Highway 2 Corridor Study

Corridors Needs Assessment

Prepared for

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Existing Conditions Abstract

Commerce City is conducting the Highway 2 Corridor Study to identify multimodal needs and opportunities, and develop recommendations for improving safety, connectivity, and comfort for all modes and users, along Highway 2 between E. 64th Avenue and I-76. A key first step in the planning process is to assess the corridor today – how well it connects the community, how well it accommodates various modes, and how well it integrates with the broader multimodal system. This report details important context and conditions along Highway 2 that will inform the planning process.

Planning Context

Highway 2 is a critical piece of Commerce City's transportation network, as both a means of local access and regional connectivity. The corridor was previously a state highway owned and operated by the Colordo Department of Transportation, but was devolved to Commerce City – this history still influences how the street is designed and operated today. It is the only direct link between the older and newer portions of the community, passing through a variety of land-use contexts and distinct neighborhoods. Because of its importantace to the community, Highway 2 has been evaluated in numerous past local and regional planning efforts. The findings and outcomes of those plans are being incorporated into the Highway 2 Corridor Study to ensure consistency.

Existing Network Inventory

Highway 2 is a 4-lane arterial carrying generally between 12,000 and 20,000 vehicles per day depending on segment, with speed limits between 35 and 45 miles per hour. Accommodations for active transportation vary: north of Quebec Street, an existing trail along the south/east side of the corridor offers a low-stress option for bicyclists and pedestrians while south of Quebec Street, the existing sidewalks and bike lanes are not low-stress given their direct adjacency to motor vehicle lanes. Signalized intersections along the corridor – generally spaced every mile to 1.5 miles – have large footprints and present a particular challenge for crossing bicyclists and pedestrians, though there are substantial safety concerns for motorists as well as evidenced by crash history.

Key Safety and Mobility Concerns

- Portions of the corridor with the highest concentrations of people from marginalized communities (south and east of Quebec Parkway) are relatively higher stress for active transportation modes
- 137 crashes have resulted in an injury and/or a fatality over 5 years,
- Commercial vehicles represent 13% of all traffic on Highway 2
- The parallel railroad limits connectivity with neighborhoods to the north and concentrates most turning movements at a handful of intersections, contributing to operational and safety issues

Existing Conditions Assessment

Previous & Concurrent Plans

Recent/past comprehensive or transportation plans relevant to Highway 2 provide helpful insight into community priorities as well as important planning context (recurring issues, previous recommendations, etc.). The plans listed below were reviewed due to their potential relevance to the Highway 2 corridor and the surrounding area.

Table 1. Previous Relevant Plans

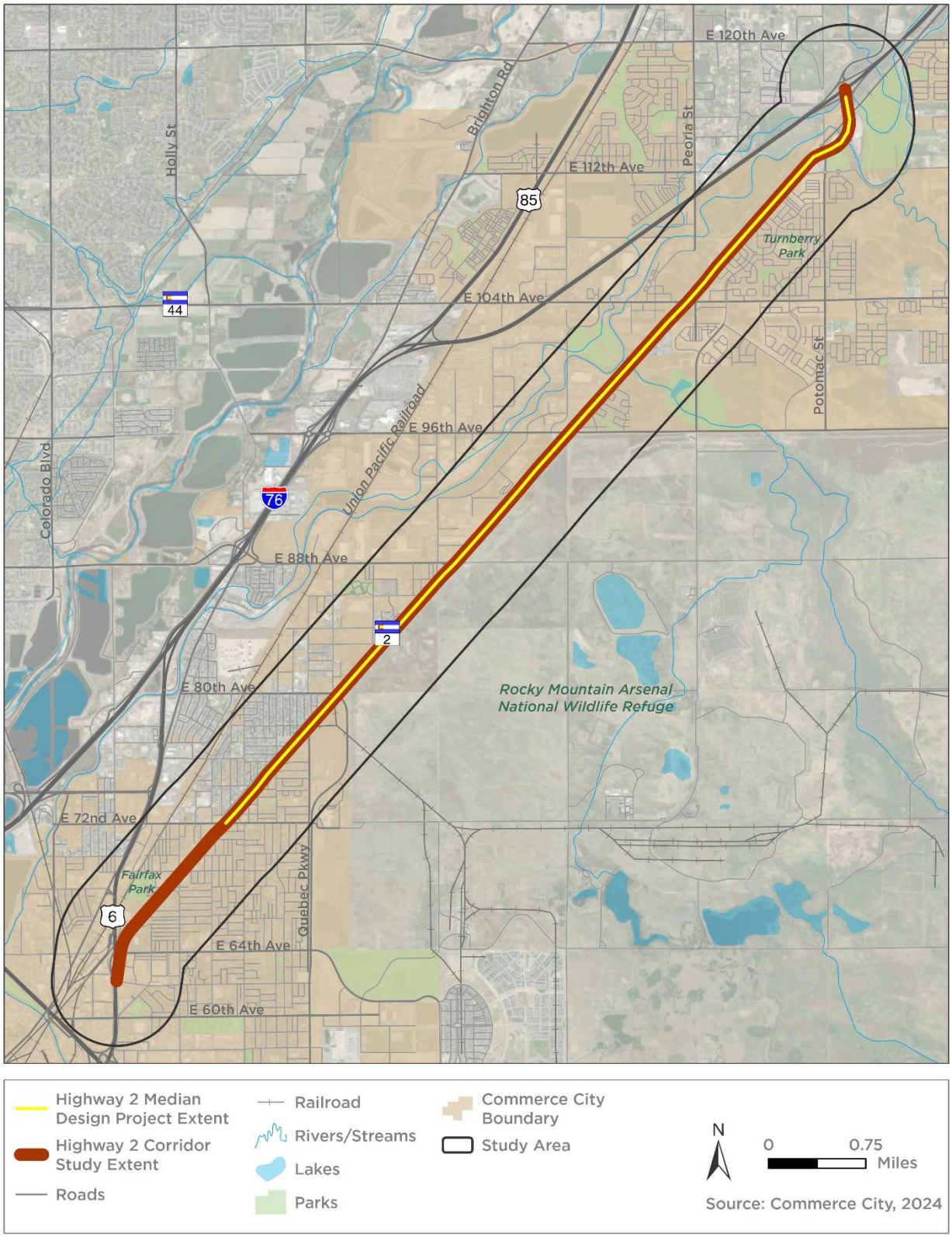
Plan/Study	Agency	Year Completed
Adams County Transportation Master Plan	Adams County	2022
Commerce City Comprehensive Plan	Commerce City	2010
Commerce City Transportation Master Plan	Commerce City	2010
DRCOG Metro Vision Regional Transportation Plan	DRCOG	2021
ULI 72nd Avenue Station Area Study	Commerce City	2021
Walk Bike Fit Active Transportation Plan	Commerce City	2012

Key observations and takeaways relating to Highway 2 from these plans include:

- Better multimodal access to Commerce City recreation centers and parks was identified as a priority for local residents.
- There were safety concerns for most of the intersections with Highway 2, specifically at E. 72nd Ave, E. 88th Ave, and E. 96th Ave.
- Highway 2 was identified as a corridor with "high levels of concern" for congestion and improving traffic flow is a top priority in the community.

There is a concurrent project designing and constructing medians between E. 72nd Avenue and I-76 with the goal of improving safety and traffic operations. Construction of the project, which may include improvements such as buffers, raised medians, and additional signage, is expected to begin in the Spring of 2025. **Figure 1** shows the extents of both the corridor study and the median design project.

Figure 1. Study Area Extents



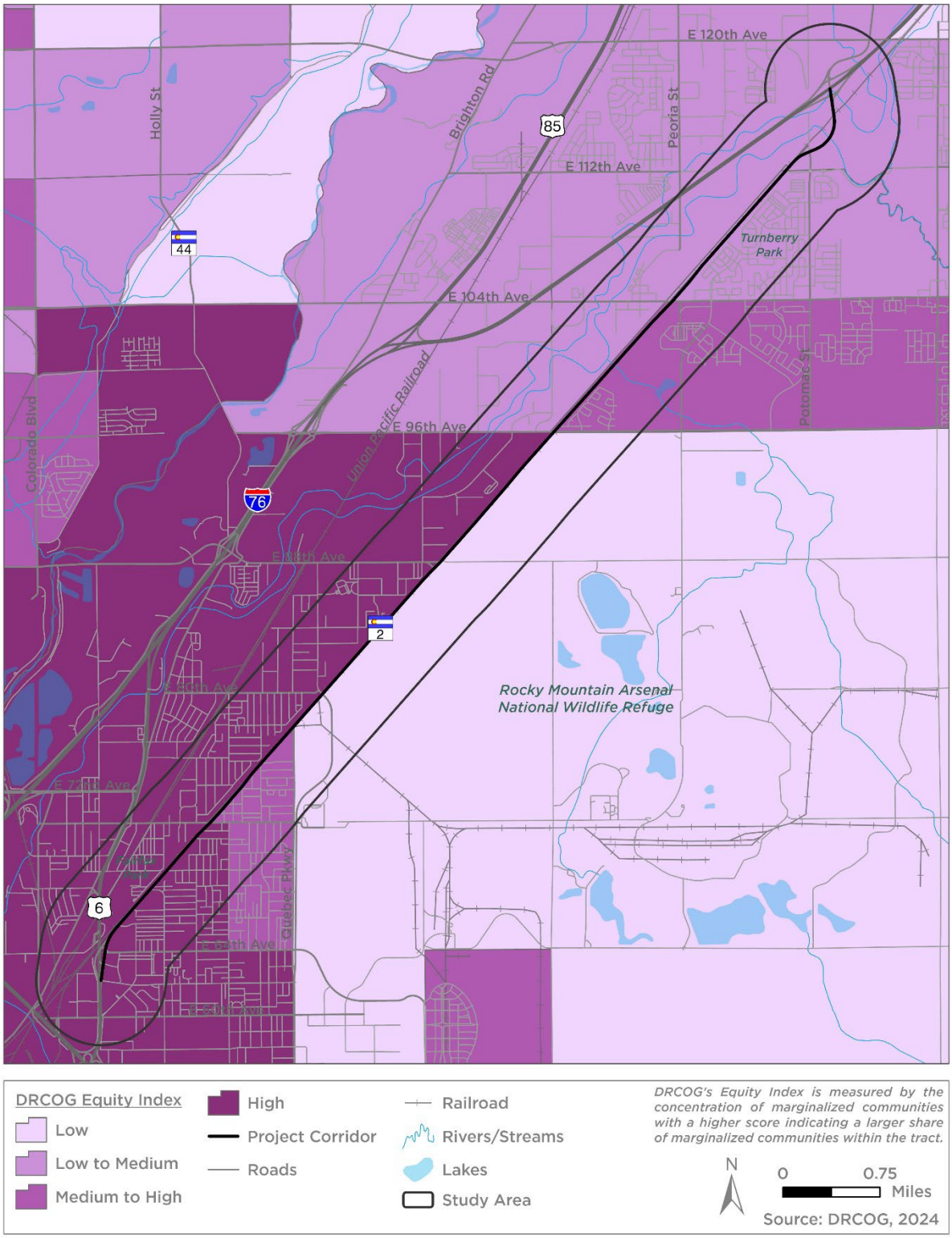
Demographic Assessment

An important element of transportation planning is understanding the demographic makeup of the community in and around the study corridor to ensure equitable outcomes. The project team reviewed Equity Index data compiled by the Denver Regional Council of Governments (DRCOG) to provide more information on who Highway 2 is serving. The Equity Index currently uses 2017-2021 American Community Survey data from the US Census to understand the distribution of marginalized communities in the region in three score domains:

