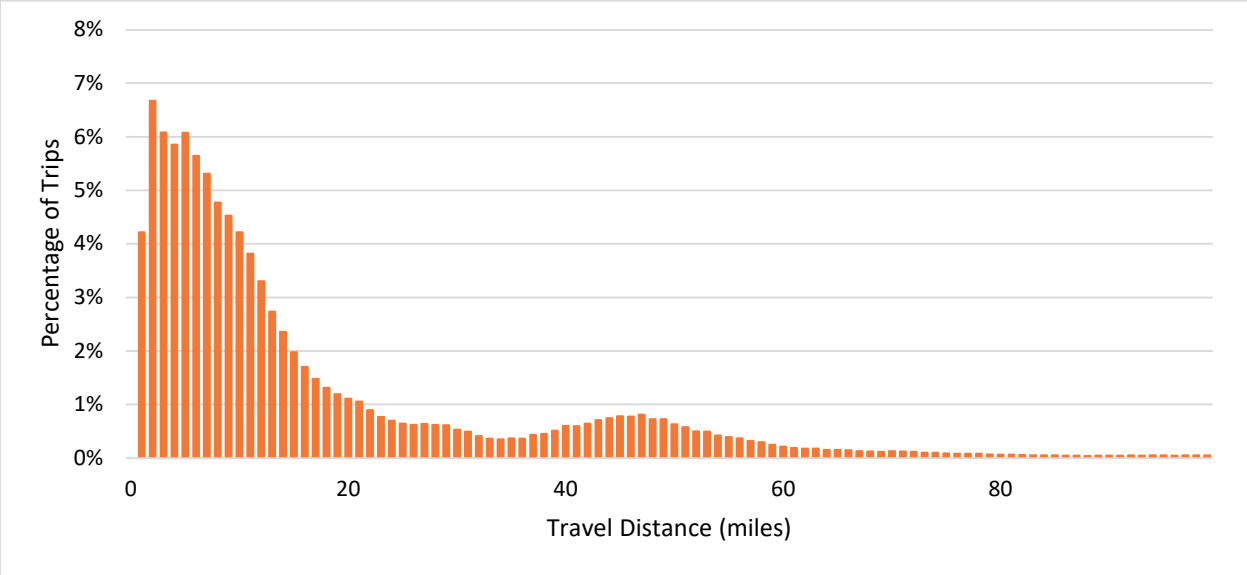


Figure 7. Trip Length Distribution

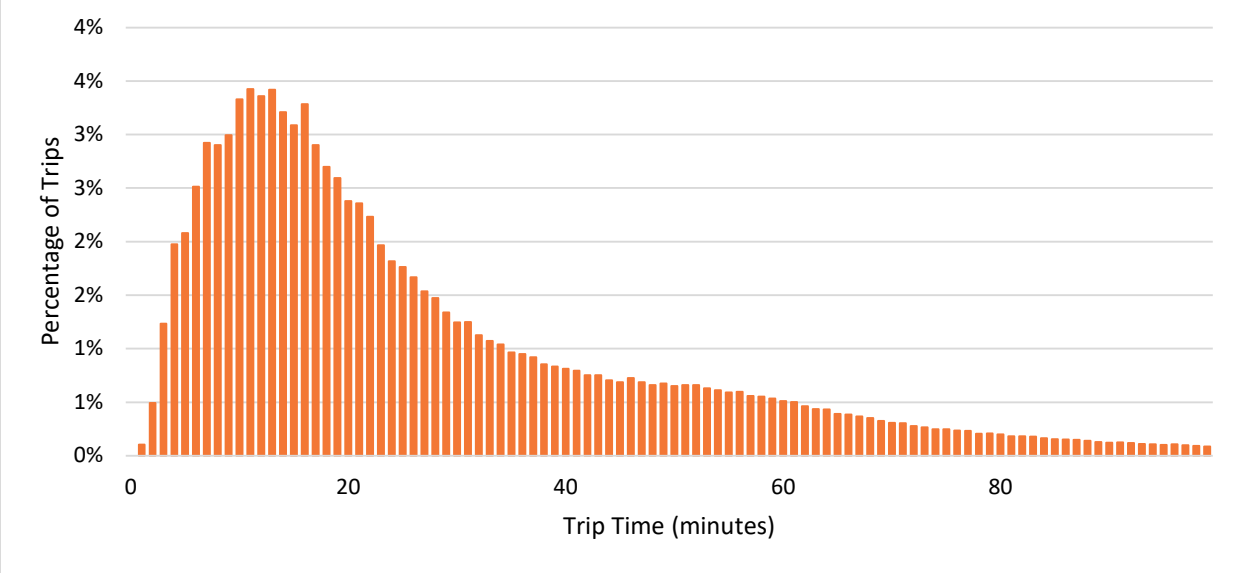


Figure 8. Trip Time Distribution

Figure 9 shows location points for each trip without a background map. With over 100 million data points, it is possible to visualize most roads in the vicinity of the project area, including lower volume roads far away from the existing Parks Highway. This demonstrates the magnitude and geographical range of the data sample. Note that the densities of waypoints in

the figure may not correspond to the number of trips beginning or ending in a TAZ region, as trips per region are a function of both the geographical extents of the region (i.e., not all regions are the same sized area) and the density of trips.

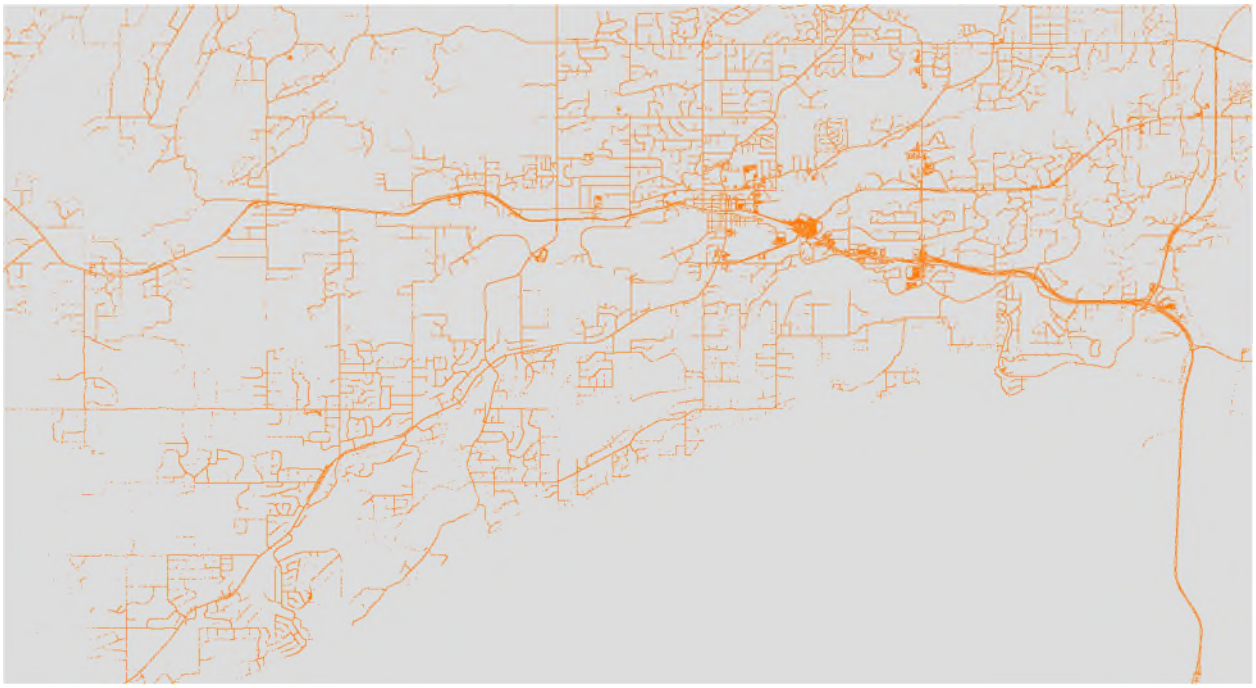


Figure 9. Trip Waypoint Datapoints

3.2 Comparing 2019 and 2021 Data

The May 2019 data were acquired in addition to 2021 data to compare travel behavior before and after the onset of the COVID-19 pandemic in March 2020. Travel patterns shown in May and June 2021 may be influenced by changes in travel behavior influenced by the ongoing COVID-19 response. These changes may not be sustained in future years as the pandemic recedes, which would reduce the soundness of conclusions based on those data. However, if travel patterns are similar, May 2019 can be excluded from the analysis.

3.2.1 Sample Size

The data sample for May 2019 is significantly smaller than for May 2021. This is because the data providers are gathering more data in their systems over time, with significant increases in their data volume occurring at the end of 2019. Table 1 shows the sample trip data points, trips, trip distance, and trip time for May 2019 and May 2021. The May 2021 sample has 25 times the number of data points, 33 times the number of trips, 20 times the trip distance, and 20 times the trip time compared to May 2019.

Table 1: Data Volumes for May 2019 and May 2021

	May 2019	May 2021	May 2019 as a Percentage of May 2021
Total Trip Data Points	2 million	49 million	4%
Total Trips	14,000	436,000	3%
Total Trip Distance (miles)	372,000	8 million	5%
Total Trip Time (minutes)	544,000	12 million	5%

3.2.2 Sample Passenger and Commercial Vehicle Distribution

The data sample is comprised of trips for both passenger vehicles and commercial vehicles. We compared the percentage of each type of trip for May 2019 and May 2021, as shown in Table 2. In the May 2019 sample, nearly two-thirds of trips were commercial vehicle trips, while in May 2021 only two percent of trips were commercial. Data collected by DOT&PF continuous counting stations on the Parks Highway show commercial vehicles represent six to seven percent of total volumes.[4] As such, only non-commercial trips were subsequently compared between the May 2019 and 2021 data.

Table 2: Commercial Vehicle Trip Proportions for May 2019 and May 2021

	May 2019	May 2021
Total Trips	14,000	436,000
Commercial Vehicle Trips	9,000	9,000
Commercial Vehicle Trips as a Percentage of Total Trips	64%	2%

3.2.3 Time of Day

The percentage of trips by the time of day is shown in Figure 10 for non-commercial traffic in May 2019 and May 2021. In May 2021, traffic grows more gradually from 4:00 AM to 6:00 PM, while in May 2019 there are plateaus where traffic levels out from 8:00 AM to 10:00 AM and from 12:00 PM to 2:00 PM. There is also a slightly higher peak from 4:00 PM to 5:00 PM in 2019.

A t-test was performed to decipher whether the difference in mean trips by the time of day was statistically significant between 2019 and 2021. A t-test is a way to see if the means of two samples (i.e., the 2019 and 2021 time of day trips) are different such that the difference is not due to randomness. A t-test can determine whether there is a "true" difference in sample means, rather than a difference that could be the result of random chance. It is a computational way to verify "sameness", instead of simply looking at a distribution and saying, "They look

[4] *Traffic Analysis and Data Application Website.* Alaska Department of Transportation and Public Facilities. Accessed 2021. https://alaskatrafficdata.drakewell.com/publicmultinodemap.asp

about the same". The t-test showed the May 2019 and 2021 data are not statistically significantly different by time-of-day trips.[5]

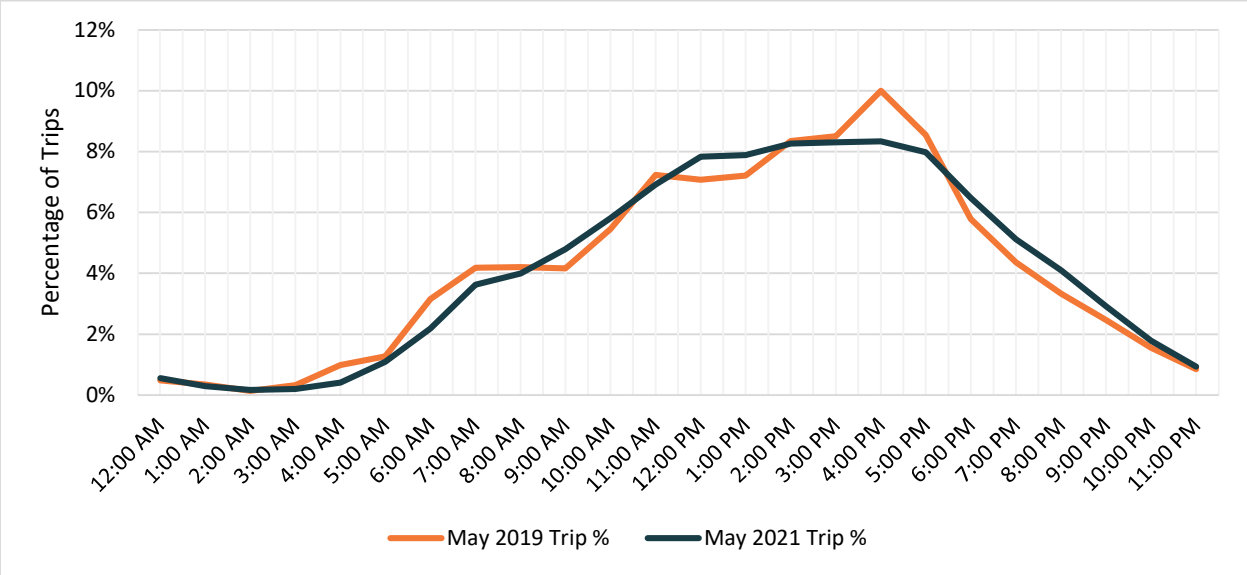


Figure 10. Trips by Time of Day for May 2019 and May 2021, Non-commercial Traffic

3.2.4 Origin-Destination

Comparing internal and external O-D pairs for non-commercial vehicles only, internal-internal trips grew from 63 percent of trips in May 2019 to 70 percent of trips in May 2021 (Figure 11). All this shift is driven by a reduction in internal-external trips, from 35 percent to 28 percent. This reduction could be associated with greater flexibility in work-from-home arrangements, reduced commercial offerings in terms of the number of businesses open and operational hours, and reactions to various COVID-19 pandemic responses (i.e. mandates and guidance) enacted by government or business entities.

[5] *A t-test is appropriate as the distributions are approximately normal. The t-test was run 100,000 times with random samples of 1,000 trips for each month. The p-value was 0.28, which indicates the null hypothesis, that the means are equal, was not rejected at the 0.05 significance level.*

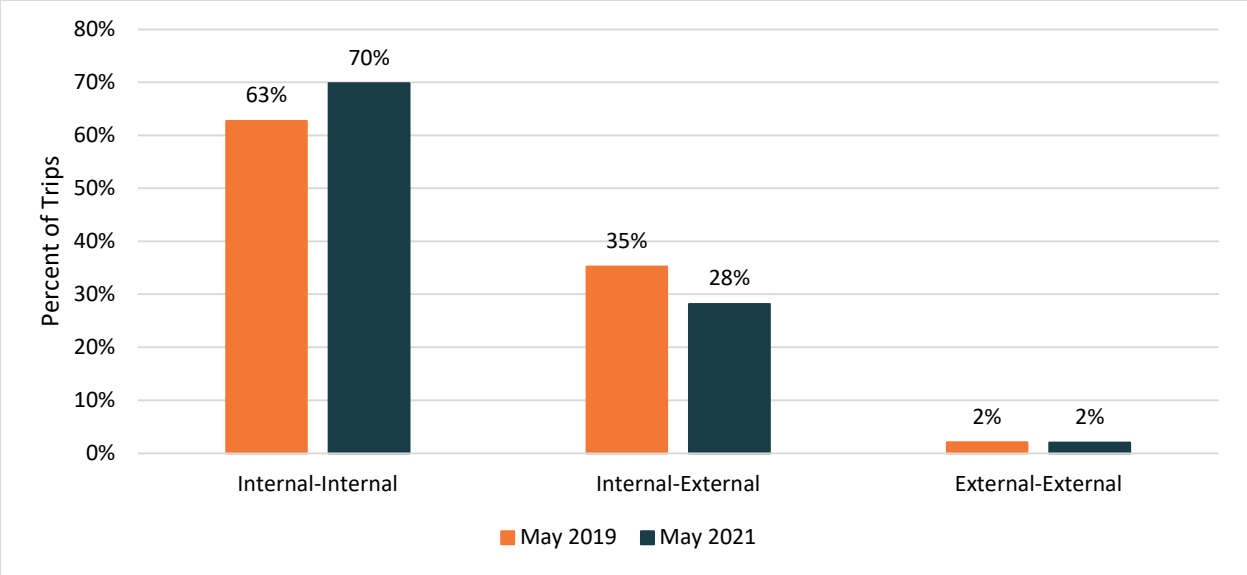


Figure 11. Passenger Vehicle O-D Pairs for Internal and External Regions, May 2019 and 2021

Finally, we compared the top 10 TAZ regions by the number of trips beginning or ending in the region and the top 25 O-D pairs between May 2019 and 2021. Non-commercial vehicles in both months used 90 percent of the same top 10 TAZs and 70 percent of the same top 25 O-D pairs.

3.2.5 Excluding 2019 Data from Further Analysis

The May 2019 data have a significantly smaller sample size and a higher percentage of commercial vehicle trips compared to the 2021 data. When analyzing trips by the time of day and O-Ds, the May 2019 and 2021 data are highly similar. Given these conclusions, the May 2019 data sample was excluded from further analysis. All subsequent analyses in this study use May 2021 and June 2021 data exclusively, with both non-commercial and commercial trips included

3.3 Calibration Factors

Total (i.e., directly recorded) traffic volumes were gathered from DOT&PF continuous counting stations (CCS) along the Parks Highway. We compared the CCS traffic volumes to the data sample traffic volumes to generate calibration factors that were then applied to the sample data. CCS traffic volumes along the Parks Highway at MP 39.9 (at Broadview Ave), MP 44.25 (at Church Road), and MP 48 (at Vine Road)[6] were analyzed for May 2021 and June 2021, the same months as the data sample.

Table 3 shows the population volumes, sample volumes, penetration rates, and calibration factors. The calibration factor is the quotient of the population volumes divided by the sample volumes, which will be subsequently applied to all trips in this analysis to better represent magnitudes off all trips that occurred.

[6] The station IDs for the CCS locations are 17005037, 17004000, and 14100048, respectively.

Table 3: Population and Sample Traffic Volumes and Sample Calibration Factors

	May 2021	June 2021
Population Traffic Volumes (thousands of vehicles/day)	28.4	29.6[7]
Data Sample Traffic Volumes (thousands of vehicles/day)	3.6	3.7
Penetration Rate (data sample as a percentage of population)	12.7%	12.4%
Calibration Factor Applied to Data Sample (population volumes ÷ sample volumes)	**7.9**	**8.1**

3.4 Seasonal Factors

Throughout this study, trips are seasonally factored to produce annual average daily and peak period traffic. This is to account for the higher traffic volumes that occur in the May and June months compared to the rest of the year. The seasonal factor was computed as the 2019 average of the factors for the three CCS locations on the Parks Highway within the study area (IDs 17005037, 17004000, 14100048), which was 1.094. The 2021 average annual daily traffic was not available at the time of the analysis.

3.5 Analysis Time Periods

The analysis summarizes trips by daily trips and weekday PM peak hourly trips. The PM peak period throughout is 3:00 to 6:00 PM. Trips in the three-hour PM peak period are then divided by three to compute average peak hourly flow. The analysis uses an average of the three hours because the peak hour varies along the Parks Highway, though not the three-hour peak period (i.e., always 3:00 to 6:00 PM). The AM peak period (7:00 to 10:00 AM) average hourly flow is also considered, though less emphasized as PM peak flows are significantly higher.

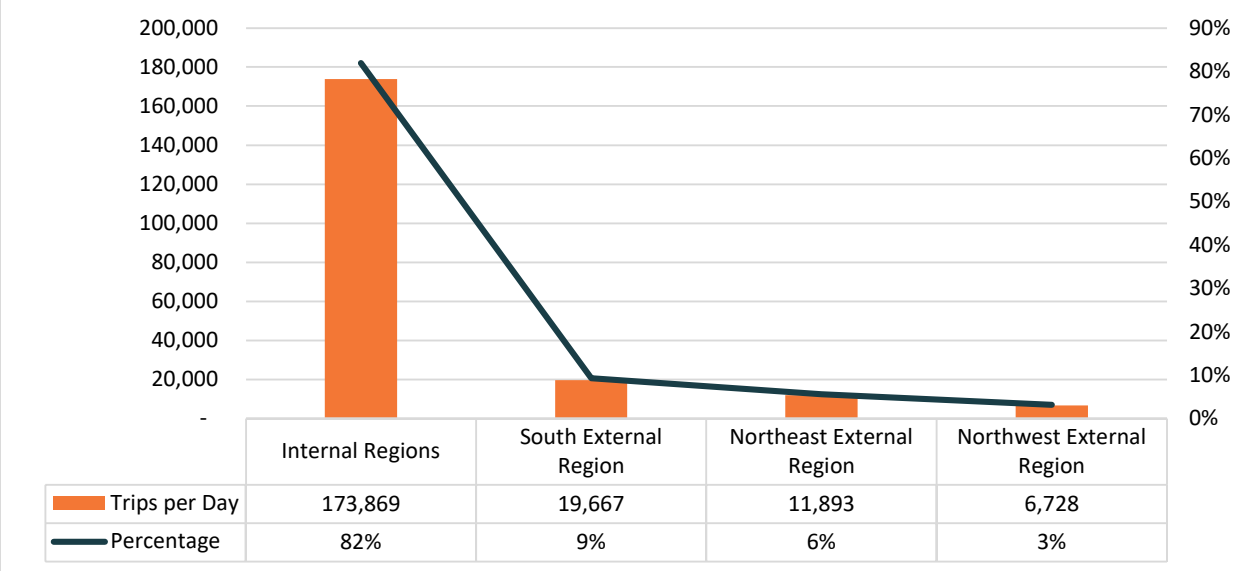
[7] The June 2021 data were not available for CCS 17005037. The May 2021 was used as a substitute.

4.0 TRAVEL PATTERNS ON THE EXISTING PARKS HIGHWAY CORRIDOR

The remainder of this analysis refers to travel patterns of the sample data after applying the calibration and seasonal factors previously developed and only considering trip data for May 2021 and June 2021. All analyses are aggregated by TAZ regions, as defined previously in Section 2.2. The analyses include non-commercial and commercial trips. Only trips that at some point touch the Parks Highway within the study area (i.e., Hyer Road to Hawk Lane) are considered in this analysis, as previously discussed.

4.1 Where Are the Most Trips Occurring?

Trips beginning or ending in internal regions accounted for 170,000 trips per day, while external regions accounted for 38,000 trips per day (Figure 12).[8] Of the external regions, most trips began or ended in the south external region, with 20,000 trips.



	Internal Regions	South External Region	Northeast External Region	Northwest External Region
Trips per Day	173,869	19,667	11,893	6,728
Percentage	82%	9%	6%	3%

Figure 12. Number of Trips with an Origin or Destination in Area

Trips are concentrated in relatively few TAZ regions. Figure 13 shows the cumulative percentage of trips accounted for by the top trip internal TAZ regions. The top five internal regions encompass nearly half of all trips, while the top 12 regions account for three-quarters of all trips.

[8] Note the trips are not mutually exclusive. For example, a single trip may have an origin in Mat-Su and a destination in Anchorage.

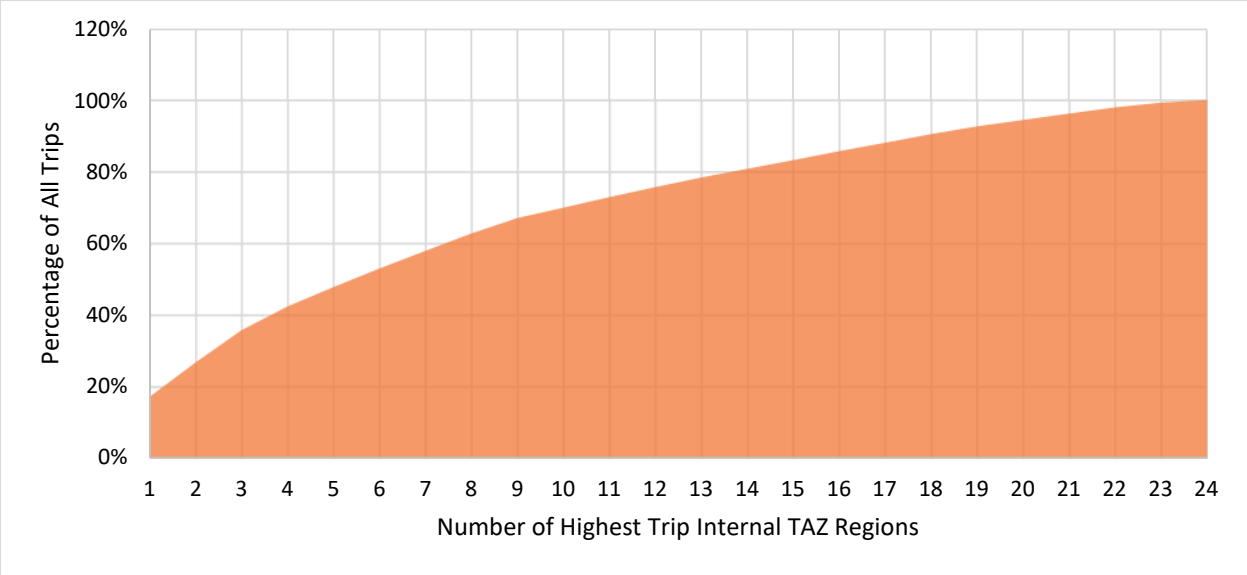


Figure 13. Percentage of Trips by Number of Internal TAZ Regions

The top trip internal TAZ regions, with corresponding percentages of all trips, are:

- Regions along the Parks Highway from Lucille Street to Hyer Road (53%)
- "KGB-South" (includes areas along Knik-Goose Bay Road south of Settler's Bay Road) (5%)
- "Pittman" (includes Meadow Lakes City Center) (5%)
- "Clapp" (includes Lake Lucille and Menard Memorial Sports Center) (4%)
- "Bogard" (includes Finger Lake Elementary and Three Bears Alaska) (3%)

Mat-Su Regional Hospital is a significant trip destination in the region and falls within the "Trunk" TAZ region. However, this region ranked 18th out of the 24 internal TAZ regions by total trips as the region only included four TAZs. Also of note, many trips to Mat-Su Regional Hospital involve driving south on Trunk Road and returning the same way, thus not touching the Parks Highway, and as such are not included in the dataset.

4.1.1 AM Peak Period

After assessing total trips by TAZ region for all hours, we analyzed travel patterns by AM and PM peak periods. Figure 14 shows the difference between destination trips and origin trips by TAZ region for the AM peak period. TAZ regions with more destination trips have a positive number and darker color, while TAZ regions with more origin trips have a negative number and lighter color. The net flow of traffic can be seen drawing trips from the outlying TAZ regions of the Mat-Su into downtown Wasilla and along the Parks Highway.

All three external TAZ regions had more destination trips than origin trips in the AM peak (Table 4). In total, this demonstrated an overall outbound traffic flow from the region (i.e., trips leaving region minus trips entering region) of 570 trips per hour, or nearly two times more outbound trips than inbound trips.

Table 4: Origin and Destination Trips per Hour by External Region, AM Peak

External Region	Destination (Outbound) Trips per Hour	Origin (Inbound) Trips per Hour	Difference
South External Region	890	400	490 (net outbound)
Northeast External Region	370	320	50 (net outbound)
Northwest External Region	190	160	30 (net outbound)
Total	**1,450**	**880**	**570 (net outbound)**

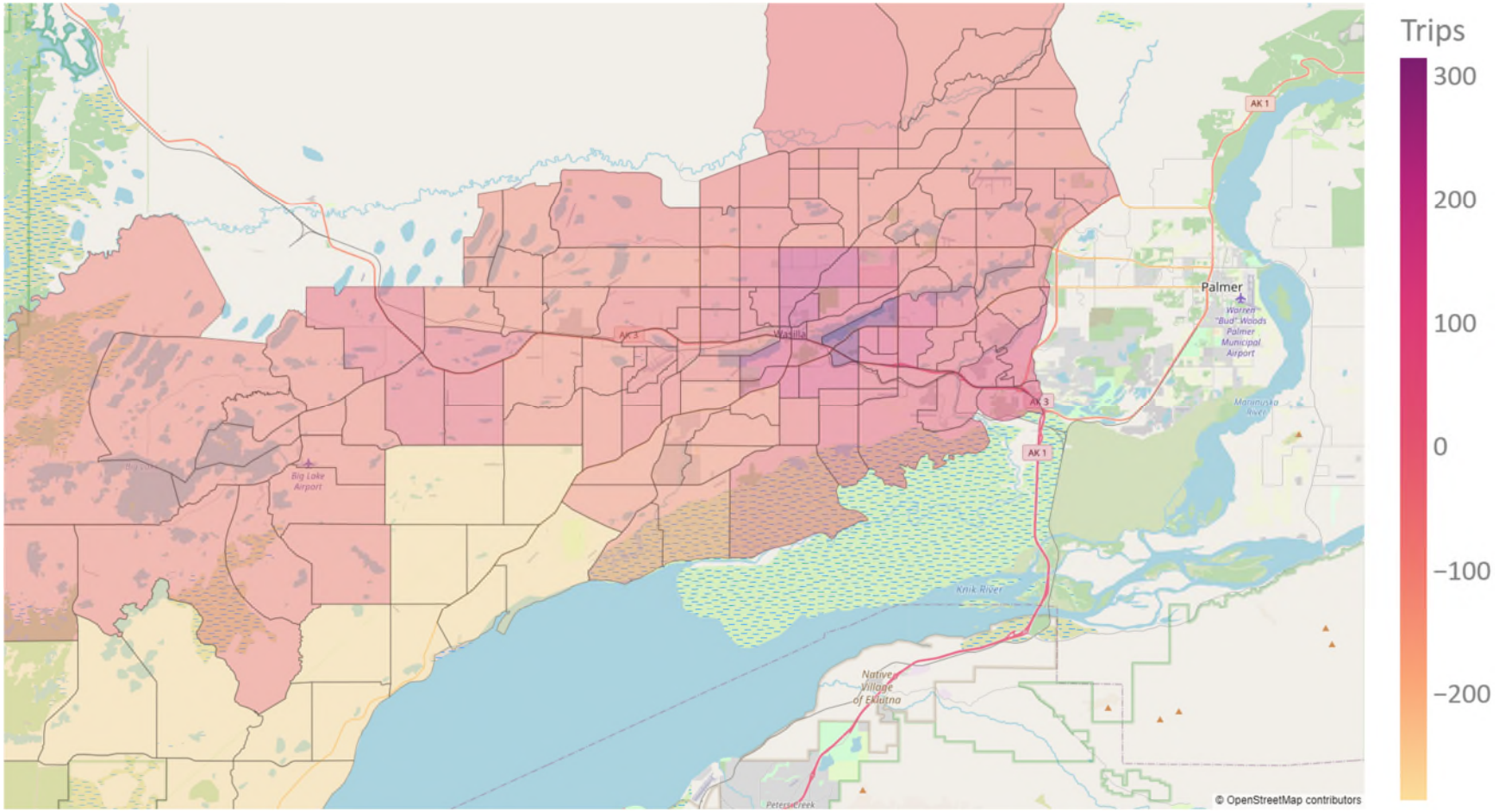


Figure 14. Origin and Destination Trips, AM Peak

4.1.2 PM Peak Period

The PM peak period travel patterns were the opposite of those in the AM peak period (Figure 15). The traffic flows for the PM period predominantly originate in the downtown Wasilla area and east toward Hyer Road with destinations along Knik-Goose Bay Road, the north side of the Parks Highway west of downtown, and north of Seldon Road.

External region trips similarly demonstrate an inbound traffic flow during the PM peak hours to the Mat-Su TAZ regions (Table 5). While a net of 570 vehicles per hour left the Mat-Su during the AM peak period, a net of 640 per hour returned to the Mat-Su during the PM peak period. This shows an imbalance between inbound and outbound traffic of 80 trips per hour when only considering the peak periods. A potential explanation is outbound trips to external regions are more distributed across the morning hours, while origin trips are more highly concentrated in the PM peak.