- *Economic Status* – People with Low Incomes, Households that are Housing-Cost Burdened, Single-Parent Households
- *Mobility Barriers* – People with a Disability, Households Without a Vehicle, Older Adults 60 and Over, Youth and Children 17 and Younger, People with Limited English Proficiency
- *Race and National Origin* – People of Color, People Born Outside the U.S.

The Equity Index is a composite score of the three score domains – a higher composite score for a census tract correlates to a higher concentration of people from marginalized communities. **Figure 2** shows the equity indices for census tracts within the study area vicinity with darker colors representing higher index scores, and thus higher concentrations of marginalized communities. Along Highway 2, marginalized communities are concentrated in the south and west portions of the corridor (the older portion of Commerce City).

Figure 2. DRCOG Equity Index



Roadway Characteristics

Highway 2 serves as the primary north-south connection through Commerce City and provides regional connectivity to the greater metro area. The speed limit along the corridor is primarily 45 miles per hour (mph); however, there is one section between E. 72nd Avenue and E. 80th Avenue where the speed limit drops to 35 mph. The cross-section of Highway 2 includes four general purposes lanes with a center turn lane/median of varying width for the entirety of the corridor, and added turn lanes at major intersections. Daily motor vehicle volumes on Highway 2 generally vary from 10,000 to 25,000 vehicles per day.

Signalized intersections are spaced approximately every 1 to 1.5 miles along the corridor, most including marked crosswalks and channelized right turn lanes. Coordination between the signals is challenging due to the distance between them. There are also designated pedestrian crossings of Highway 2 at three other locations between E. 64th Avenue and E. 80th Avenue: pedestrian crossings at Magnolia Street and Quebec Parkway include Rectangular Rapid Flashing Beacons (RRFBs), and the crossing at E. 67th Place is just a crosswalk with warning signage. The BNSF Railway railroad is parallel to Highway 2 for the entirety of the study area, limiting both availability of right-of-way for improvements and opportunities to improve connectivity; because of the limited railroad crossing points, most turning traffic is funneled to just a handful of intersections, making them busier and more challenging to navigate for active users than a typical urban arterial intersection. An average of X trains

Drainage is conveyed by curb & gutter to the south of the Quebec Parkway intersection and paved shoulders to the north. Along the south portion of the corridor, several tributaries including Irondale Gulch flow in a northwesterly direction across Highway 2 (there are no existing culverts in this area) into the Irondale neighborhood, with no formal detention or retention facilities. During major storm events, these tributaries pond behind the railroad embankment, sometimes overtopping the railroad and roadway. The 2018 Irondale Neighborhood & Infrastructure Plan includes several drainage-specific recommendations relevant to Highway 2 including construction of a pipe underneath the roadway near E. 88th Avenue to convey northwest flows and construction of a drainage channel along the east side of the roadway between E. 80th Avenue and E. 88th Avenue for runoff conveyance. Between E. 96th Avenue and E. 104th Avenue, large storm events have caused First Creek to overtop onto Highway 2 and resulted in temporary closures due to excessive flooding, indicating a potential need to increase capacity of the culverts that convey First Creek underneath that segment of the road.

Existing landscaping and lighting along the corridor are limited. There is no pedestrian-scale lighting, including along the trail; standard streetlights are spaced approximately every 500' on both sides of the street. Formal landscaping treatments are limited to some of the existing raised medians between E. 72nd Avenue and Quebec Parkway, and some large trees exist in the buffer space between Highway 2 and the railroad. There are also few existing user amenities along the trail.

Figures 3 through **7** present typical existing cross-sections for five distinct segments of the Highway 2 corridors developed with the Streetmix platform, **Figures 8** through **11** present an inventory of existing transportation features along the corridor.

Figure 3. Highway 2 Typical Cross-section – E. 64th to E. 72nd

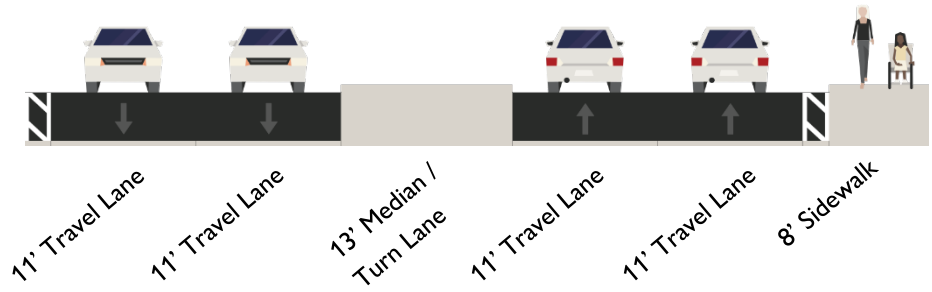


Figure 4. Highway 2 Typical Cross-section – E. 72nd to Quebec

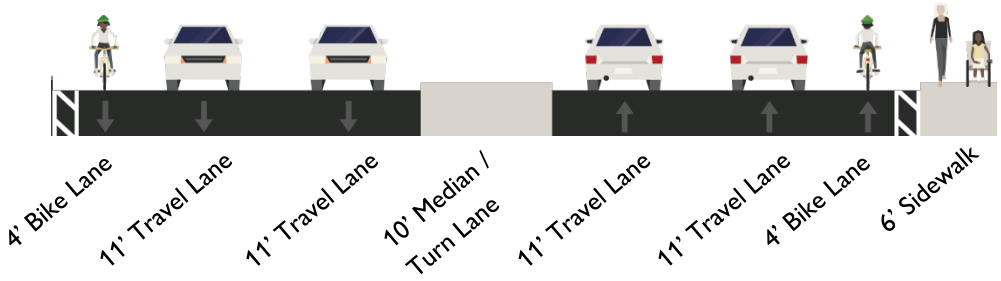


Figure 5. Highway 2 Typical Cross-section - Quebec to E. 96th

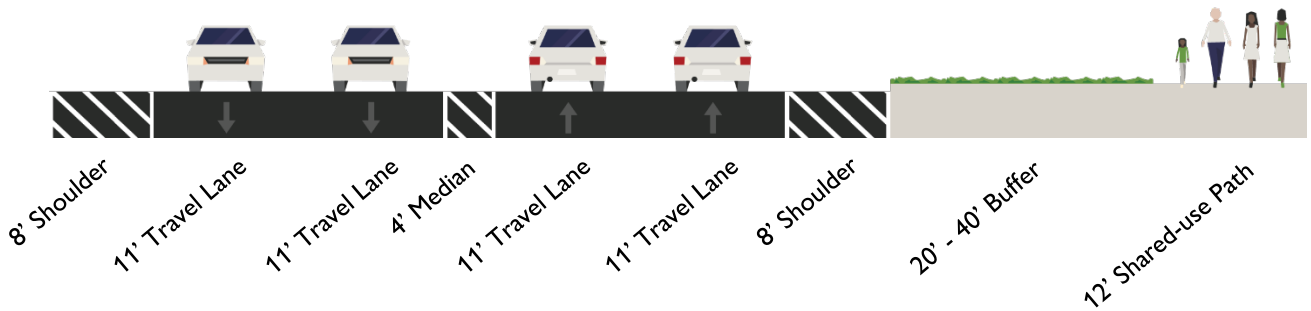


Figure 6. Highway 2 Typical Cross-section – E. 96th to E. 112th

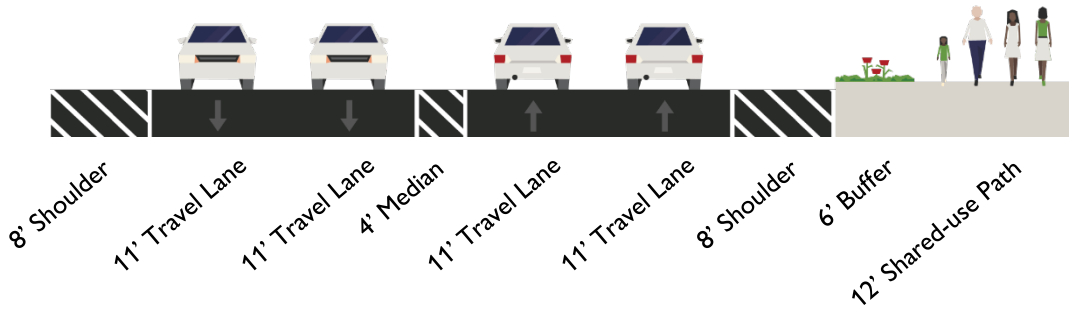


Figure 7. Highway 2 Typical Cross-section – E. 112th to I-76

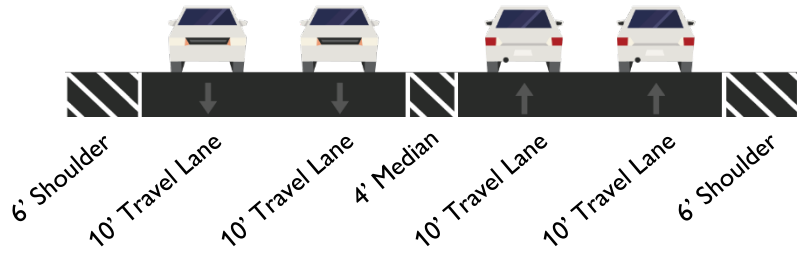


Figure 8. Traffic Signals & Other Crosswalks

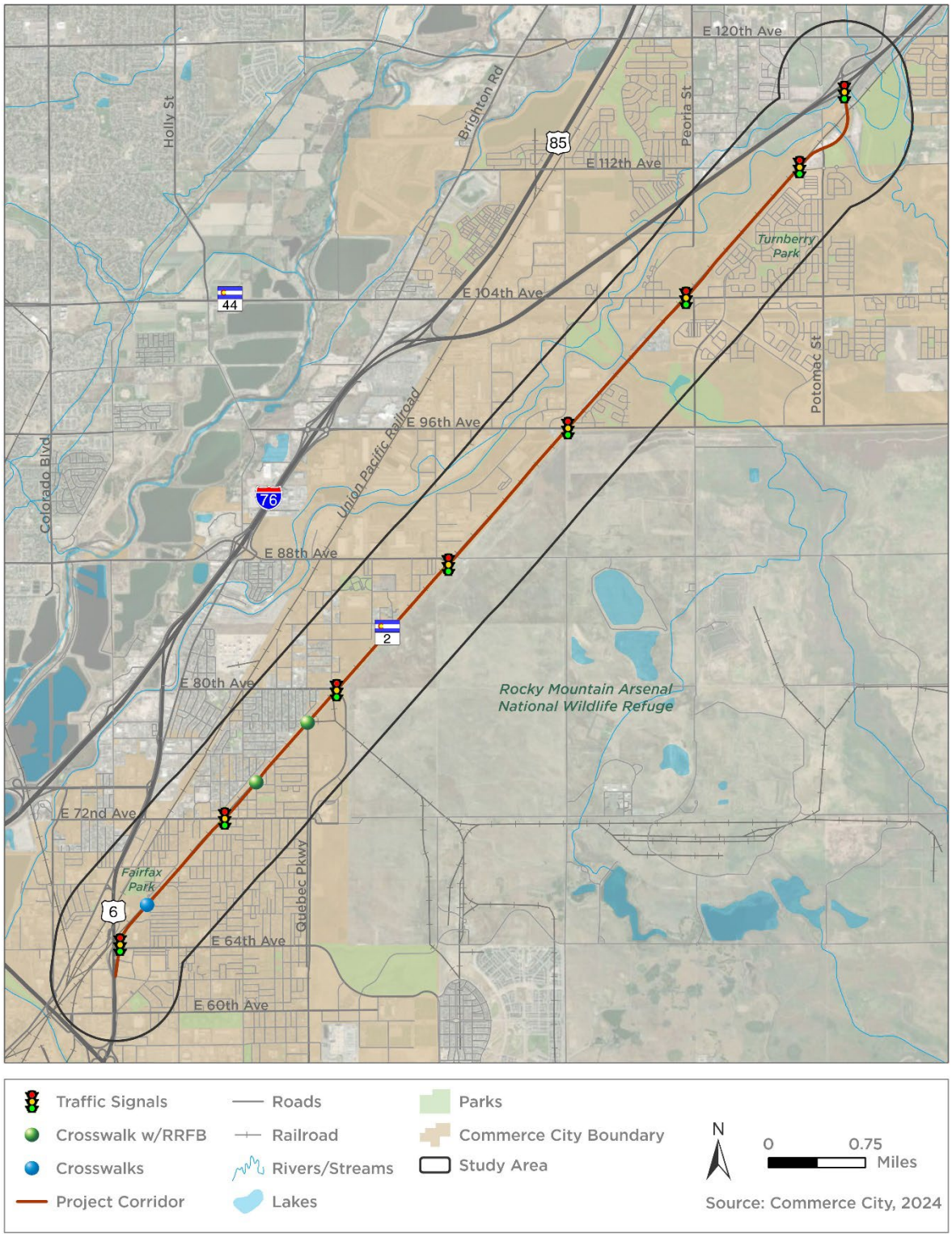


Figure 9. Posted Speed Limits

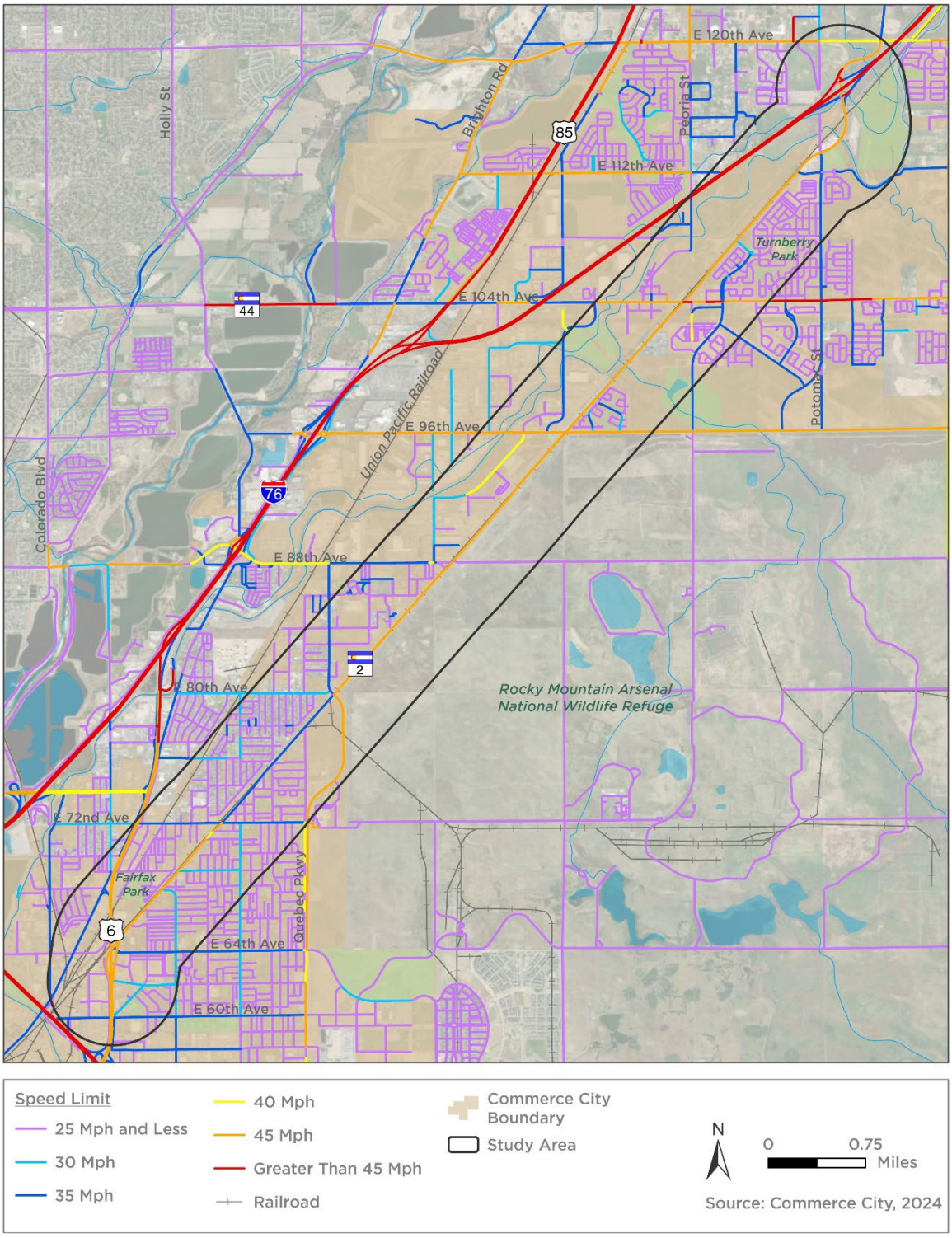


Figure 10. Number of Lanes

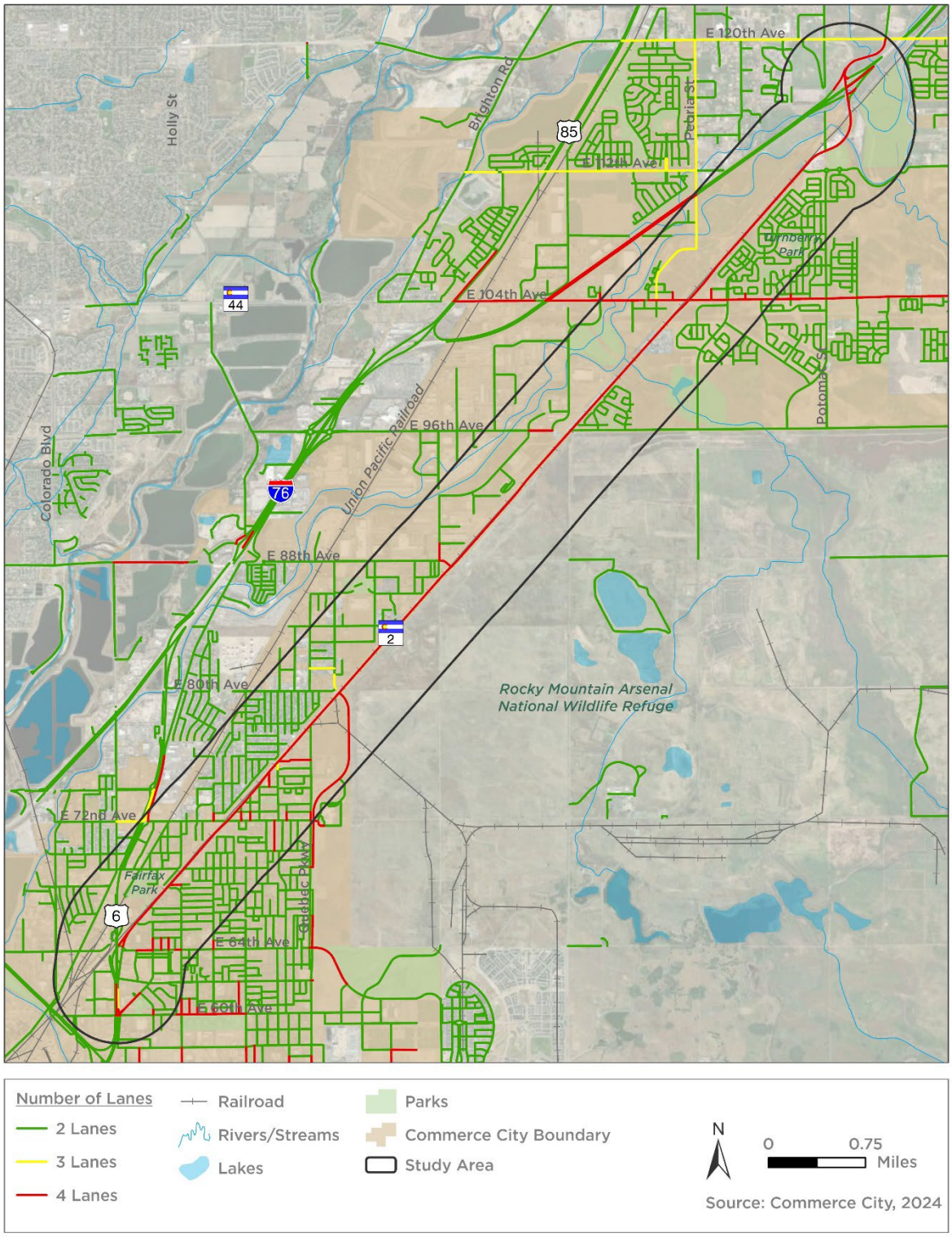
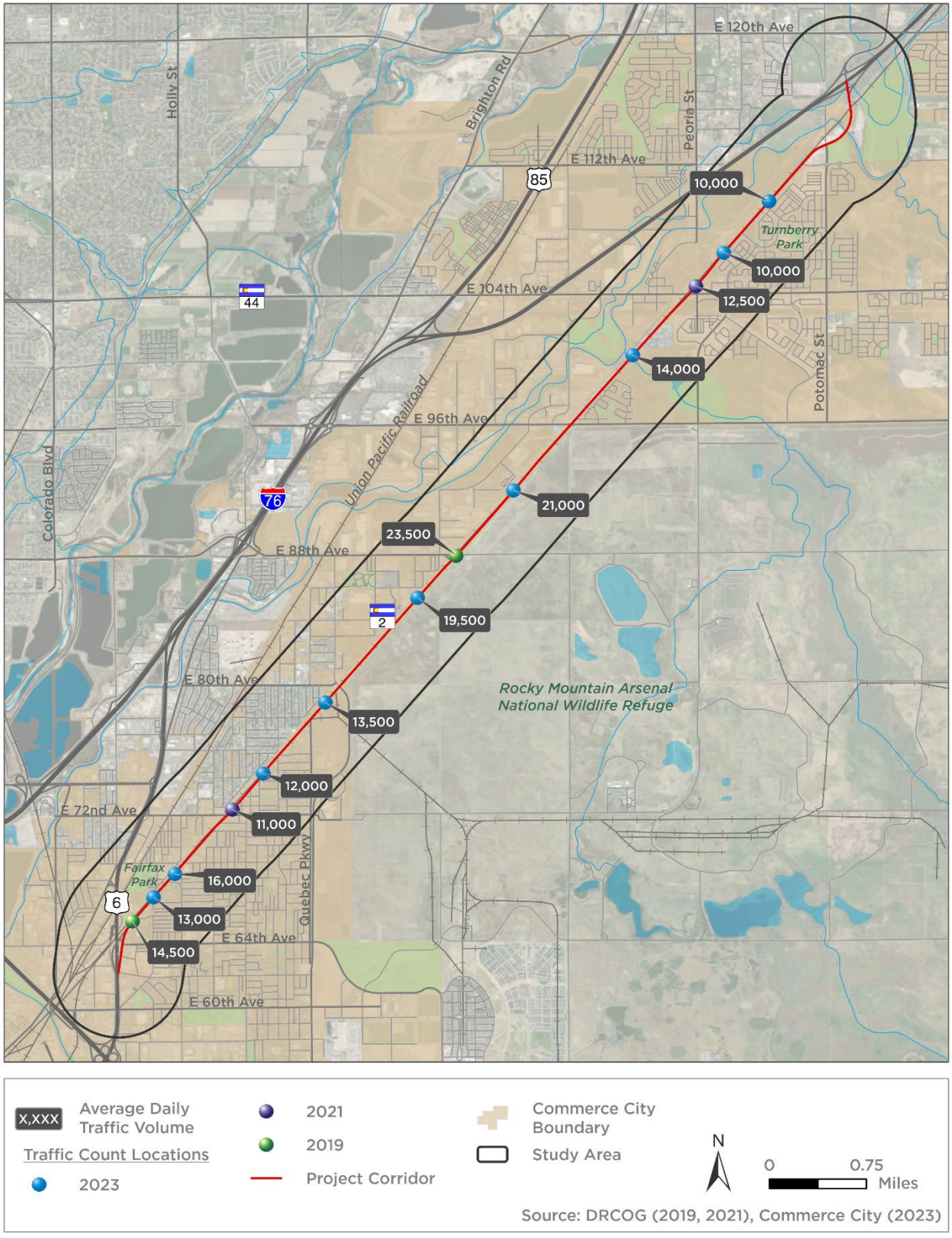


Figure 11. Traffic Volumes



Multimodal Transportation

Highway 2 is an important link in Commerce City's biking and walking network because of the level of connectivity it provides throughout the city's extents. As shown in **Figure 12**, active transportation facilities exist throughout the study area but vary in the level of separation and comfort they provide. Southwest of the Quebec Parkway intersection, bicyclists and pedestrians are served by an attached (generally 8' wide) sidewalk on the south side of Highway 2 and a short stretch of striped bike lanes between E. 72nd Avenue and Quebec Parkway. Northeast of Quebec Parkway, a detached 12' trail along the south side of Highway 2 extends all the way to E. 112th Avenue; striped shoulders between 4' and 6' wide also exist within the roadway footprint. In addition to the handful of signalized intersections along Highway 2, there are several other designated bike/ped crossing points as shown in **Figure 3**.

Level of Traffic Stress