Table 5: Origin and Destination Trips per Hour by External Region, PM Peak

External Region	Destination (Outbound) Trips per Hour	Origin (Inbound) Trips per Hour	Difference
South External Region	770	1,420	-640 (inbound)
Northeast External Region	590	640	-50 (inbound)
Northwest External Region	370	320	50 (outbound)
Total	**1,730**	**2,380**	**-640 (inbound)**

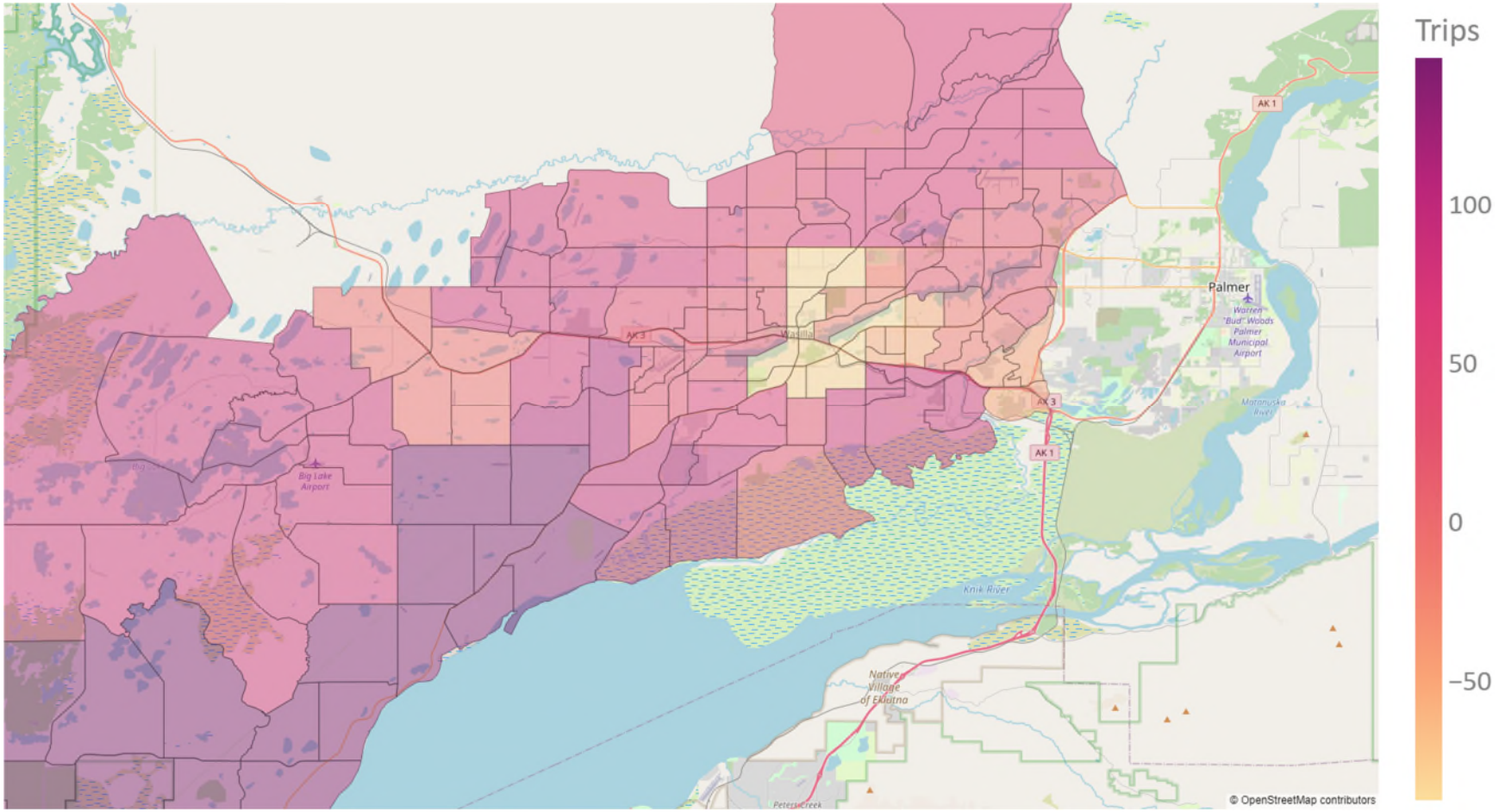


Figure 15. Origin and Destination Trips, PM Peak

4.2 What Are the Most Frequent Combinations of Origins and Destinations?

We analyzed O-D pairs to understand travel patterns between TAZ regions. O-D pairs were organized such that travel direction does not matter for whether a TAZ region was the origin or the destination of the O-D pair. Trips are organized into unique combinations of two TAZ regions as endpoints, regardless of which TAZ region is the origin or destination. Appendix A contains origin-destination trip tables where order does matter.

Overall, drivers completed 105,000 trips per day using 375 unique combinations of O-D TAZ regions. These trips are highly concentrated in a small subset of all O-D pairs, as shown in Figure 16. One-third of trips are concentrated in the top 25 O-D pairs, while nearly three-quarters of trips are encompassed in the top 30 percent of O-D pairs (or 150 pairs). Trips by O-D pair in the AM and PM peaks show similar distributions.

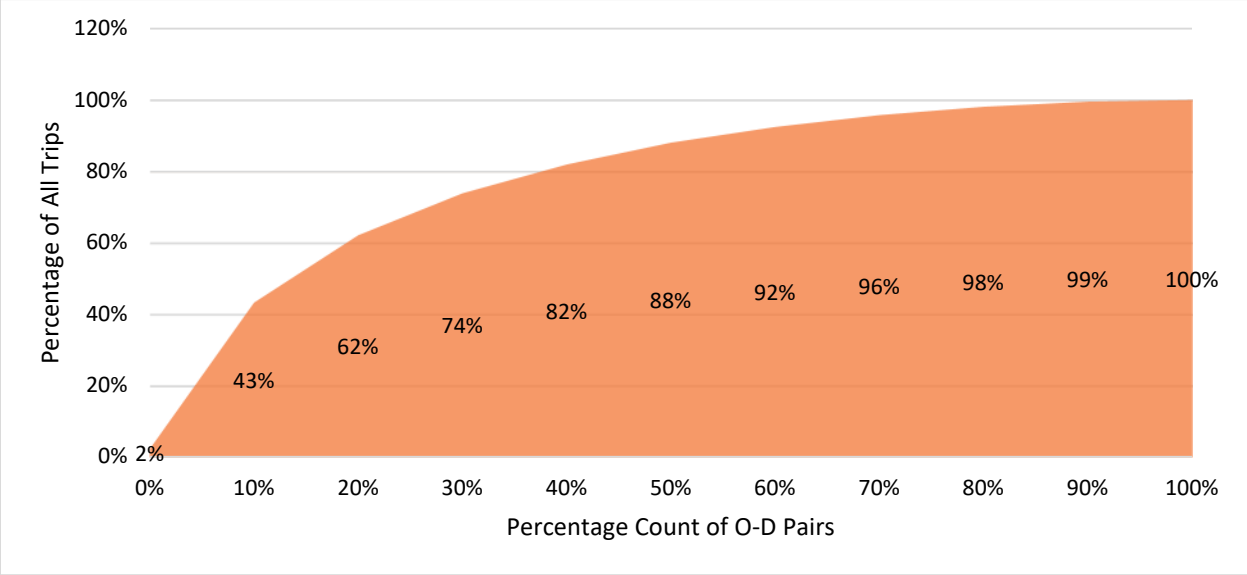


Figure 16. Percentage of Trips by Percentage Count of O-D Pairs

During the peak periods, internal-internal trips represent 61 to 64 percent of all trips (Figure 17). This percentage increases to 68 percent of trips outside of peak periods. This demonstrates that inter-regional trips are a larger driver of peak period traffic volumes, but that off-peak volumes are more heavily concentrated towards intra-regional trips.

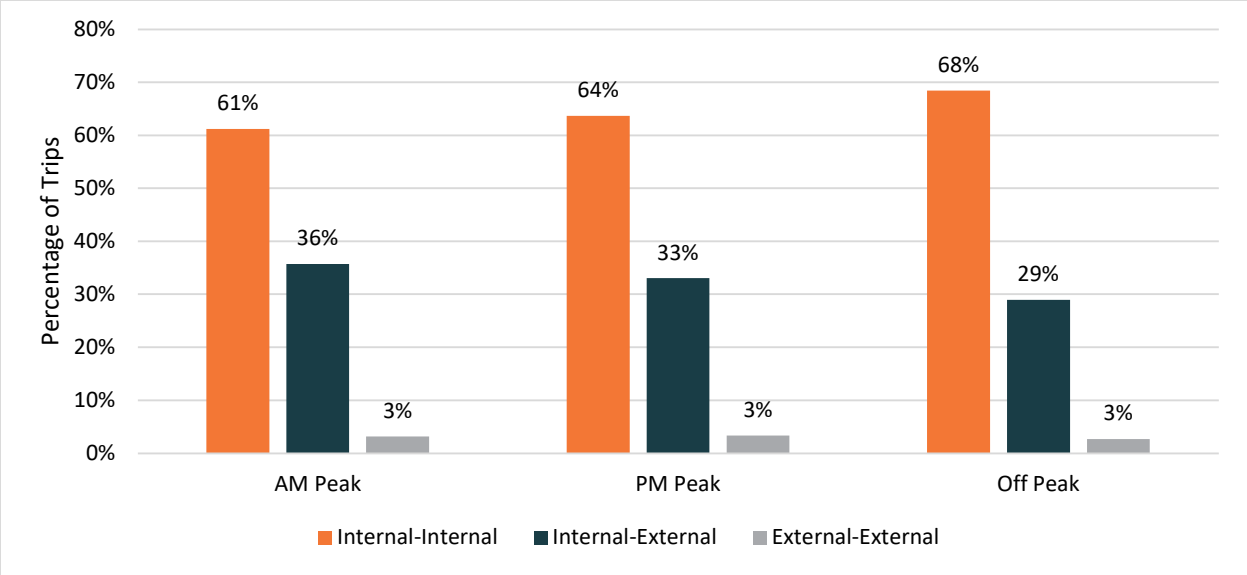


Figure 17. O-D Pairs for Internal and External Regions

4.2.1 Internal-Internal Trips

As mentioned in Section 4.1, trips to and from the downtown core of Wasilla along the Parks Highway is a popular travel pattern. When represented by O-D pairs, this becomes even more clear as trips to or from the "Palmer-Wasilla Hwy" TAZ region accounted for half of all internal-internal trips. This region covers north and south of the Parks Highway between Wasilla Lake and Hermon Road, as well as the north side of the Palmer-Wasilla Highway up to the Seward Meridian Highway. This area includes many large trip generators such as large grocery stores, retail centers, restaurant chains, clothing department stores, fitness centers, outdoor outfitters, elementary school, and a medical office park Other popular internal TAZ regions include the "Main", which covers downtown Wasilla, and "Fairview-East" TAZ regions, which includes a retail supercenter, movie theatre, car dealership, hotel, and several restaurants south of the Parks Highway between Hermon Road and Hyer Road. Table 6 shows the top 10 O-D trip pairs for all hours of the day.

Table 6: Top 10 Internal-Internal Trip O-D Pairs, All Hours

Origin TAZ Region	Destination TAZ Region	Trips per Day	Cumulative Percentage of Total Trips
Main	Palmer-Wasilla Hwy	2,400	3%
Fairview-East	Palmer-Wasilla Hwy	2,300	7%
Palmer-Wasilla Hwy	Palmer-Wasilla Hwy	2,100	10%
KGB-North	Palmer-Wasilla Hwy	1,500	12%
KGB-South	Palmer-Wasilla Hwy	1,400	14%
Palmer-Wasilla Hwy	Seward Meridian	1,300	16%
KGB-North	Main	1,200	17%
Lucille	Palmer-Wasilla Hwy	1,000	19%
Fishhook	Palmer-Wasilla Hwy	1,000	20%

Origin TAZ Region	Destination TAZ Region	Trips per Day	Cumulative Percentage of Total Trips
Fairview-East	Main	1,000	22%

4.2.2 Internal-External Trips

Of the 35 percent of all trips that were internal-external, over half of these trips were to or from the south external region and a third were to or from the northeast external region (Figure 18). This demonstrates significant traffic flows over the eastern end of the project area, regardless of the time of day.

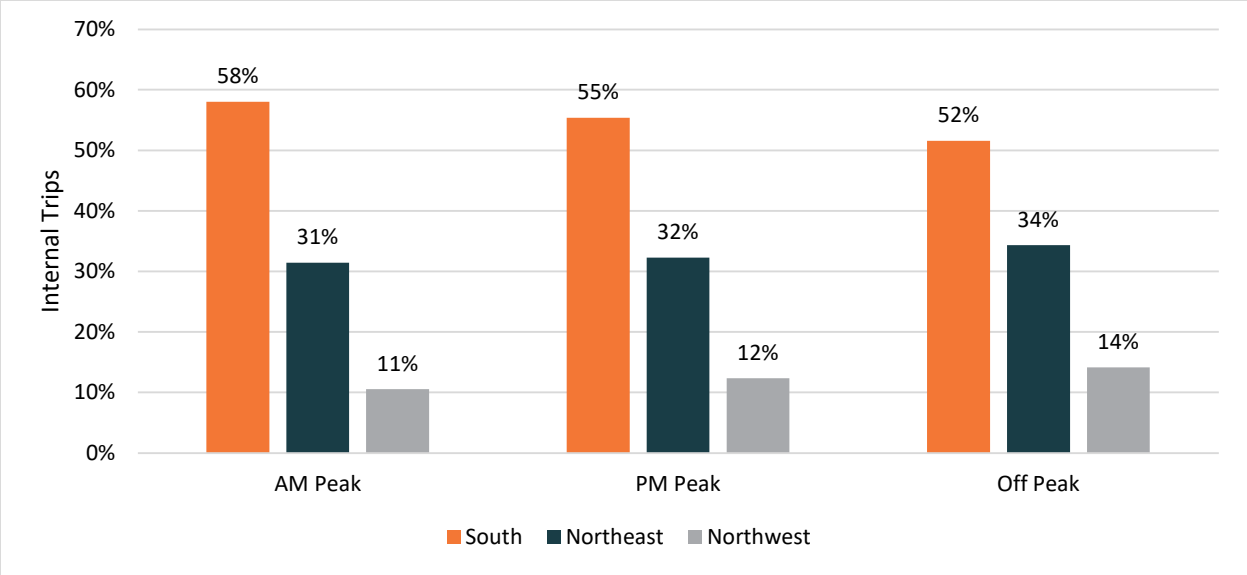


Figure 18. Internal-External Trip Pairs by External Region

From all three external regions, the most frequent internal region destinations are near downtown Wasilla and the Palmer-Wasilla Highway and Parks Highway intersection. Knik-Goose Bay Road south of Settler's Bay Road ("KGB-South") is a highly used destination from the south and northeast external regions.

4.2.3 External-External Trips

External-external trips represented three percent of all trips, and of these, trips between the northwest and the south or northeast regions accounted for 80 percent of this category (Table 7). This demonstrates the large trip distances involved with most external-external trips.

Table 7: O-D Pairs for External-External Trips

Origin External Region	Destination External Region	Trips – All Hours	Trips – AM Peak	Trips – PM Peak
Northwest	South	66%	63%	66%
Northeast	Northwest	13%	17%	12%

Origin External Region	Destination External Region	Trips – All Hours	Trips – AM Peak	Trips – PM Peak
Northeast	Northeast	9%	9%	8%
Northeast	South	5%	5%	7%
South	South	5%	5%	6%
Northwest	Northwest	1%	2%	1%

4.3 What Routes Does Traffic Take Between Origins and Destinations?

After understanding which TAZs are the highest use origins and destinations and which O-D pairs are most used, we analyzed the routes that traffic takes between origins and destinations. This section focuses on the PM peak, due to the higher traffic volumes and traffic design typically being driven by the evening peak period.

4.3.1 Internal-Internal Trips

Origins for internal-internal trips during the PM peak were shown in Section 4.2.1 to be concentrated in the downtown Wasilla area bound by Lucas Road to the west, Seward Meridian Parkway to the east, Fern Street to the south, and Seldon Road to the north.[9] High use destination TAZ regions were identified as (1) “Pittman”, (2) “KGB-South”, and (3) “Bogard” and “Fishhook”.