To attract and support bicyclists and pedestrians of a wide range of ages and abilities, a corridor must include safe, low-stress facilities that limit the interaction with motor vehicles on streets. Level of Traffic Stress (LTS) is a standard tool for assessing comfort levels for active transportation. The tool calculates scores on a scale of 1 to 4 based on street characteristics such as traffic speeds and volumes, number of lanes, bike lane/sidewalk width, and buffer distances. LTS values of 1 and 2 are considered low-stress; values of 3 and 4 are indicative of roadways that do not provide a high level of comfort for most active mode users. Pedestrian and Bicycle LTS analyses were conducted for Highway 2 (see **Figure 13** and **Figure 14**) – due to the high motor vehicle speeds and volumes, and the lack of physical separation between existing active transportation facilities and vehicle lanes, the corridor is high-stress for both user types southwest of Quebec Parkway. Northeast of Quebec Parkway, the existing trail provides a low-stress option for both, but on-street bicycling is still high-stress.

Transit

There is no transit service along Highway 2 today, but understanding the makeup of the broader transit network in the area is still important from an active transportation perspective since most transit users walk or bike to/from bus stops. RTD operates two bus routes through the core city area: Route 49 and Route 88, both of which run between N Line and A Line stations at 30 to 60 minute frequencies (both are recommended for increased frequencies in RTD's System Optimization Plan). Between the two routes, there are over a dozen bus stops within ½ mile of Highway 2, primarily along E. 69th Avenue, E. 72nd Avenue, and Monaco Street; the closest rail station, Commerce City / 72nd Avenue Station, is about a mile and a half west of the corridor along E. 72nd Avenue, so within biking and walking distance for some people. Route 104L, which runs between Denver International Airport and Westminster, also crosses Highway 2 at E. 104th Avenue.