Figure 19, Figure 20, and Figure 21 show the most heavily used roads between the origin area and “Pittman”, “KGB-South”, and “Bogard” and “Fishhook” together, respectively. The following patterns were observed:

- For traffic going from the downtown Wasilla origin area to the “Pittman” destination, the Parks Highway is the main east-west route used, with Church Road and Pittman Road being the primary north-south side streets to access the Parks Highway.
- Traffic traveling from downtown Wasilla to “KGB-South” heavily use Knik-Goose Bay Road, but alternative use of Clapp Street and Vine Road does occur.
- Between downtown Wasilla and “Bogard” and “Fishhook”, travelers have multiple options and a dominant route does not appear in the data. Use of the Palmer-Wasilla Highway, Fishhook Road, Bogard Road, and the Parks Highway to travel east-west appear evenly distributed. The primary north-south route is the Seward Meridian Parkway.

[9] The TAZ regions that make up this area are “Crusey”, “KGB-North”, “Lucille”, “Main”, “Palmer-Wasilla Hwy”, and “Seward Meridian”.

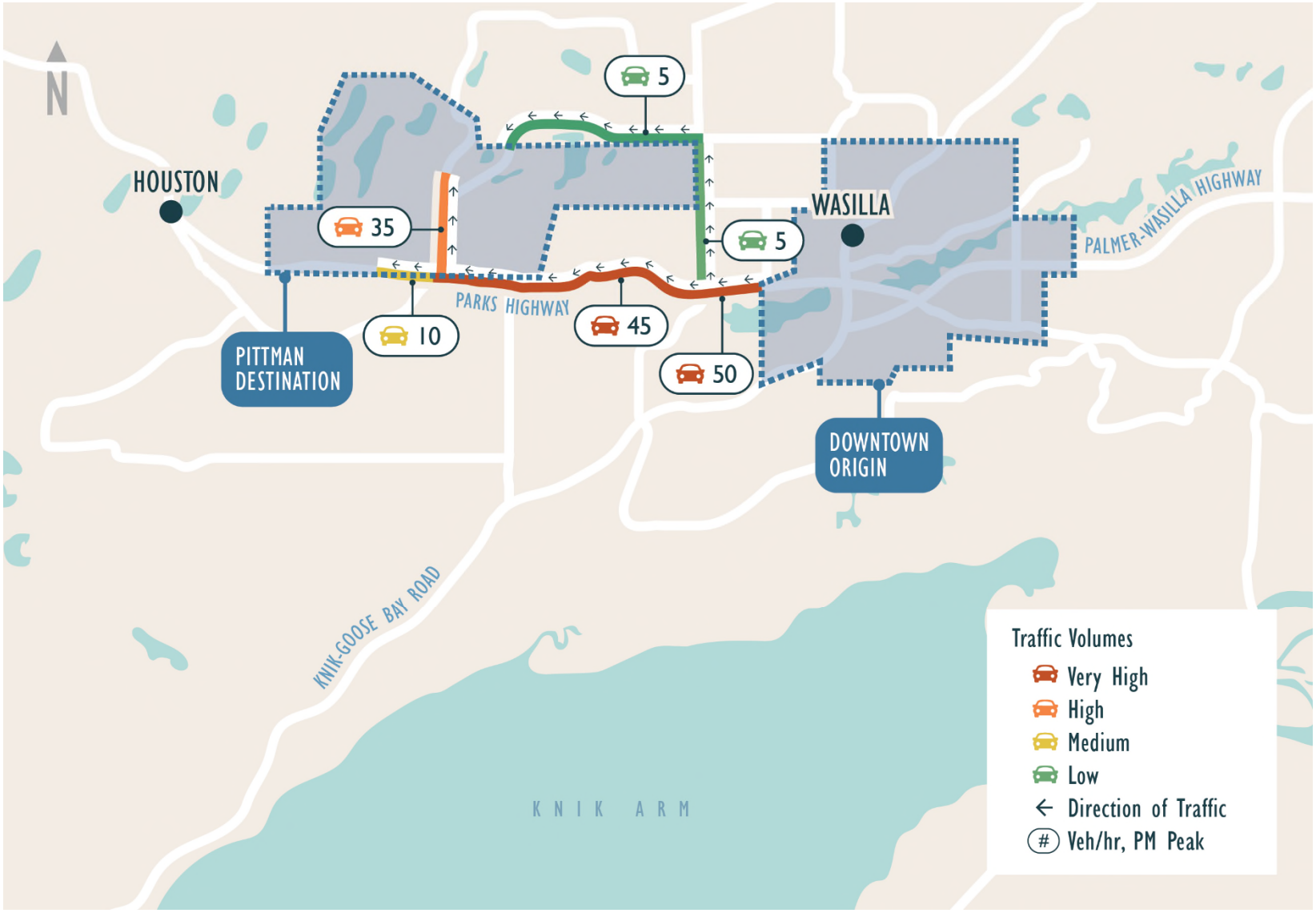


Figure 19. Trips by Link between Origin and Destination Region, PIttman Destination

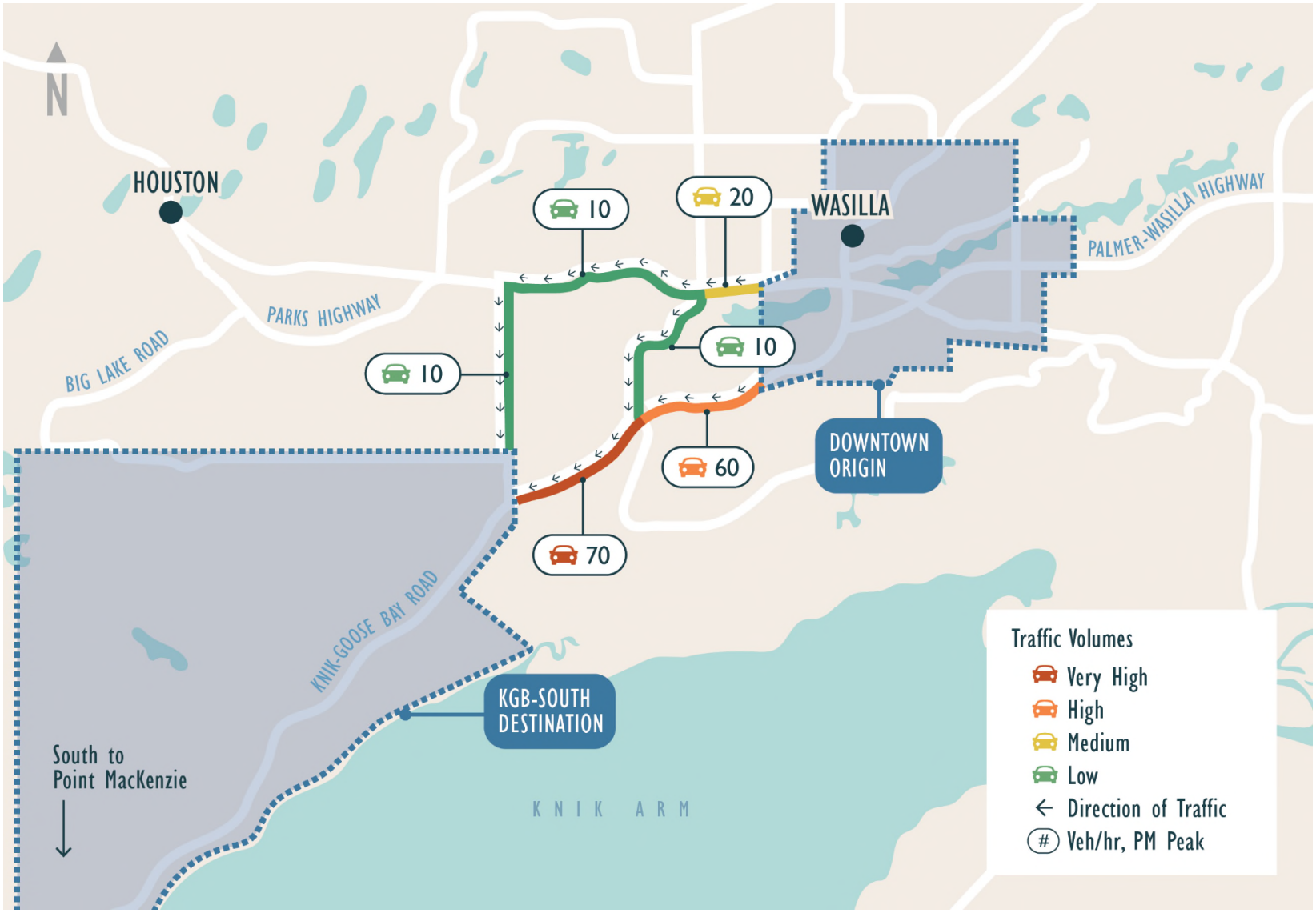


Figure 20. Trips by Link between Origin and Destination Region, KGB-South Destination

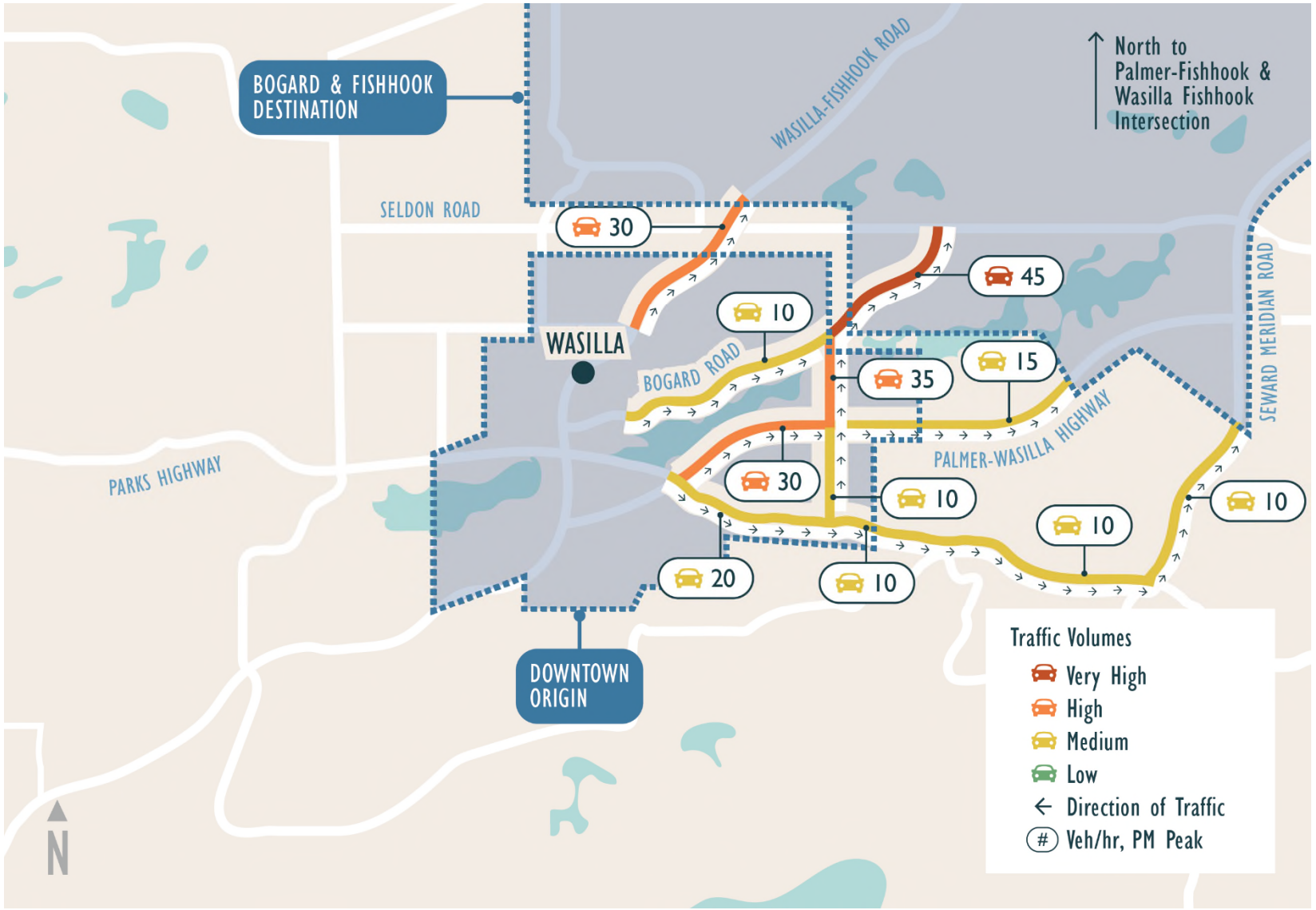


Figure 21. Trips by Link between Origin and Destination Region, Bogard & Fishhook Destination

4.3.2 Internal-External Trips

To understand route choice for internal-external trips, we analyzed patterns between each external region and the downtown Wasilla area (same area as the origin for internal-internal trips shown in Section 4.3.1). We also analyzed patterns to the "KGB-South" from the south and northeast external regions.

Table 8 shows the number of trips between the selected focus internal and external regions. The south and northeast external regions were more heavily origins in the PM peak, though the northeast external region was more balanced. The inverse was true for the northwest external region: more trips occurred with the northwest external region as the destination instead of the origin.

Table 8: Trips per Hour between Internal and External O-D Areas, PM Peak

Origin Region	Destination Region	Trips per Hour (Reverse O-D)
South External Region	Downtown Wasilla	460 (300)
	Southwest Internal Area	100 (50)
Northeast External Region	Downtown Wasilla	250 (250)
	Southwest Internal Area	50 (40)
Downtown Wasilla	Northwest External Region	110 (70)

Figure 22 through Figure 26 show the most heavily used roads between the origin and destination pairs listed previously in Table 8. The following patterns were observed:

- Vehicles from the south external region almost exclusively use the Parks Highway to arrive in downtown Wasilla. The density of trips decreases west of the Seward Meridian Highway, with a very low-density west of Lucille Street. Vehicles traveling to "KGB-South" most heavily use the Parks Highway to Knik-Goose Bay Road, with the density of trips along Knik-Goose Bay Road decreasing south of Settler's Bay.

- From the northeast external region, vehicles continue to use the Parks Highway from the Glenn Highway and from Trunk Road to access downtown Wasilla. However, trip density is also high along the Palmer-Wasilla Highway for the entire route into downtown. The third route with lower density is Bogard Road into downtown. For vehicles traveling to "KGB-South", trip density is more evenly split between the Parks Highway and the Palmer-Wasilla Highway.

- From downtown Wasilla to the northwest external region, vehicles exclusively travel along the Parks Highway.

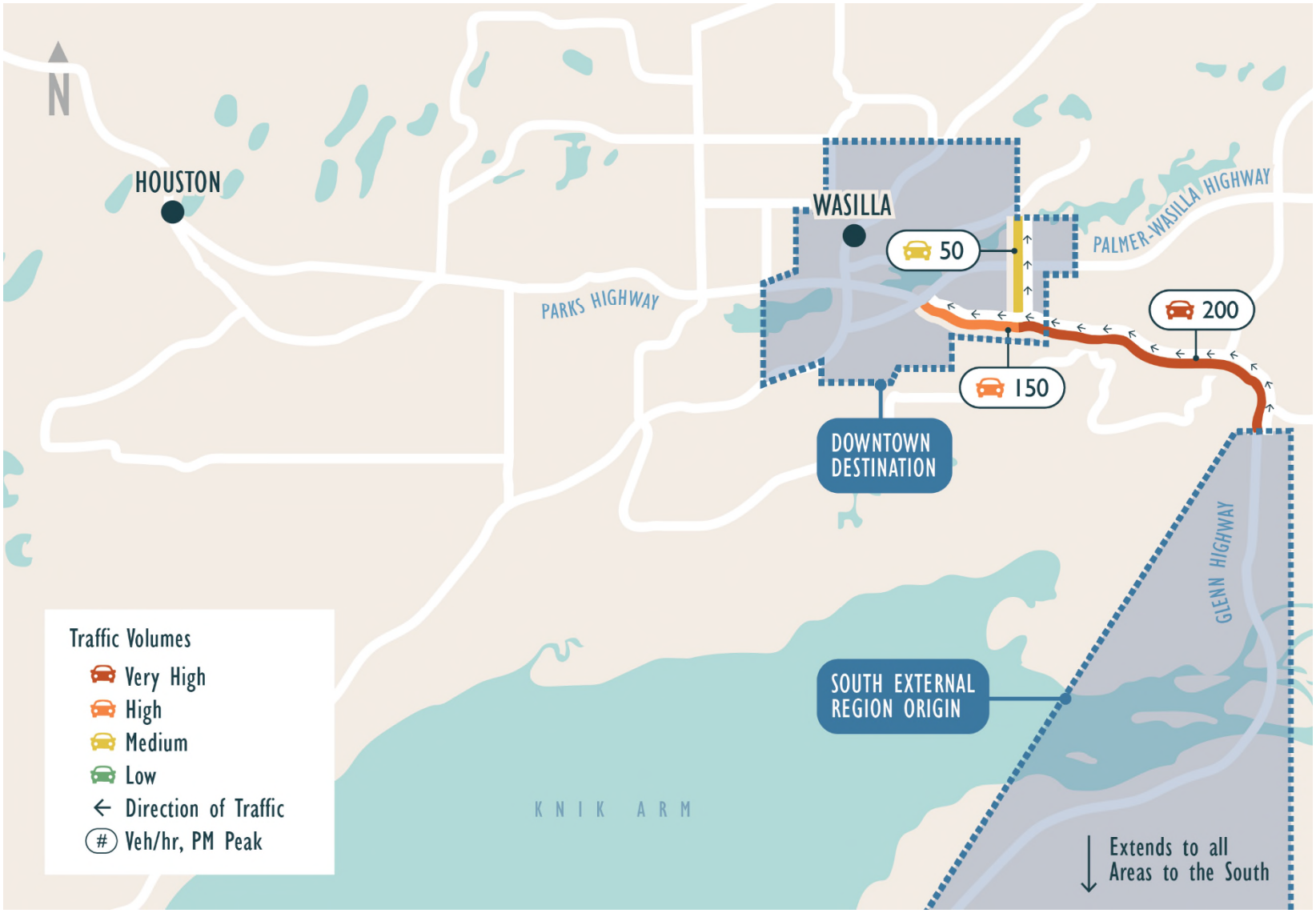


Figure 22. Trips by Link from South External Region to Downtown Wasilla

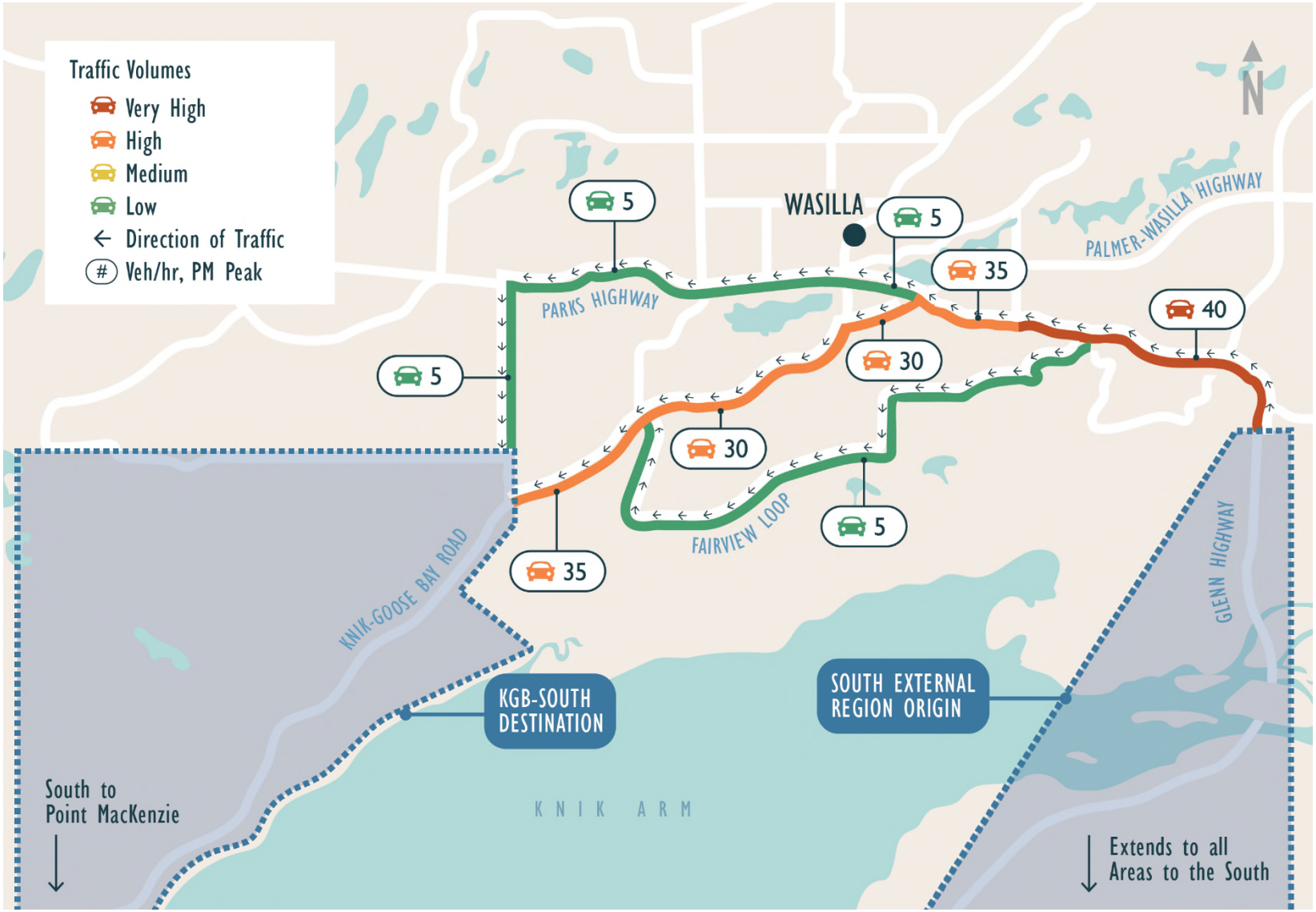


Figure 23. Trips by Link from South External Region to KGB-South

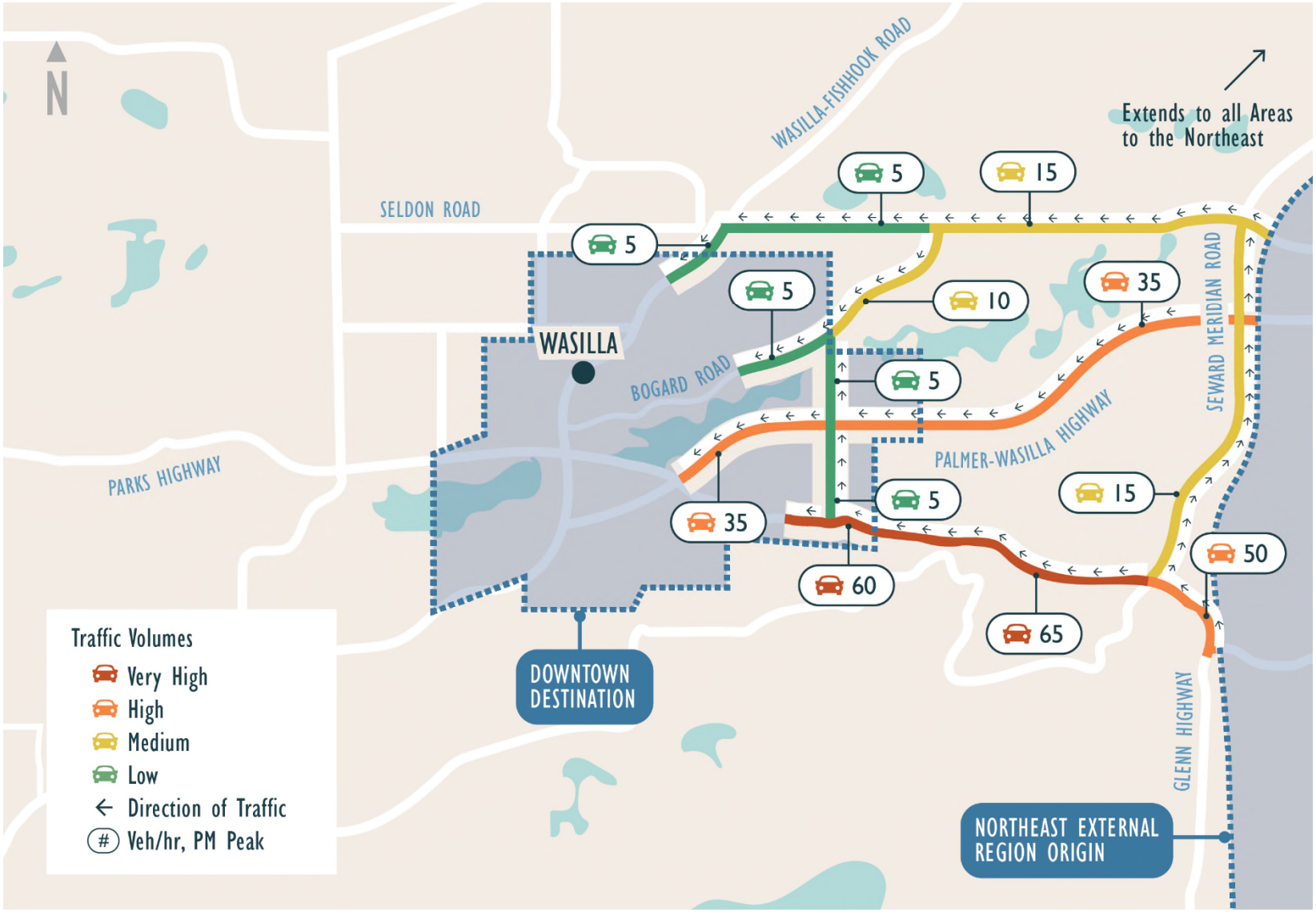


Figure 24. Trips by Link from Northeast External Region to Downtown Wasilla

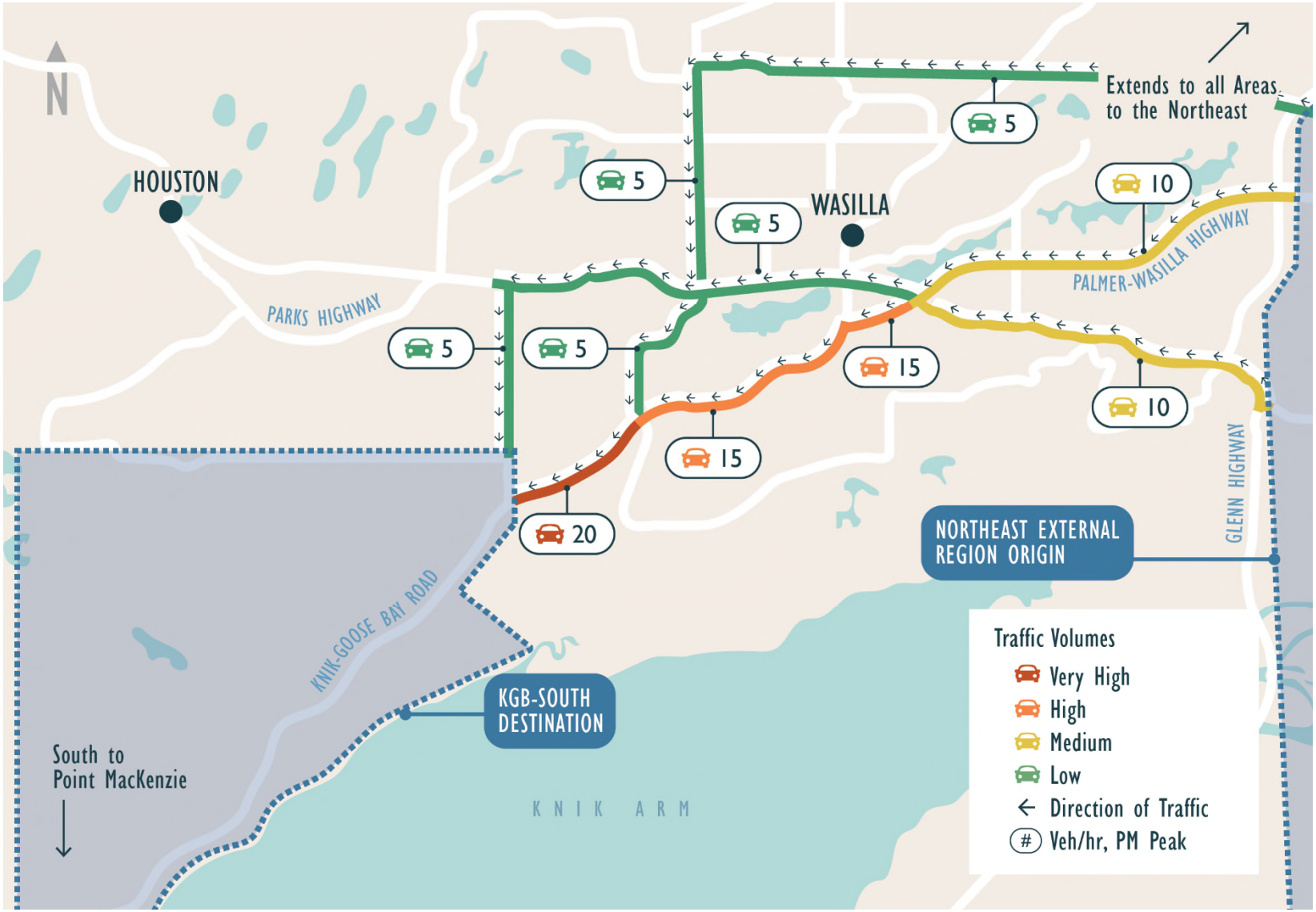


Figure 25. Trips by Link from Northeast External Region to KGB-South

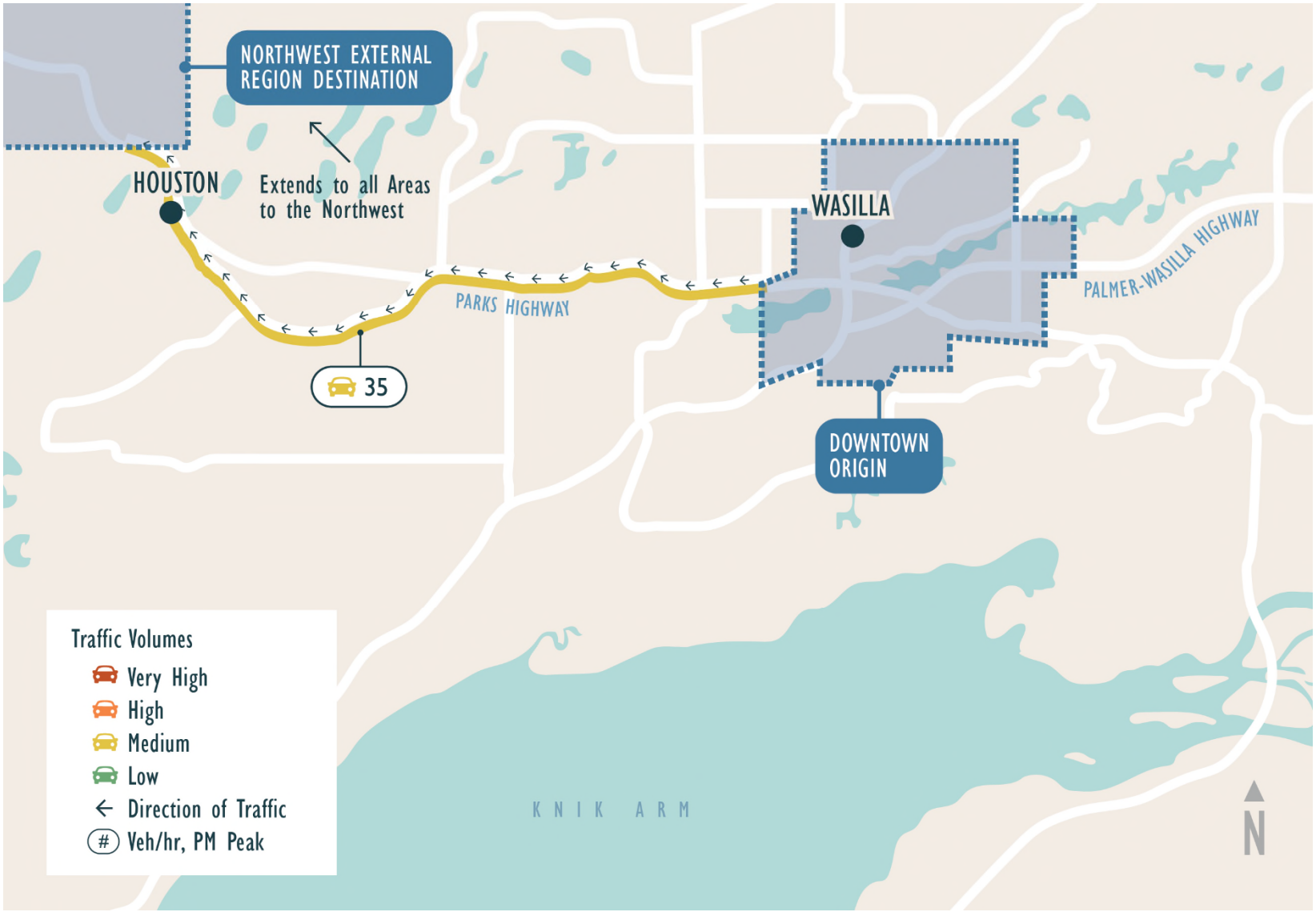


Figure 26. Trips by Link from Downtown Wasilla to Northwest External Region

5.0 EXPECTED TRAVEL PATTERNS ON THE ALTERNATIVE CORRIDOR

In this section, we use the findings from Section 4.0 to (1) identify which interchange locations would experience the highest use and (2) estimate the amount of traffic that is likely to use the alternative corridor. We have undertaken a qualitative analysis (Section 5.1) which manually re-assigns traffic to the alternative corridor based on observations in the O-D data and a trip assignment model (Section 5.2) which uses a mathematical algorithm to re-assign Parks Highway trips based upon the lowest travel time between two locations.