Figure 12. Existing Bicycle Network

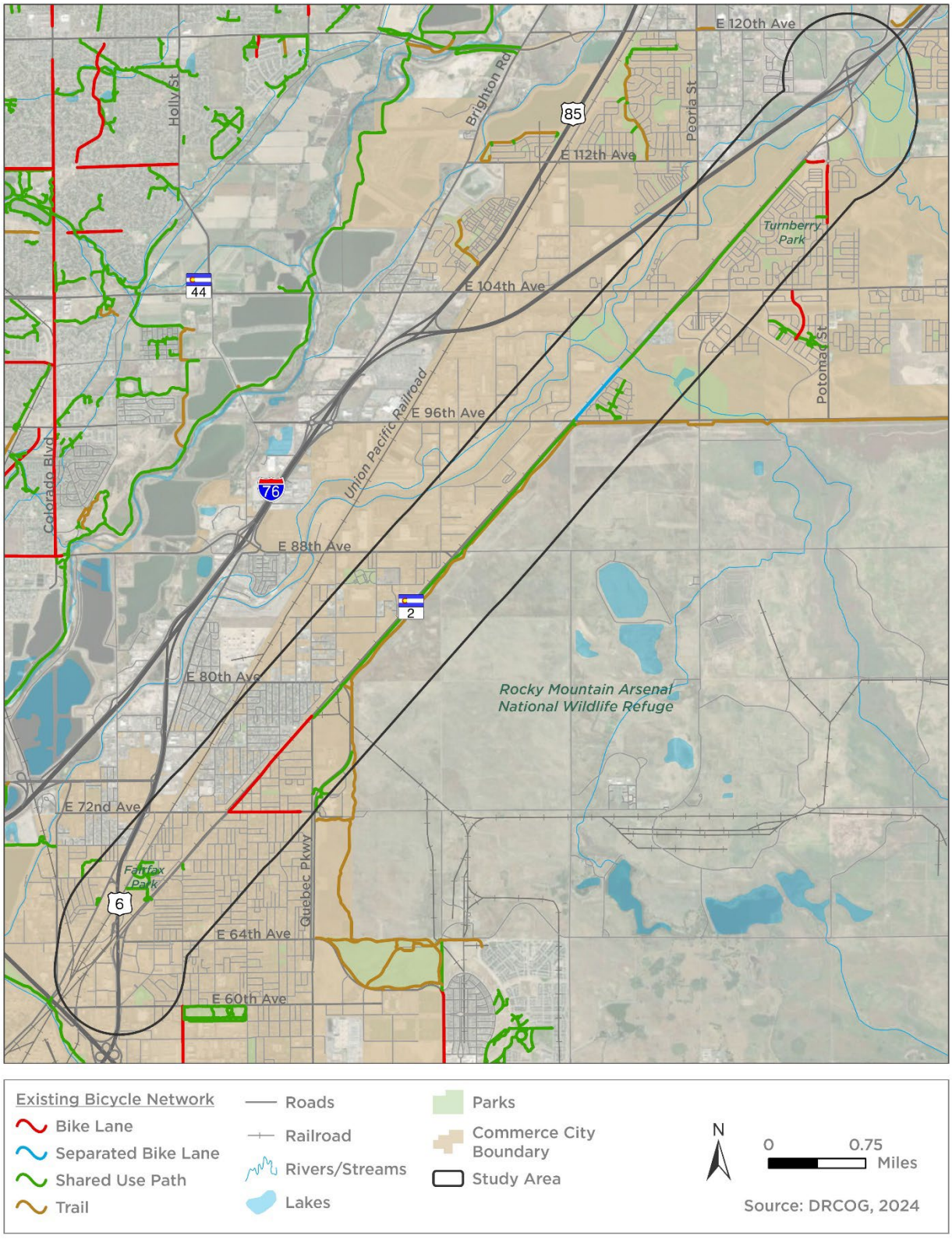


Figure 13. Pedestrian Level of Traffic Stress

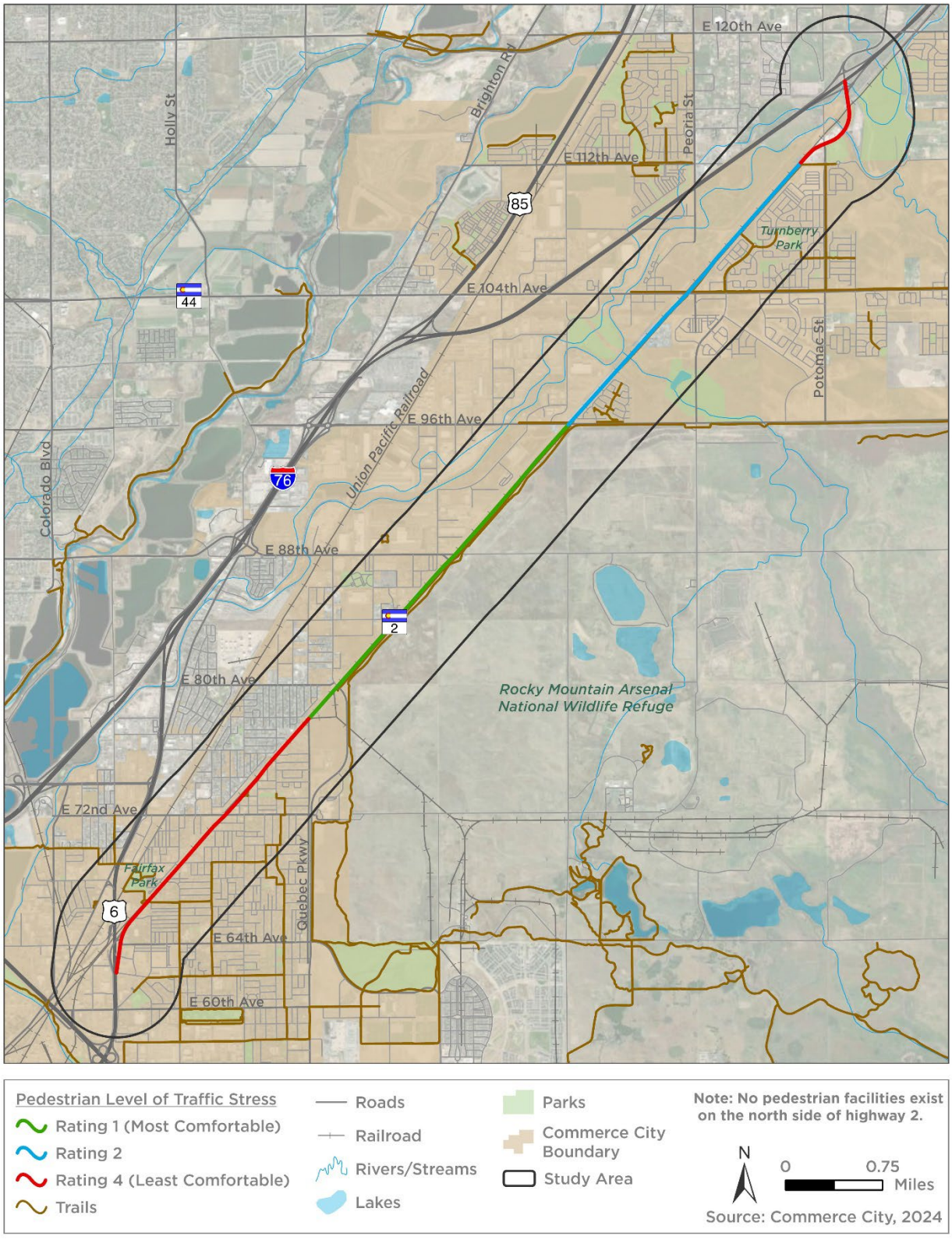
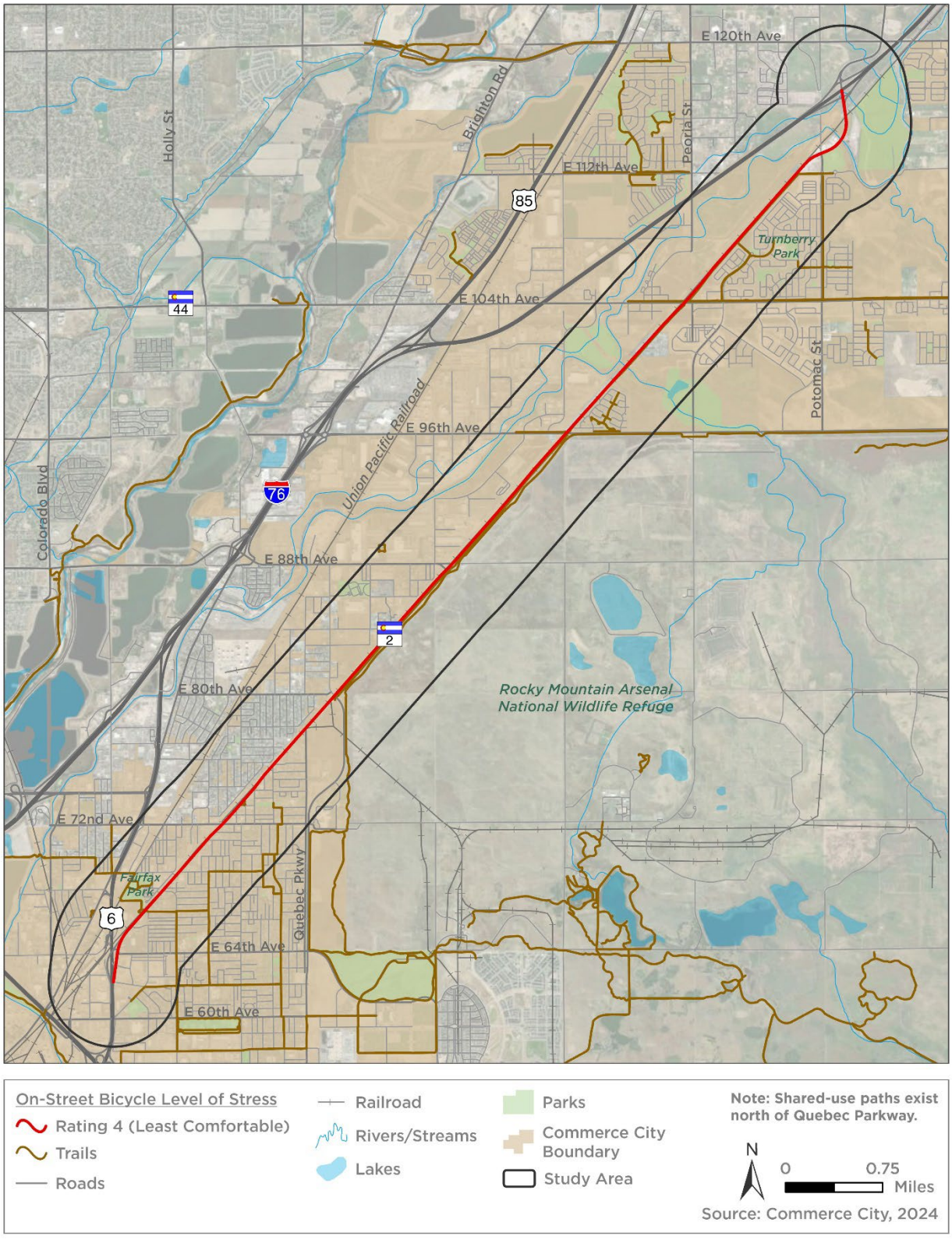


Figure 14. Bicycle Level of Traffic Stress



Travel Characteristics

Travel characteristic data along Highway 2 were obtained using the Replica platform, which provides additional information about the trips that are being taken along the highway by aggregating data from smartphones and GPS-enabled vehicles. The data presented in this section comes from Spring 2023 weekdays. **Figures 15** and **16** show the origins and destinations of the trips that travel through the corridor on a typical weekday by census tract, respectively. A large percentage of the trips that begin somewhere near Highway 2 also end somewhere near Highway 2, and vice versa. Denver International Airport, the I-70 corridor, and communities to the northeast such as Lochbuie and Hudson also see relatively high levels of daily travel to and from the Highway 2 corridor.

In terms of all daily trips that travel through the Highway 2 corridor, the average distance of the trip is 19.2 miles, with over 60 percent (%) of the trips traveling at least 8 miles (the study area spans just over 8 miles). The average trip duration in minutes is about 30 minutes, with over 50% of trips being over 20 minutes. The vast majority (over 85%) of corridor users are traveling in private automobiles, either as drivers or passengers. Notably, over 12% of corridor users are in commercial vehicles – a relatively high percentage of truck traffic for an arterial street. **Figures 17** through **19** present charts of Highway 2 trip characteristics.