5.1 Qualitative Analysis

Estimating how much traffic is likely to use the alternative corridor is highly dependent on where interchanges are assumed to be located. By analyzing route choice shown previously in Section 4.3, the interchange locations shown in Figure 27 are likely to draw the most traffic away from the existing Parks Highway. An east connection was assumed with the existing Parks Highway between the Hyer Road and Seward Meridian Highway interchanges and a west connection between the Pittman Road and Big Lake Road intersections. These connection assumptions are consistent with conceptual alignments detailed in the Parks Highway Alternative Corridor Project Conceptual Corridor Planning Report.[10]

We then assigned each TAZ region to an interchange number. The assigned interchange is the one a TAZ region would likely use assuming drivers from the region use the alternative corridor. TAZ regions by interchange number are shown in Table 9.

[10] *Parks Highway Alternative Corridor Project – Conceptual Planning Report.* Alaska Department of Transportation and Public Facilities. 2015. http://www.parkshighwayalternative.com//documents/PHAC%20Conceptual%20Corridor%20Planning%20Report%20-%20Final%20-%200415.pdf

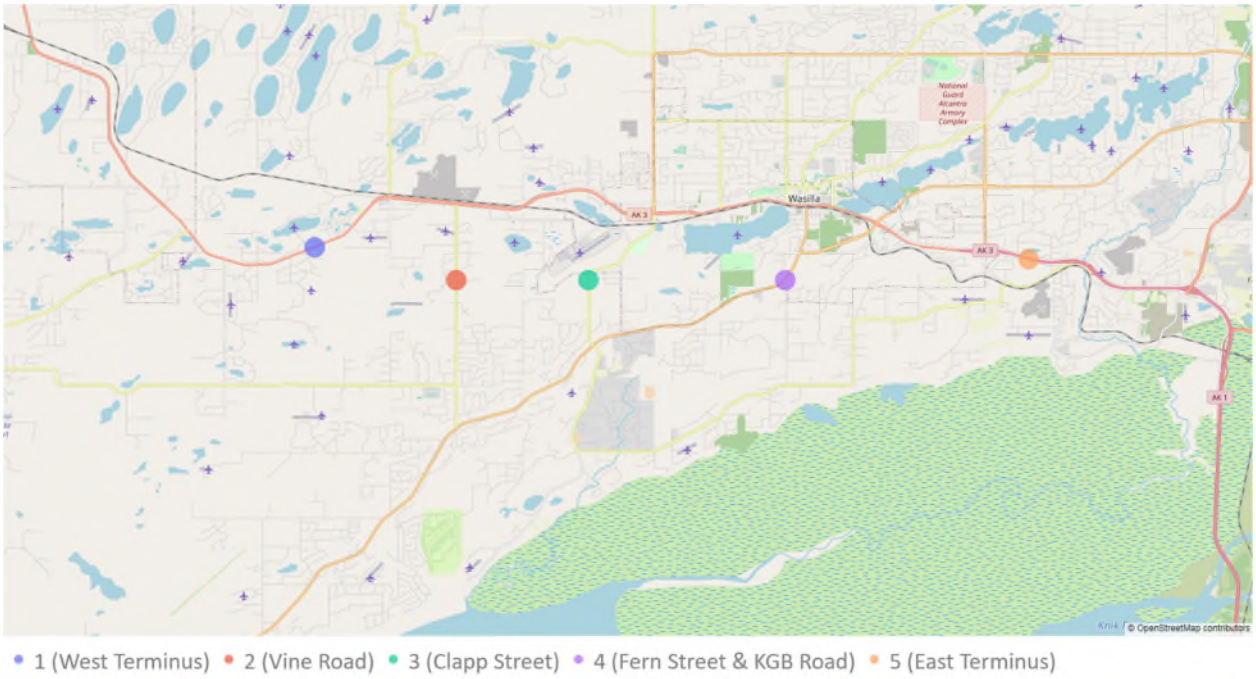


Figure 27. Interchange Locations

Table 9: TAZ Regions by Assigned Interchange Number

Interchange Number (Location)	TAZ Region
1 (West Terminus)	Northwest External Region
	Big Lake Road
	Parks-Big Lake
2 (Vine Road)	Pittman
	Vine
	KGB-South
3 (Clapp Street)	Fairview-West
	Clapp
	Church-South
	Church-North
	Lucas
4 (Fern Street & KGB Road)	Fern
	KGB-North
	Fairview-Central
	Lucille

Interchange Number (Location)	TAZ Region
	Shrock
	Main
	Crusey
	Palmer-Wasilla Hwy
	Fishhook
5 (East Terminus)	Hyer
	Fairview-East
	Trunk
	South External Region
	Northeast External Region
	Seward Meridian
	Bogard

5.1.1 Scenarios

We analyzed three scenarios based on the difference in interchange segments (distance between two consecutive interchanges) between the origin and destination to estimate the amount of traffic that would use the alternative corridor:

1. Scenario 1: O-D path includes a minimum of one interchange segment.
2. Scenario 2: O-D path includes a minimum of two interchange segments.
3. Scenario 3: O-D path includes a minimum of three interchange segments.

The three scenarios attempt to answer the question “How much travel time savings is needed for drivers to use the alternative corridor versus the existing Parks Highway?” Travel times were estimated using the existing Parks Highway and the alternative corridor, by the difference in interchanges. The following assumptions were made:

- The total alternative corridor alignment distance from the west terminus to the east terminus is 10.8 miles. The same distance traveled is assumed for the existing Parks Highway and the alternative corridor.[11]
- Travel speed on the existing Parks Highway was assumed to be the posted speed limit of 45 mph. Travel speed on the alternative corridor was assumed to be 60 mph.[12]

[11] Depending on where drivers divert to the alternative corridor, traveling on the alternative corridor may involve driving the additional offset distance between the existing Parks Highway and the alternative corridor. This may result in an overstatement of travel time savings in using the alternative corridor.

[12] Travel speeds on the existing Parks Highway are likely lower than 45 miles per hour during congested periods. This may result in an understatement of travel time savings in using the alternative corridor.

- The travel time on the existing Parks Highway accounted for signalized intersection delay. With 12 intersections between the alternative corridor west and east termini, there are an average of three signalized intersections between each interchange. 45 seconds of delay per intersection was assumed, which corresponds to the middle of the range of level-of-service D.[13]

Estimated travel time differences by the number of interchange segments are shown in Table 10. Vehicles traveling across one interchange segment are estimated to save 3.2 minutes in travel time, with vehicles traveling three interchange segments estimated to save 9.5 minutes. Travel time savings per year assume the trip is made twice per day, five days per week, 52 weeks per year.

Table 10: Estimated Travel Times on Existing Parks Highway and Alternative Corridor by Interchange Difference

Interchange Segments	Distance (mi)	Travel Time on Existing Parks Highway (minutes)	Travel Time on Alternative Corridor (minutes)	Difference in Travel Time (minutes)	Travel Time Savings Per Year (minutes)
1	2.7	5.9	2.7	-3.2	1,600
2	5.4	11.7	5.4	-6.3	3,300
3	8.1	17.6	8.1	-9.5	4,900

5.1.2 Results

The expected percentage of trips that would use the alternative corridor by scenario (as detailed previously in 2.4.1) are shown in Table 11. For all hours, the expected percentage ranges from 67 percent for Scenario 1 to 16 percent for Scenario 3. Scenario 3 represents a lower bound of expected traffic, with Scenario 1 representing an upper bound. Scenario 2 is the most likely, as five minutes of travel time savings per trip is likely a sufficient incentive for drivers to alter their travel paths. The percentage that would likely use the alternative corridor increases slightly for the PM peak.

Table 11: Expected Trips to Use Alternative Corridor, per Qualitative Analysis

Time of Day	Scenario	Percentage Using Alternative Corridor	Trips per Period
All Hours	Scenario 1: Min. One Interchange Segments	67.2%	70,700 trips/day
	Scenario 2: Min. Two Interchange Segments	30.2%	31,700 trips/day

[13] Several signalized intersections along the existing Parks Highway have a higher average delay and operate at or near level-of-service F, which corresponds to more than 80 seconds of average vehicle delay, over double the assumed delay in this analysis. This may result in an understatement of travel time savings in using the alternative corridor.

Time of Day	Scenario	Percentage Using Alternative Corridor	Trips per Period
	Scenario 3: Min. Three Interchange Segments	16.0%	16,800 trips/day
PM Peak	Scenario 1: Min. One Interchange Segments	67.9%	7,000 trips/hour
	Scenario 2: Min. Two Interchange Segments	30.9%	3,180 trips/hour
	Scenario 3: Min. Three Interchange Segments	16.8%	1,730 trips/hour

To understand how travel patterns may shift, Table 12 shows the percentage of internal-internal, internal-external, and external-external trips that would likely use the alternative corridor.

Because of the long distances traveled, all trips between the northwest external region and either the northeast or south external regions are expected to shift their paths. By using the alternative corridor, drivers would bypass the 12 signalized intersections along the existing Parks Highway, while traveling at a higher speed the entire length of the corridor with little to no change in total trip distance.

About half of the internal-external trips are expected to shift. Drivers from the “KGB-South” and “Fern” regions traveling to the south external region would likely access the alternative corridor at the Clapp Street or Fern Street interchanges, then have uninterrupted flow back onto the existing Parks Highway at the east terminus system-to-system interchange. The alternative corridor allows these drivers to bypass the Palmer-Wasilla Highway intersection, the most congested intersection in the area. Drivers from the northwest external, “Big Lake Road”, and “Parks-Big Lake” regions would likely use the alternative corridor to travel to downtown Wasilla via the west terminus to the Fern Street interchange, bypassing eight signalized intersections on the existing Parks Highway.

Internal-internal trips are expected to see the smallest percentage shift to the alternative corridor. Many of these trips involve traveling between the “Main” and “Palmer-Wasilla Highway” regions, or within the same region. Drivers with shorter trip distances would be less incentivized to travel an additional north-south distance to access the alternative corridor, particularly if the distance is less than a difference of one interchange-to-interchange segment. Many of these trips prioritize ease of access to their destinations, with less demand for the increased mobility of a controlled-access facility.

However, internal-internal drivers going from “Vine” and “Pittman” to downtown Wasilla are likely to use the alternative corridor via the interchanges at Vine Street and Fern Street, bypassing five signalized intersections. Additionally, drivers going between regions east of the Seward Meridian Highway and regions west of Clapp Street are likely to access the alternative corridor at the east terminus and Clapp Street or Vine Street interchanges, bypassing eight signalized intersections.

Table 12: Expected Percentage of Trips to Use Alternative Corridor by Trip Type, Scenario 2

Trip Category	Percentage of All Trips	Percentage of Category Likely to Use Alternative Corridor	Percentage of All Trips Likely to Use Alternative Corridor
Daily			
Internal-Internal	66.7%	24.0%	16.0%
Internal-External	30.5%	39.2%	12.0%
External-External	2.8%	79.1%	2.2%
PM Peak Period			
Internal-Internal	63.7%	24.5%	15.6%
Internal-External	33.0%	38.5%	12.7%
External-External	3.3%	78.0%	2.6%

Based on the qualitative analysis, a traffic volume shift of 30.2 percent to the alternative corridor is likely, with interchanges assumed at the east terminus at the existing Parks Highway, Fern Street, Clapp Street, Vine Road, and the west terminus at the existing Parks Highway.

5.2 Trip Assignment Modeling

The qualitative analysis selected preliminary interchange locations by analyzing travel paths of traffic on the existing Parks Highway and estimated traffic shifting to the alternative corridor using assumptions of interchange segment thresholds needed for drivers to change routes. The TAM refines which interchanges are most beneficial by running iterations with and without certain interchanges, and comparing results of shifting traffic volumes. The TAM takes a more detailed approach to estimating the quickest travel paths with varying speed limits, lengths, and nodal delay for each path, and thus more precisely estimates how much traffic is likely to shift to the alternative corridor.

5.2.1 Building the Model

Road Segments, Intersection Nodes, Links, and Entry Points

Both the existing Parks Highway and the alternative corridor provide the main means of east-west travel in the region. The main question of the modeling process is “How much traffic will choose the alternative corridor over the other east-west options?” Therefore, the model focuses on travel patterns along high-volume east-west road segments south of the existing Parks Highway. The segments included in the model are shown in Table 13.

Table 13: East-West Road Segments Included in TAM

Road	Start	End	2019 AADT Range (thousands of vehicles per day)
Existing Parks Highway	Big Lake Road	Glenn Highway Interchange	13.5 – 38.0
Knik-Goose Bay Road	Settler's Bay Road	Existing Parks Highway	9.0 - 19.0
Fairview Loop	Knik-Goose Bay Road	Existing Parks Highway	1.5 – 3.5
Hollywood Road	Big Lake Road	Vine Road	1.5 – 3.0

Along each segment, nodes were identified to include in the model for high-volume intersection crossroads. Nodes were selected such that all high volume (over 2,00 vehicles per day) intersections were included. Included nodes are shown in Figure 28.

Links that represent potential travel paths were created between applicable node pairs, resulting in 155 total unidirectional links. Distances were computed for links based on latitudes and longitudes of the nodes using the Haversine formula, which accounts for the curvature of the earth.[14]

Traffic from each TAZ region was then assigned to nodes to enter the network. The process of assigning TAZ regions to nodes was the same as the process of organizing TAZs into regions (see Section 2.2). The entirety of traffic from the region is assumed to begin their trip at these entry points. Traffic from the northeast external region has multiple entry points into the network. Trips were distributed to each entry point according to the relative distribution shown in the origin-destination data, namely, 36 percent to the Glenn Highway interchange, 34 percent to Trunk Road interchange, and 29 percent to the Palmer-Wasilla Highway and Seward Meridian Parkway intersection. Because the trips in the dataset are limited to those that at some point touch the Parks Highway, these entry points account for nearly all trips from the external region.

[14] *Haversine Formula.* Wikipedia - The Free Encyclopedia. Accessed 2021. https://en.wikipedia.org/wiki/Haversine_formula

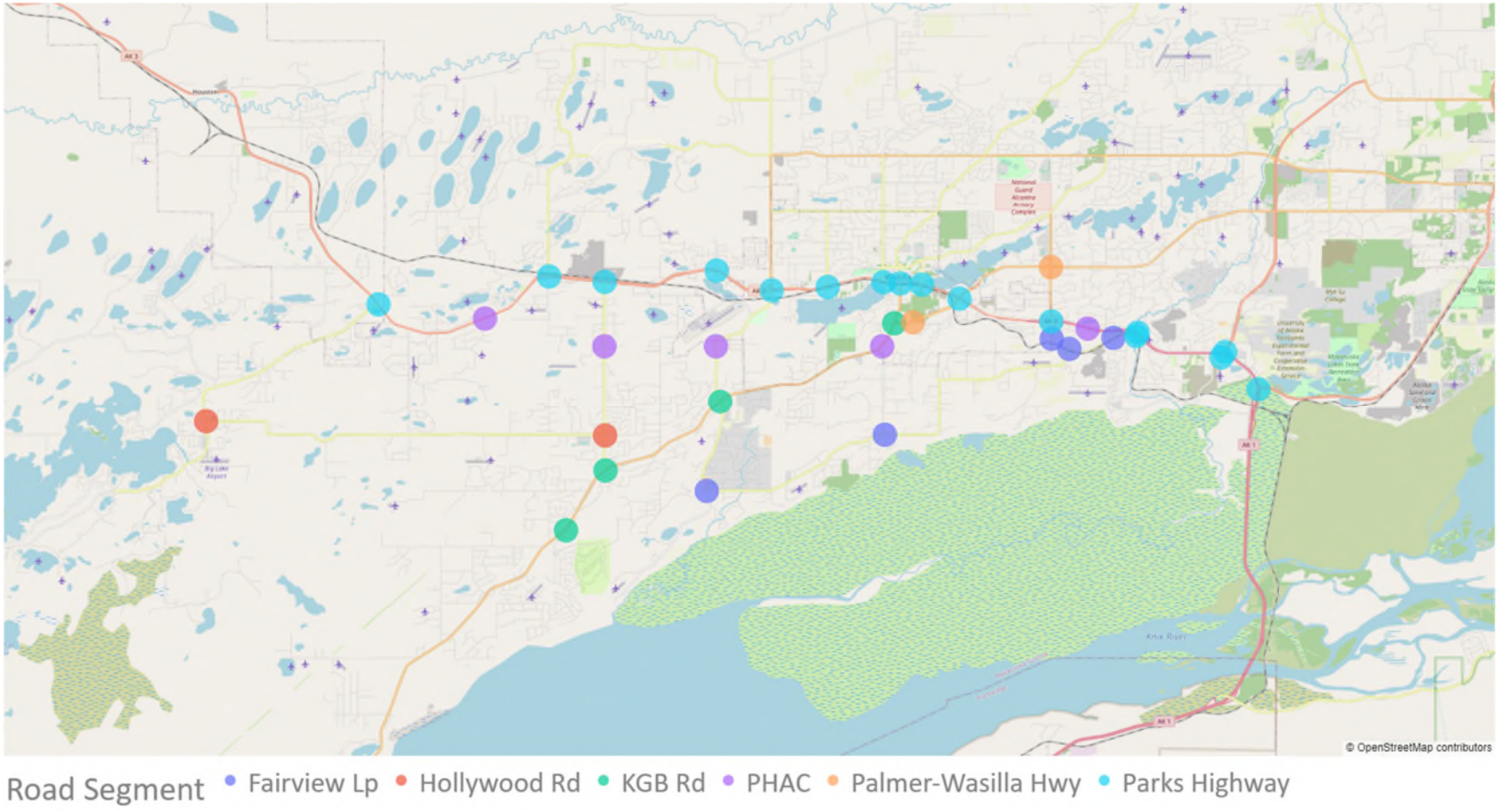


Figure 28. Nodes Included in Trip Assignment Model

Travel Times

The travel time of each path is a function of the link distance, the travel speed, and nodal delay. Travel speeds were modeled as follows:

- Alternative corridor: 60 mph
- Existing Parks Highway east of the Palmer-Wasilla Highway: 60 mph
- All other roads: 45 mph

The nodal delay was modeled to account for average delay at intersections. The nodal delay was modeled as follows:

- Signalized intersections: 45 seconds per vehicle (middle of the range for level-of-service D)
- Stop-controlled approaches: 10 seconds per vehicle (upper bound for level-of-service A)

Intersections on the existing Parks Highway west of Church Road may have a lower average delay, while intersections near downtown Wasilla are near capacity (i.e., level of service F, or over 80 seconds of delay). The same delay was assumed at each signalized intersection node for simplicity and represents a reasonable estimate. The alternative corridor east and west termini were assumed to be free-flow system-to-system interchanges, and hence no nodal delay. Nodal delay is accounted for at freeway ramp terminal intersections throughout the network.

Other Modeling Considerations and Assumptions

In this TAM, volumes were not redistributed based on road segment capacity limits (i.e., capacity-restrained trip assignment). This was unnecessary as no links reached their maximum capacity, as determined by Exhibit 16-14 in the 2010 Highway Capacity Manual.[15]

Interchanges along the alternative corridor were modeled as single-point urban interchanges, similar to the ramp terminal configuration at the Seward Meridian interchange. This results in one 45 second delay (i.e., the average nodal delay used elsewhere in the model) for each vehicle exiting the alternative corridor. Similar ramp terminal configurations may be implemented on the alternative corridor and the single node per interchange approach was selected for modeling simplicity.

The curvature of links was not accounted for in the model. As such, the link distances do not precisely match segment lengths in the field. However, this does not overly bias either the existing Parks Highway or the alternative corridor, as links in each alignment approximately progress across the region at the same latitude (i.e., north-south). While the existing Parks Highway has a noticeable curve between Clapp Street and Vine Road, the alternative corridor is also likely to have noticeable curvature at certain locations.

The TAM does not account for trips that shift from other roads to the alternative corridor, as the O-D data only include trips that at some point included the existing Parks Highway. For

[15] *HCM 2010 Highway Capacity Manual.* Transportation Research Board of the National Academies. 2010. https://www.hcqstrb.org/hcm

instance, some trips that begin and end along Knik-Goose Bay Road or Hollywood Road may also shift to the alternative corridor. The magnitude or presence of these shifts cannot be determined with the data used in this study.

5.2.2 Base Model without Alternative Corridor

Before predicting the traffic volume shift to the alternative corridor with the TAM, we developed a model without the alternative corridor and compared the model with existing Parks Highway volumes from DOT&PF CCS locations. This helped confirm that modeling parameters adequately reflected existing conditions.

Table 14 shows modeled volumes and DOT&PF CCS volumes by the existing Parks Highway segment. The DOT&PF CCS data are for May and June 2021, the same months as the collected O-D data. The segments shown are all three locations for which CCS data are available on the existing Parks Highway. Volumes on the Seward Meridian Highway to the Palmer-Wasilla Highway and Lucas Road to Church Road segments are within a 10 percent difference of the CCS volumes. While volumes on Vine Road to Pittman Road are at a 15 percent difference, the difference in volumes is still relatively small at 3,300 vehicles.

Some model error is expected due to the assumption that all traffic from TAZ regions enter the network through a common signalized intersection, whereas some observed traffic enters from direct access points along the Parks Highway. The CCS data are collected at a single point within the segment, whereas the model predicts a constant volume throughout the segment (neglecting changes in volumes from driveways and side streets within the segment), meaning the two data sources are not precisely comparable.

Table 14: Existing Parks Highway Modeled Volumes without Alternative Corridor and DOT&PF CCS Volumes

Existing Parks Highway Segment	Modeled Trips per Day	DOT&PF CCS Trips per Day	Difference	Percentage Difference
Seward Meridian Highway to Palmer-Wasilla Highway	37,668	36,995	+673	+1.8%
Lucas Road to Church Road	29,809	27,206	+2,603	+9.6%
Vine Road to Pittman Road	18,601	21,877	-3,276	-15.0%

5.2.3 Model with Alternative Corridor

Models were run with the alternative corridor with all interchange locations assumed in the qualitative analysis and with different scenarios of interchange locations.

<u>All Interchanges</u>

TAM results with the alternative corridor constructed and all interchange locations present are shown in Table 15. The percentages and numbers correspond closely with the expected values shown in the qualitative analysis Scenario 2 (shown previously in Table 11). The breakdown of

percentage shift to the alternative corridor by internal-internal, internal-external, and external-external trips is also similar to the qualitative analysis Scenario 2 results (shown previously in Table 12). The same observations in shifting trip patterns discussed in the qualitative analysis hold for patterns in the TAM with all interchange locations.

Table 15: Expected Trips to Use Alternative Corridor, per Trip Assignment Model, All Interchanges

Period	Percentage Using Alternative Corridor	Trips per Period
All Hours	30.1%	31,600 trips/day
PM Peak	30.6%	3,150 trips/PM peak

Interchange Location Scenarios

Various scenarios were run with different combinations of interchanges. Table 16 shows expected trips to use the alternative corridor by interchange location scenario. Removing the Vine Road interchange (i.e., Fern Street and Clapp Street interchanges only) results in only a minor decrease in volumes shifting to the alternative corridor, while removing Clapp Street and Fern Street results in large volumes continuing to use the existing Parks Highway.

Table 16: Expected Trips to Use Alternative Corridor by Interchange Location Scenario, per Trip Assignment Model

Period	Trips per Day on Alternative Corridor (% of all trips)			
	All Interchanges	Fern Street and Clapp Street Interchanges Only	Fern Street Interchange Only	No Interchanges (only east and west termini)
All Hours	31,600 (30.1%)	28,800 (27.7%)	23,800 (22.3%)	10,800 (10.2%)

Removing Vine Road does not result in significantly decreased alternative corridor volumes because the interchange serves a smaller number of O-D pairs, with lower density residential and commercial development in the immediate area. Most of the traffic from “KGB-South” is traveling to downtown Wasilla, the south external region, or the northeast external region, all of which are to the east. This results in “KGB-South” traffic using Knik-Goose Bay Road to drive northeast to the Clapp Street interchange. Finally, Vine Road terminates to the north at the existing Parks Highway and so provides less of a direct route for development north of the Parks Highway to access the interchange, unlike both Clapp Street and Fern Street (with Knik-Goose Bay Road) which continue north.

With each additional interchange built, there are expected diminishing returns in terms of additional trips on the alternative corridor (Table 17). Adding the Fern Street interchange alone pulls an additional 13,000 trips per day off the existing Parks Highway, more than doubling traffic from only building the east and west termini. By adding in the Clapp Street interchange, alternative corridor volumes are expected to increase by 21 percent over volumes with just a

Fern Street interchange. The additional benefit of Vine Road is noticeably smaller, only increasing volumes by another 2,800 trips per day or an increase of 10 percent.

Table 17: Expected Marginal Increases in Traffic Shifting to Alternative Corridor by Interchanges Built

Interchanges Built	Marginal Additional Trips Shifting to Alternative Corridor (% Increase from Preceding Scenario)
Building the east and west termini at the existing Parks Highway	+10,800 trips/day
Adding the Fern Street interchange	+13,000 trips/day (+120%)
Adding the Clapp Street interchange	+5,000 trips/day (+21%)
Adding the Vine Road interchange	+2,800 trips/day (+10%)

5.3 Expected Alternative Corridor Volume Estimates

When assuming interchange locations at Vine Road, Clapp Street, and Fern Street, the results from the Scenario 2 qualitative analysis and the TAM analysis closely align, with percentage shifts to the alternative corridor of 30.2 percent and 30.1 percent, respectively. Furthermore, the breakdowns by internal and external trip types closely align. Given the more precise nature of the TAM methodology, the TAM results were used.

Because removing the Vine Road interchange results in only a 10 percent additional drop in volumes shifting to the alternative corridor, whereas larger decreases are expected when removing any of the other interchanges, this analysis estimates alternative corridor volumes that assume no interchange will be constructed at Vine Road.

Expected trips per day and PM peak by alternative corridor segment are shown in Table 18, assuming 2021 existing conditions. Trips significantly decrease west of the Vine Road interchange and are relatively constant east of the interchange. Trips per day east of the Vine Road interchange are similar to the 2019 AADTs on the existing Parks Highway east of the alternative corridor east terminus (between Hyer Road and the Glenn Highway).

Table 18: Expected Trips on Alternative Corridor by Segment from Trip Assignment Model, 2021 Existing Conditions

Alternative Corridor Segment	Trips per Day	Trips per Hour, PM Peak
Alternative Corridor East Terminus to Fern Street Interchange	18,600	1,910
Fern Street Interchange to Clapp Street Interchange	18,200	1,810
Clapp Street Interchange to Alternative Corridor West Terminus	15,300	1,540

Table 19 shows expected volumes by the segment on the existing Parks Highway with and without the alternative corridor constructed. Volumes decrease between 6,000 and 19,000 vehicles per day with the construction of the alternative corridor. The expected decreases on the existing Parks Highway demonstrate the number of trips currently using the facility as a through route instead of for local access.

While the percentage of all trips shifting to the alternative corridor is 30 percent, percentage shifts by segment vary significantly. Firstly, note that the same change in trips per day by segment results in different percentage changes, due to differences in the base number of trips per day (i.e., without the alternative corridor) on each segment. For instance, while volumes decrease by 90 percent from Vine Road to Pittman Road and by 36 percent from Crusey Street to Main Street, the absolute change in volumes is similar (i.e., 14,000-15,000), because Crusey Street to Main Street has over double the base trips per day (i.e., 39,100 versus 16,800).

Secondly, the percentage of trips shifting to the alternative corridor is a function of the proportion of trips that are pass-through versus those that have local origins or destinations. For instance, volumes decrease substantially between Stanley Road and Pittman Road due to lower development density levels and corresponding lower trips beginning or ending in between the intersections. The data show that of all trips that occurred on these segments, only eight percent have an origin or destination along Vine Road.

Drivers that begin or end their trips near the Pittman Road intersection typically use the west terminus to access the alternative corridor and either exit at the Clapp Street interchange or farther east. However, this is highly dependent on where the west terminus is located. If located further west at the Johnsons Road intersection, the percentage change drops to 69 percent (6,400 trips per day) and 75 percent (4,600 trips per day) shifting to the alternative corridor on Stanley Road to Vine Road and Vine Road to Pittman Road, respectively. If the west terminus is far enough away from the Pittman Road intersection, fewer trips will divert west to the terminus instead of heading east on the existing Parks Highway.

Table 19: Expected Trips on Existing Parks Highway by Segment from Trip Assignment Model

Existing Parks Highway Segment	Trips per Day with Alternative Corridor	Trips per Day without Alternative Corridor	Change in Trips per Day	% Change
Alternative Corridor East Terminus to Seward Meridian Highway	22,600	29,500	-6,900	-23%
Seward Meridian Highway to Palmer-Wasilla Highway	19,300	34,000	-14,700	-43%
Palmer-Wasilla Highway to Crusey Street	25,500	39,300	-13,800	-35%
Crusey Street to Main Street	25,200	39,100	-13,900	-36%
Main Street to Lucille Street	13,300	32,200	-18,900	-59%
Lucille Street to Lucas Road	9,400	28,300	-18,900	-67%

Existing Parks Highway Segment	Trips per Day with Alternative Corridor	Trips per Day without Alternative Corridor	Change in Trips per Day	% Change
Lucas Road to Church Road	8,000	27,000	-19,000	-70%
Church Road to Stanley Road	5,100	21,000	-15,900	-76%
Stanley Road to Vine Road	3,400	19,300	-15,900	-82%
Vine Road to Pittman Road	1,700	16,800	-15,100	-90%
Pittman Road to Alternative Corridor West Terminus	6,500	12,600	-6,100	-48%

6.0 SUMMARY AND NEXT STEPS

In this analysis, travel patterns were investigated in terms of origins and destinations in the vicinity of the Parks Highway Alternative Corridor PEL study area. The analysis was based on "big data" collected by a third-party vendor that aggregates location data generated through smartphone apps and in-vehicle GPS systems for the entirety of May and June 2021.

Following analysis of O-D patterns on the existing Parks Highway, interchange locations were selected that would likely result in the highest traffic volume shift to the alternative corridor, assuming 2021 existing conditions. The following interchange locations result in the highest traffic volume shift:

- East Terminus at Existing Parks Highway
- Fern Street
- Clapp Street
- West Terminus at Existing Parks Highway

A TAM was developed based on the assumption of least travel time route selection, to predict the percentage shift to the alternative corridor. 2021 existing conditions values for daily and PM peak trips are shown in Table 20 and spatially in Figure 29.