Figure 15. Origins of Trips to Highway 2 Corridor

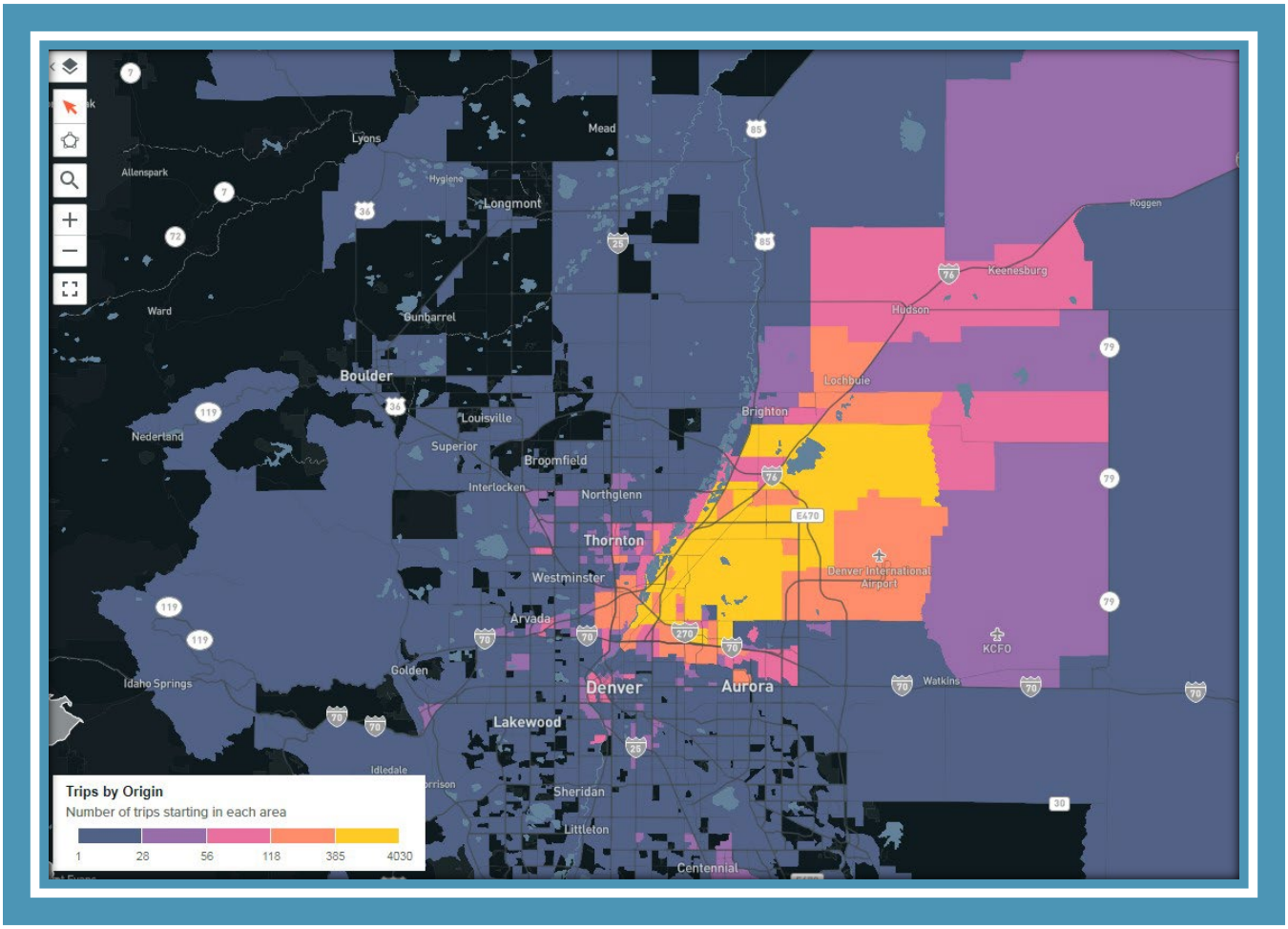


Figure 16. Destinations of Trips from Highway 2 Corridor

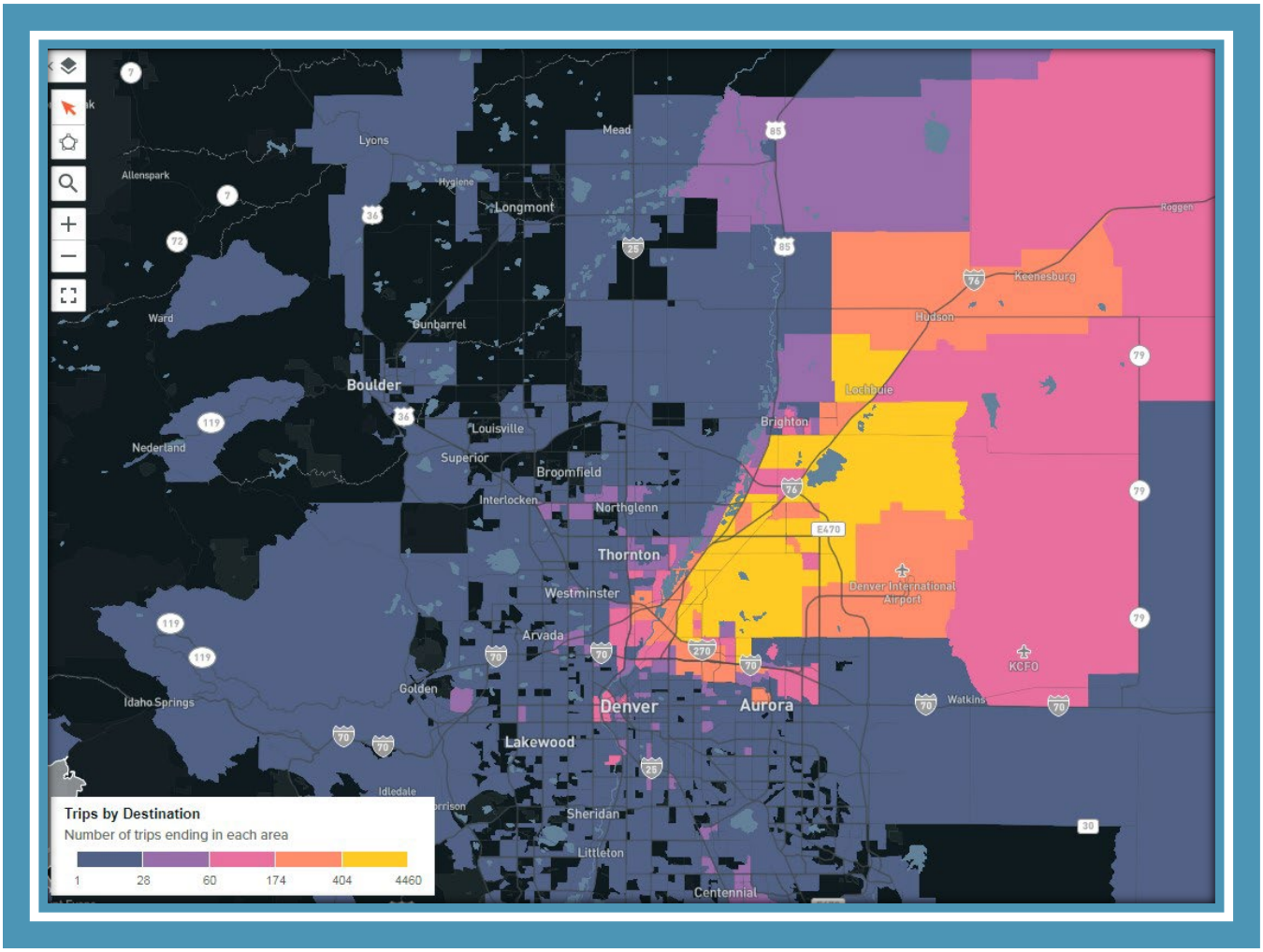


Figure 17. Highway 2 Average Trip Distance Distribution

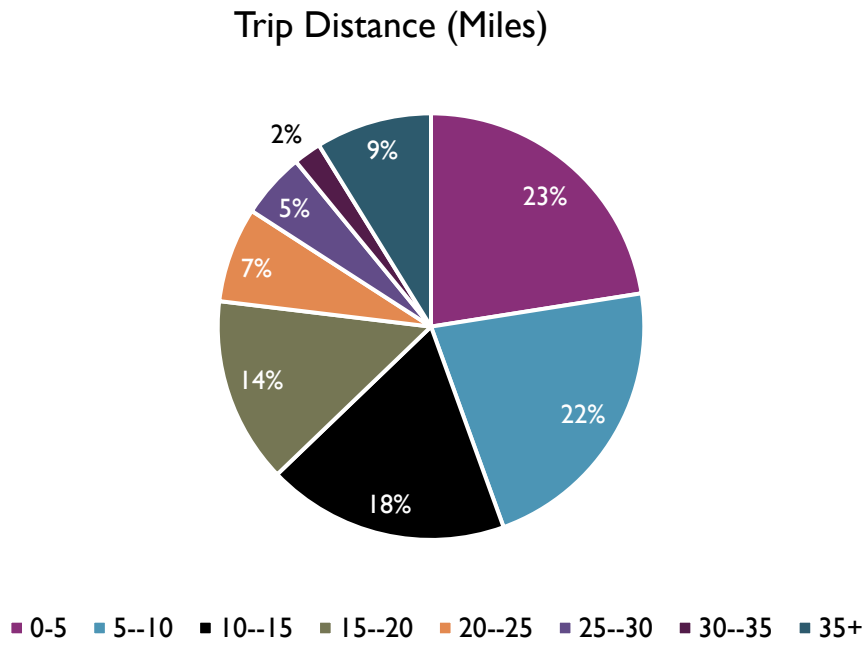


Figure 18. Highway 2 Average Trip Duration Distribution

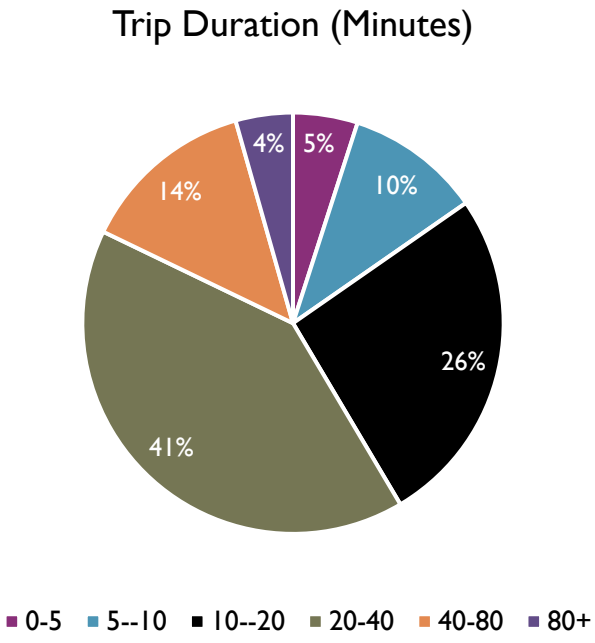
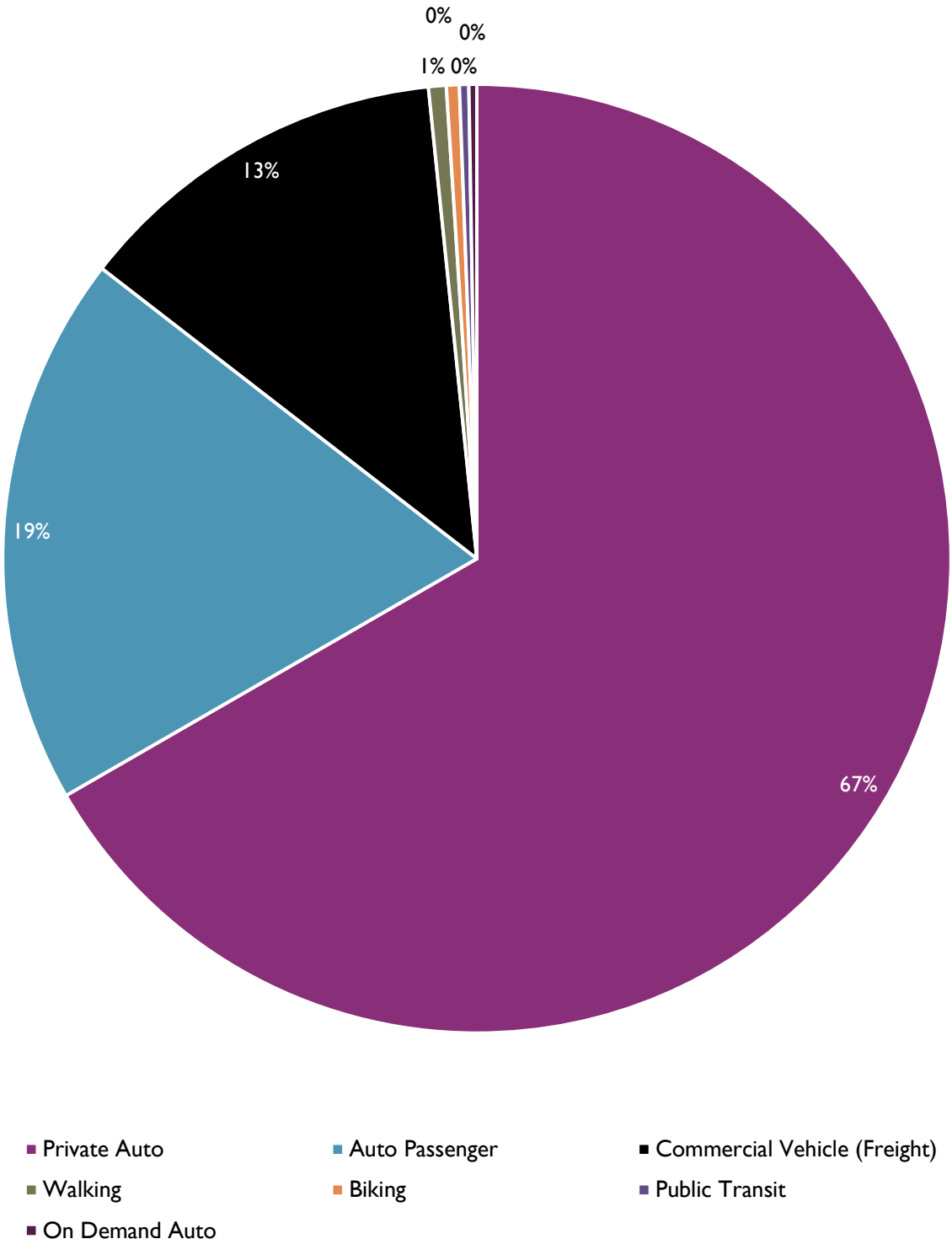


Figure 19. Primary Mode for Trips along Highway 2



Intersection Operations

Replica data was also used to assess operations at signalized intersections along Highway 2. It is important to note that, while Replica is a valuable tool for estimating traffic volumes, it comes with a medium level of certainty – factors such as data aggregation, sampling biases, and variability in volumes can all impact the integrity.

Using the Spring 2023 Thursday dataset, estimates of intersection turning-movement and through-movement counts were derived by selecting specific linked paths between different intersection legs and calculating total trips that passed through each linked path. This process results in estimated daily traffic volumes traveling through each intersection, while also accounting for left- and right-turn movements. **Table 2** below presents estimated daily volumes by movement at each signalized intersection between E. 64th Avenue and E. 112th Avenue. In all rows, the northbound and southbound movements are those originating from Highway 2.

Table 2. Highway 2 Daily Intersection Movement Volumes

Intersection	NBL	NBT	NBR	EBL	EBT	EBR	SBL	SBT	SBR	WBL	WBT	WBR
E. 64th Avenue	239	5960	1760	-	-	-	279	261	6260	920	1710	39
E. 72nd Avenue	1160	3330	837	3100	6940	853	270	3610	2580	1080	6550	463
E. 80th Avenue	1070	3670	15	411	6550	1190	6400	3810	439	6	4660	5960
E. 88th Avenue	960	9090	-	1490	-	1060	-	9510	2140	-	-	-
E. 96th Avenue	1110	6950	2000	682	2560	668	426	7420	567	2900	1460	406
E. 104th Avenue	813	3990	3220	4650	11900	877	139	4020	887	3510	11600	379
E. 112th Avenue	-	8940	11	-	-	-	2	5120	-	58	-	70

NB = Northbound, SB = Southbound, EB = Eastbound, WB = Westbound, L = Left, T = Through, R = Right

When evaluating intersection functionality, hourly volumes are more critical to understand and analyze than daily volumes since demand tends to peak during specific hours of a day, rather than being evenly distributed throughout the course of a day. While detailed turning movement counts are the most accurate way to analyze a specific intersection, standard peak hour ranges can be applied if only daily volume totals are available – 10% is a generally accepted value for the percent of daily traffic that occurs in a peak hour, with 15% being a conservative value that can be applied if substantial growth in traffic demand is anticipated. For the Highway 2 signalized intersections, peak hour percentages of 10% and 15% were applied to the daily intersection movement volumes presented in **Table 2**. **Tables 3** and **4** present the estimated peak-hour intersection movement counts.

Table 3. Estimated Peak Hour Intersection Counts (10% Peak Hour Rate)

Intersection	NBL	NBT	NBR	EBL	EBT	EBR	SBL	SBT	SBR	WBL	WBT	WBR
E. 64th Avenue	24	596	176	0	0	0	28	26	626	92	171	4
E. 72nd Avenue	116	333	84	310	694	85	27	361	258	108	655	46
E. 80th Avenue	107	367	2	41	655	119	640	381	44	1	466	596
E. 88th Avenue	96	909	0	149	0	106	0	951	214	0	0	0
E. 96th Avenue	111	695	200	68	256	67	43	742	57	290	146	41
E. 104th Avenue	81	399	322	465	1190	88	14	402	89	351	1160	38
E. 112th Avenue	0	894	1	0	0	0	0	512	0	6	0	7

Table 4. Estimated Peak Hour Intersection Counts (15% Peak Hour Rate)

Intersection	NBL	NBT	NBR	EBL	EBT	EBR	SBL	SBT	SBR	WBL	WBT	WBR
E. 64th Avenue	36	894	264	0	0	0	42	39	939	138	257	6
E. 72nd Avenue	174	500	126	465	1041	128	41	542	387	162	983	69
E. 80th Avenue	161	551	2	62	983	179	960	572	66	1	699	894
E. 88th Avenue	144	1364	0	224	0	159	0	1427	321	0	0	0
E. 96th Avenue	167	1043	300	102	384	100	64	1113	85	435	219	61
E. 104th Avenue	122	599	483	698	1785	132	21	603	133	527	1740	57
E. 112th Avenue	0	1341	2	0	0	0	0	768	0	9	0	11

Appropriate intersection configurations are highly context-dependent, with factors such as cycle lengths multimodal safety implications all being important to assess on an individual basis, but the Federal Highways Administration (FHWA) does provide some general guidance for intersection sizing:

- Enough through lanes should be provided to prevent any single lane from exceeding 450 vehicles per hour
- Exclusive left-turn lanes should be considered when left-turn volumes exceed 100 vehicles per hour; dual left-turn lanes could be considered when left-turn volumes exceed 300 vehicles per hour
- Exclusive right-turn lanes should be considered when right-turn volumes and adjacent through lane volumes each exceed 300 vehicles per hour

As these tables show, there is likely a substantial amount of turning traffic at signalized intersections along Highway 2 during peak hour conditions; by FHWA standards, dedicated turn lanes are operationally important at many of them. This will be an important consideration as potential intersection safety and operations improvements are evaluated over the course of the Highway 2 Corridor Study.

Safety Analysis

Data Collection

Crash data was obtained using DiExSys Vision Zero Suite (VZS) platform to review and document existing safety conditions in the study area. The most recently available 5-year period of crash data is from January 1, 2018, to December 31, 2022. Crash history from 2020 through 2021 may be impacted by the widespread impacts to travel patterns and crash frequency stemming from the COVID-19 pandemic.

Crash History

The corridor crash history for the period of January 1, 2018, to December 31, 2022, was evaluated to understand the magnitude and nature of existing safety problems within the study area. During the study period, 558 crashes were recorded in the study area, of which 421 resulted in Property Damage Only (PDO), 134 resulted in injuries (193 people injured), and three (3) were fatal collisions (four people killed). **Table 5** summarizes the total crashes by severity over the five-year study period.