The O-D matrices and percentage expected shifts to the alternative corridor by O-D pair will be used to develop the base year model for the Parks Highway Alternative Corridor PEL traffic forecasting study, which will predict volumes on the alternative corridor for the future build year and design year.

Table 20: Expected Trips on Alternative Corridor by Segment, 2021 Existing Conditions

Alternative Corridor Segment	Expected 2021 Annual Average Daily Traffic	Expected 2021 PM Peak Traffic
Alternative Corridor East Terminus to Fern Street Interchange	18,600 veh/day	1,910 veh/hr
Fern Street Interchange to Clapp Street Interchange	18,200 veh/day	1,810 veh/hr
Clapp Street Interchange to Alternative Corridor West Terminus	15,300 veh/day	1,540 veh/hr

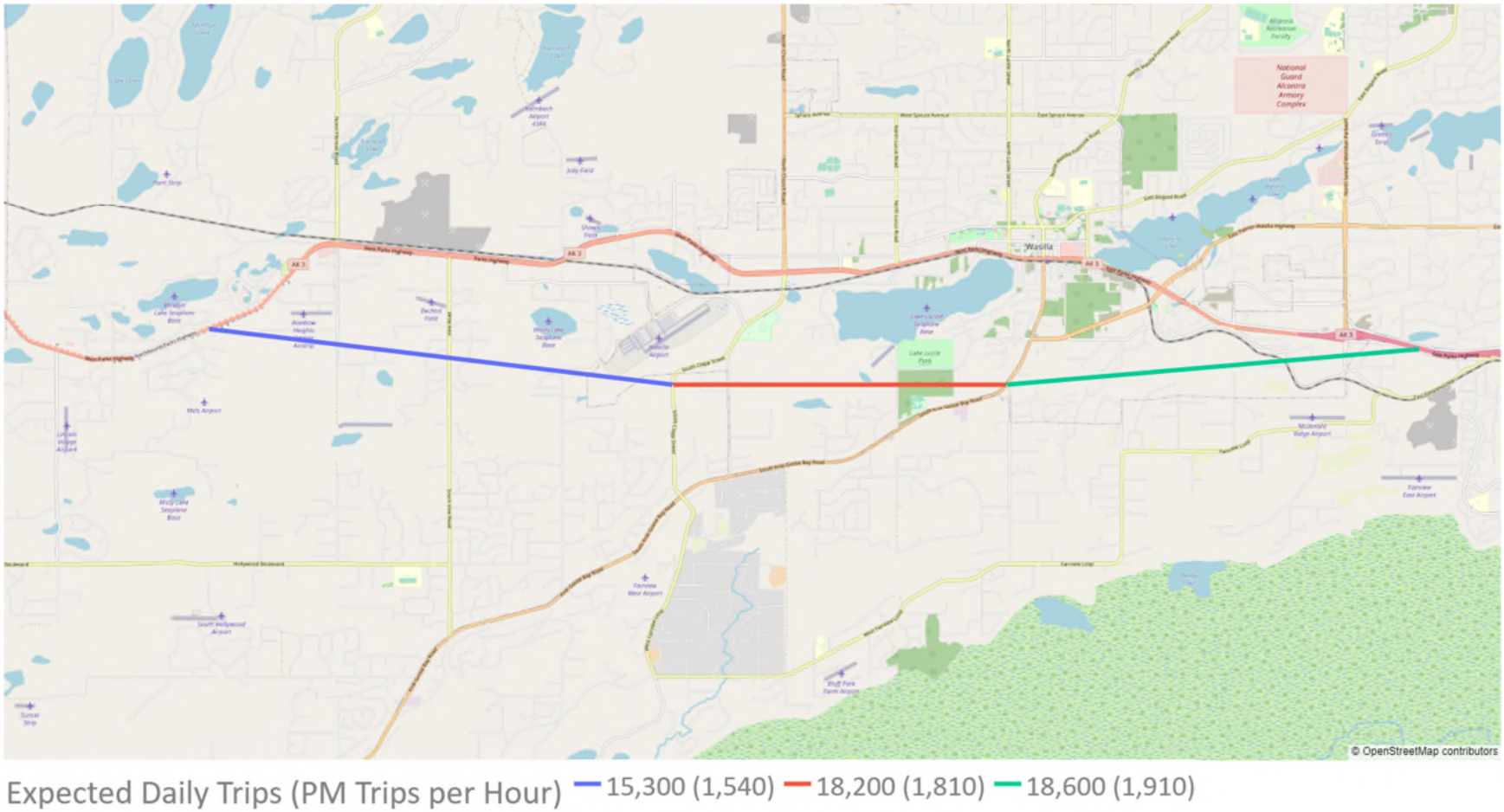


Figure 29. Expected Trips on Alternative Corridor by Segment, 2021 Existing Conditions

APPENDIX A. ORIGIN-DESTINATION MATRIX TABLE

		Origin								
		Big Lake Road	Bogard	Church-North	Church-South	Clapp	Crusey	Fairview-Central	Fairview-East	Fairview-West
Destination	Big Lake Road	0.074%	0.049%	0.028%	0.034%	0.085%	0.045%	0.003%	0.091%	0.009%
	Bogard	0.061%	0.141%	0.010%	0.033%	0.078%	0.029%	0.026%	0.342%	0.060%
	Church-North	0.029%	0.013%	0.075%	0.022%	0.068%	0.017%	0.004%	0.083%	0.027%
	Church-South	0.026%	0.030%	0.023%	0.155%	0.094%	0.034%	0.006%	0.067%	0.018%
	Clapp	0.069%	0.077%	0.064%	0.089%	0.283%	0.072%	0.014%	0.120%	0.047%
	Crusey	0.042%	0.029%	0.009%	0.027%	0.071%	0.106%	0.024%	0.208%	0.056%
	Fairview-Central	0.004%	0.025%	0.004%	0.005%	0.013%	0.019%	0.036%	0.026%	0.002%
	Fairview-East	0.099%	0.356%	0.090%	0.076%	0.144%	0.214%	0.030%	0.792%	0.099%
	Fairview-West	0.008%	0.057%	0.021%	0.018%	0.040%	0.046%	0.003%	0.071%	0.114%
	Fern	0.007%	0.058%	0.018%	0.014%	0.034%	0.048%	0.002%	0.068%	0.007%
	Fishhook	0.038%	0.016%	0.006%	0.026%	0.086%	0.031%	0.015%	0.259%	0.043%
	Hyer	0.028%	0.024%	0.007%	0.007%	0.048%	0.018%	0.008%	0.203%	0.030%
	KGB-North	0.105%	0.189%	0.098%	0.075%	0.167%	0.152%	0.023%	0.252%	0.061%
	KGB-South	0.022%	0.131%	0.063%	0.051%	0.093%	0.088%	0.001%	0.193%	0.016%
	Lucas	0.062%	0.027%	0.014%	0.040%	0.108%	0.024%	0.009%	0.097%	0.047%

	Origin								
	Big Lake Road	Bogard	Church-North	Church-South	Clapp	Crusey	Fairview-Central	Fairview-East	Fairview-West
Lucille	0.058%	0.089%	0.049%	0.068%	0.162%	0.085%	0.019%	0.216%	0.082%
Main	0.142%	0.136%	0.081%	0.130%	0.290%	0.153%	0.073%	0.479%	0.252%
Northeast External Zone	0.150%	0.031%	0.031%	0.078%	0.243%	0.090%	0.066%	0.694%	0.168%
Northwest External Zone	0.155%	0.056%	0.034%	0.033%	0.106%	0.040%	0.009%	0.082%	0.034%
Palmer-Wasilla Hwy	0.243%	0.454%	0.228%	0.159%	0.411%	0.336%	0.106%	1.091%	0.382%
Parks-Big Lake	0.101%	0.026%	0.030%	0.035%	0.070%	0.023%	0.003%	0.050%	0.014%
Pittman	0.199%	0.051%	0.044%	0.110%	0.182%	0.068%	0.013%	0.135%	0.047%
Seward Meridian	0.067%	0.160%	0.035%	0.031%	0.101%	0.070%	0.032%	0.459%	0.082%
Shrock	0.013%	0.006%	0.003%	0.013%	0.060%	0.018%	0.004%	0.081%	0.015%
South External Zone	0.455%	0.168%	0.220%	0.129%	0.364%	0.263%	0.079%	0.561%	0.281%
Trunk	0.046%	0.021%	0.027%	0.024%	0.053%	0.052%	0.031%	0.250%	0.051%
Vine	0.017%	0.059%	0.037%	0.023%	0.063%	0.050%	0.001%	0.092%	0.009%

		Origin								
		Fern	Fishhook	Hyer	KGB-North	KGB-South	Lucas	Lucille	Main	Northeast External Zone
Destination	Big Lake Road	0.006%	0.032%	0.027%	0.088%	0.017%	0.061%	0.073%	0.180%	0.131%
	Bogard	0.057%	0.014%	0.024%	0.173%	0.130%	0.020%	0.073%	0.113%	0.035%
	Church-North	0.020%	0.004%	0.008%	0.103%	0.065%	0.020%	0.065%	0.126%	0.027%
	Church-South	0.013%	0.022%	0.008%	0.068%	0.053%	0.044%	0.083%	0.148%	0.073%
	Clapp	0.037%	0.087%	0.048%	0.151%	0.085%	0.115%	0.178%	0.333%	0.218%
	Crusey	0.055%	0.018%	0.026%	0.159%	0.108%	0.020%	0.058%	0.144%	0.108%
	Fairview-Central	0.005%	0.016%	0.008%	0.019%	0.001%	0.007%	0.020%	0.071%	0.067%
	Fairview-East	0.087%	0.255%	0.201%	0.336%	0.250%	0.104%	0.252%	0.482%	0.736%
	Fairview-West	0.008%	0.042%	0.026%	0.056%	0.011%	0.044%	0.095%	0.261%	0.159%
	Fern	0.101%	0.043%	0.023%	0.050%	0.006%	0.039%	0.070%	0.228%	0.149%
	Fishhook	0.044%	0.155%	0.013%	0.234%	0.086%	0.019%	0.082%	0.152%	0.039%
	Hyer	0.020%	0.014%	0.101%	0.085%	0.050%	0.020%	0.042%	0.076%	0.096%
	KGB-North	0.048%	0.220%	0.088%	0.308%	0.107%	0.136%	0.253%	0.600%	0.478%
	KGB-South	0.008%	0.087%	0.046%	0.109%	0.168%	0.101%	0.157%	0.352%	0.360%
	Lucas	0.043%	0.020%	0.020%	0.129%	0.097%	0.149%	0.130%	0.162%	0.092%
	Lucille	0.066%	0.096%	0.041%	0.254%	0.157%	0.108%	0.397%	0.424%	0.204%
	Main	0.227%	0.130%	0.100%	0.575%	0.342%	0.127%	0.342%	0.819%	0.333%

	Origin								
	Fern	Fishhook	Hyer	KGB-North	KGB-South	Lucas	Lucille	Main	Northeast External Zone
Northeast External Zone	0.162%	0.033%	0.081%	0.472%	0.435%	0.089%	0.179%	0.285%	0.254%
Northwest External Zone	0.020%	0.058%	0.012%	0.128%	0.080%	0.045%	0.094%	0.208%	0.173%
Palmer-Wasilla Hwy	0.313%	0.468%	0.207%	0.766%	0.656%	0.251%	0.501%	1.105%	1.068%
Parks-Big Lake	0.013%	0.033%	0.010%	0.049%	0.050%	0.040%	0.056%	0.117%	0.075%
Pittman	0.037%	0.052%	0.026%	0.204%	0.147%	0.102%	0.147%	0.294%	0.149%
Seward Meridian	0.087%	0.125%	0.105%	0.268%	0.173%	0.062%	0.116%	0.224%	0.426%
Shrock	0.016%	0.007%	0.004%	0.094%	0.026%	0.010%	0.054%	0.083%	0.018%
South External Zone	0.243%	0.252%	0.165%	0.457%	0.762%	0.174%	0.316%	0.624%	0.067%
Trunk	0.045%	0.050%	0.048%	0.121%	0.131%	0.026%	0.066%	0.144%	0.041%
Vine	0.005%	0.040%	0.021%	0.059%	0.026%	0.049%	0.103%	0.228%	0.157%

		Origin								
		Northwest External Zone	Palmer-Wasilla Hwy	Parks-Big Lake	Pittman	Seward Meridian	Shrock	South External Zone	Trunk	Vine
sDestination	Big Lake Road	0.139%	0.244%	0.109%	0.233%	0.058%	0.013%	0.437%	0.031%	0.015%
	Bogard	0.056%	0.418%	0.029%	0.044%	0.127%	0.005%	0.140%	0.026%	0.058%
	Church-North	0.028%	0.260%	0.030%	0.043%	0.042%	0.002%	0.196%	0.022%	0.034%
	Church-South	0.036%	0.159%	0.035%	0.089%	0.041%	0.011%	0.130%	0.023%	0.019%
	Clapp	0.108%	0.402%	0.066%	0.158%	0.109%	0.064%	0.320%	0.044%	0.052%
	Crusey	0.035%	0.323%	0.023%	0.054%	0.077%	0.007%	0.290%	0.050%	0.050%
	Fairview-Central	0.010%	0.113%	0.004%	0.012%	0.030%	0.004%	0.099%	0.027%	0.001%
	Fairview-East	0.103%	1.111%	0.060%	0.156%	0.434%	0.084%	0.636%	0.241%	0.090%
	Fairview-West	0.034%	0.383%	0.017%	0.045%	0.078%	0.013%	0.281%	0.043%	0.006%
	Fern	0.026%	0.293%	0.016%	0.037%	0.082%	0.015%	0.222%	0.035%	0.004%
	Fishhook	0.064%	0.495%	0.031%	0.043%	0.111%	0.007%	0.227%	0.040%	0.035%
	Hyer	0.019%	0.187%	0.011%	0.024%	0.093%	0.005%	0.166%	0.040%	0.017%
	KGB-North	0.135%	0.694%	0.063%	0.209%	0.275%	0.097%	0.423%	0.101%	0.054%
	KGB-South	0.077%	0.667%	0.058%	0.148%	0.158%	0.031%	0.676%	0.099%	0.017%
	Lucas	0.049%	0.246%	0.042%	0.075%	0.067%	0.008%	0.175%	0.031%	0.037%
	Lucille	0.082%	0.495%	0.058%	0.099%	0.126%	0.057%	0.312%	0.084%	0.082%

	Origin								
	Northwest External Zone	Palmer-Wasilla Hwy	Parks-Big Lake	Pittman	Seward Meridian	Shrock	South External Zone	Trunk	Vine
Main	0.132%	1.182%	0.098%	0.241%	0.273%	0.072%	0.686%	0.157%	0.189%
Northeast External Zone	0.195%	0.914%	0.080%	0.153%	0.336%	0.020%	0.084%	0.033%	0.160%
Northwest External Zone	0.035%	0.315%	0.161%	0.347%	0.053%	0.021%	0.936%	0.033%	0.045%
Palmer-Wasilla Hwy	0.273%	1.993%	0.140%	0.365%	0.704%	0.212%	1.291%	0.341%	0.266%
Parks-Big Lake	0.118%	0.117%	0.356%	0.278%	0.038%	0.017%	0.145%	0.032%	0.034%
Pittman	0.200%	0.409%	0.262%	0.713%	0.097%	0.025%	0.396%	0.044%	0.105%
Seward Meridian	0.046%	0.514%	0.039%	0.097%	0.306%	0.028%	0.469%	0.136%	0.067%
Shrock	0.024%	0.230%	0.019%	0.024%	0.031%	0.066%	0.156%	0.015%	0.019%
South External Zone	0.932%	1.064%	0.188%	0.402%	0.438%	0.148%	0.151%	0.054%	0.261%
Trunk	0.039%	0.289%	0.027%	0.058%	0.111%	0.011%	0.055%	0.107%	0.053%
Vine	0.046%	0.333%	0.041%	0.103%	0.077%	0.016%	0.263%	0.049%	0.101%

APPENDIX B. ORIGIN-DESTINATION METHODS MEMORANDUM