Table 5. Crash Severity by Year (DiExSys Vision Zero Suite, 2018-2022)

Year	PDO Crashes†	Injury Crashes‡	Fatal Crashes‡	Total Crashes	Persons Injured	Persons Killed
2018	100	27	1	123	34	1
2019	110	28	0	138	39	0
2020	66	33	1	100	51	2
2021	62	27	0	89	35	0
2022	83	19	1	103	34	1
Total	**421**	**134**	**3**	**558**	**193**	**4**
Average	**84.2**	**26.8**	**0.6**	**111.6**	**38.6**	**0.8**

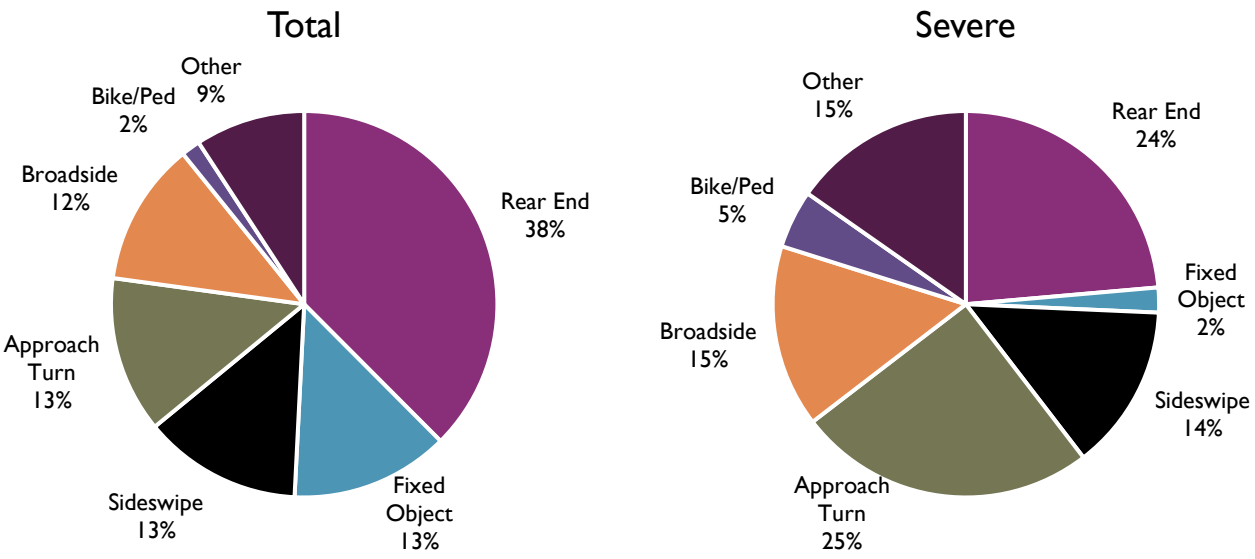
†PDO = Property Damage Only

‡Injury and Fatal Crashes are often grouped together as "Severe Crashes"

Crash Types

Crash types were evaluated to understand which movements and collision types are most common on the corridor and most likely to result in severe (injury or fatal) crashes. **Figure 20** shows the distribution of recorded crash types for total and severe crash frequencies.

Figure 20. Top Crash Types



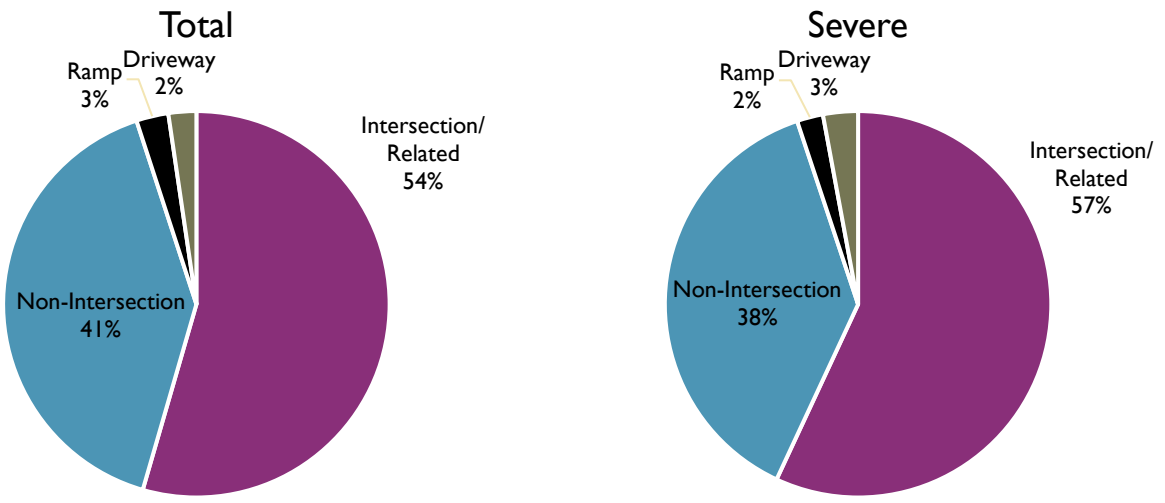
Rear End crashes were most common, comprising 38% of total crashes. Fixed Object (13%), Sideswipe Same Direction (13%), Approach Turn (13%), and Broadside (12%) crashes were the next most common crash types. As depicted in **Figure 20**, there are notable differences between the distribution of total and severe (injury and fatal) crash frequencies. This indicates certain crash types may be more susceptible to Injury or Fatal crashes. For example:

- Approach Turn crashes represent 13% of total crashes, but 25% of severe crashes.
- Broadside crashes represent 12% of total crashes, but 15% of severe crashes.
- Bicycle and Pedestrian crashes combined account for just 2% of total crashes, but 5% of severe crashes.

Crash Locations

Crash locations were evaluated to understand what types of facilities within the study area are more susceptible to Injury and Fatal crashes. **Figure 21** displays a comparison of crash locations for total and severe crashes. The distribution of crash locations was not substantially different between total and severe crash frequencies.

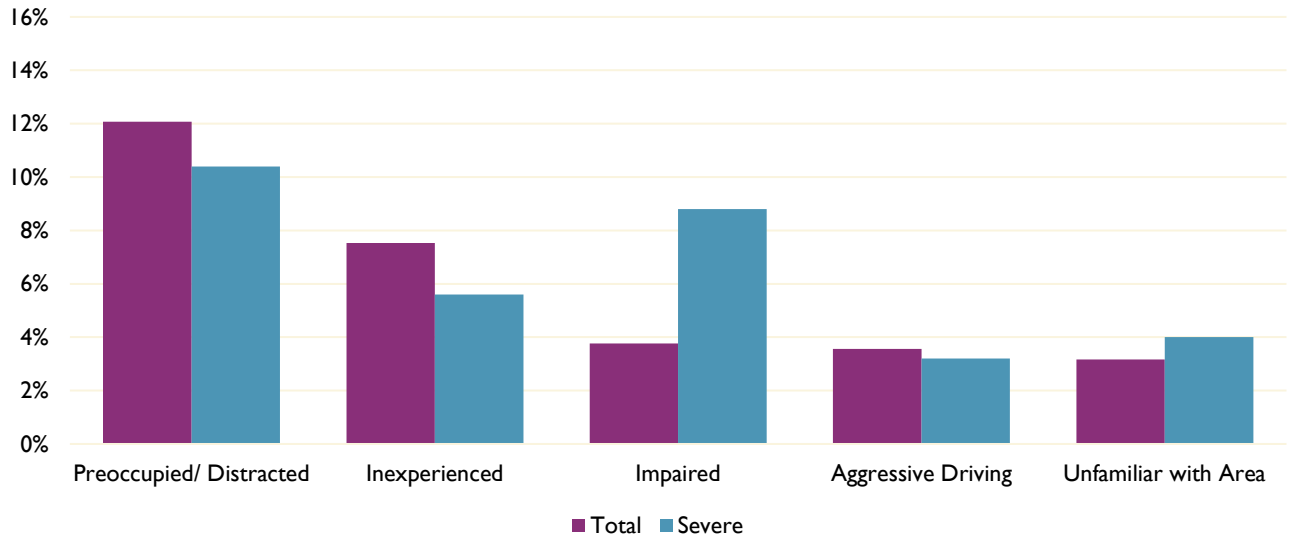
Figure 21. Crashes by Location Type



Driver Contributing Factors

Driver Contributing Factors were evaluated to understand their impact on the recorded crash history. Most crashes did not cite a contributing factor. **Figure 22** displays a comparison of the recorded contributing factors for total and severe crashes. As shown in the figure, Impaired Drivers were cited as a contributing factor in 4% of total crashes, but 9% of severe crashes.

Figure 22. Crashes by Driver Contributing Factor



Fatal Crashes

Three fatal crashes occurred along Highway 2 during the study period.

- Fixed Object Crash – E. 88th Avenue (January 27, 2018)
  - An eastbound motorist on E. 88th Avenue ran off the road and struck a light/utility pole near the Highway 2 & E. 88th Avenue intersection. The crash occurred under Dark-Lighted conditions. No driver contributing factors were cited.
- Head On Crash – north of Turnberry Parkway (October 16, 2020)
  - A southbound motorist on Highway 2 crossed over the centerline approximately 430 feet north of Turnberry Parkway and struck two northbound motorists head on. Both northbound drivers were killed. Alcohol and speeding were both cited in the crash record as contributing factors.
- Overturning Crash – Quebec Parkway (June 7, 2022)
  - A northbound motorist on Quebec Parkway ran off the road, overcorrected, and overturned in the roadway near the Highway 2 & Quebec Parkway intersection. The crash occurred under Dark-Unlighted conditions. Alcohol was cited as a contributing factor.

Crash Density

In addition to reviewing crash history, additional analysis of the spatial distribution of crashes along the study area was conducted to determine locations where crashes are most frequent. As shown in **Figure 18**, the highest concentrations of total crashes within the study area are generally at/related to intersections. The following intersections have the highest crash density:

- E. 72nd Avenue – 66 crashes (9 severe crashes)
- Quebec Parkway/Rosemary Street – 86 crashes (17 severe crashes)
- E. 88th Avenue – 30 crashes (9 severe crashes)
- E. 96th Avenue – 44 crashes (12 severe crashes)
- E. 104th Avenue – 64 crashes (18 severe crashes)

Crashes at these five intersections make up 52 percent of the total crash history and 47 percent of the severe crash history.

Figure 16. Crash Density