

Appendix C1.

Transportation Resources





C1. Transportation Resources Technical Memorandum

July 2023

Project Number: NHPP 006A-06

Subaccount Number: 22922

The following project information can be found in Attachment A Project Information:

- Introduction and Background
- Project Study Area
- Purpose and Need
- Proposed Action Description

Methodology

Travel Demand Forecasts

The alternatives evaluation that identified the specific improvements for the Proposed Action was completed in 2020 and utilized travel demand forecasts based on the updated Denver Regional Council of Governments (DRCOG) Focus 2.2 model, which was the approved model and horizon year at the time. The 2040 peak hour traffic forecasts used to develop the Proposed Action design recommendations were also compared to the traffic forecasts for development along and adjacent to Vasquez Boulevard. If needed, minor edits were made to the peak hour forecasts for consistency.

The regional travel demand model provides output for daily traffic volumes on the roadway network. Due to the complexity of real-world behavior, a travel demand model is not expected to provide precise traffic volume forecasts. A common technique used to improve the reliability of travel demand forecasts is referred to as post-processing adjustment. To improve the reliability of the forecasts, a post-processing adjustment of the daily traffic volume output from the DRCOG 2040 (Focus 2.2) model was performed to develop the traffic forecasts for the traffic analyses. The adjustment methodology compares the existing year model traffic volumes to the existing traffic counts compiled for the project area roadways. The 2040 model output was adjusted based on factors and/or differences from the existing model traffic volumes versus actual traffic volumes. This post-processing adjustment methodology follows the methods outlined in the National Cooperative Highway Research Program (NCHRP) Report 765, generally utilizing the average of the results from the modified ratio and difference methods.



DRCOG approved the Focus 2.3 model with horizon year 2050 with the adoption of the 2050 Metro Vision Regional Transportation Plan in April 2021. A sensitivity evaluation was conducted to assess the magnitude of differences between the 2040 forecasts used for the project development, the 2050 forecasts, and the potential for impacts on the Proposed Action conclusions and/or design.

The comparative analysis of the daily traffic volumes from the DRCOG 2040 and 2050 models showed the average volume increase on the roadway segments is less than 6.0% and there is an annual growth from 2040 to 2050 of less than 1.0% on all area roadway segments. With overall area roadway capacity limitations, the peak hour traffic forecasts will likely increase at an even lower growth rate than the daily forecasts. The volume increases from the 2040 to 2050 models can be handled with the Proposed Action and it is reasonable to consider that a new full traffic performance analysis for year 2050 would not impact intersection lane configuration decisions made based on the 2040 traffic analysis.

Updating the traffic forecasts to incorporate the DRCOG 2050 travel demand model would not change the conclusions made from the analysis of the 2040 forecasts or the lane configurations, therefore the project continued to utilize the DRCOG 2040 Focus 2.2 travel demand model as the basis for the NEPA documentation and project-level analysis.

Traffic Operations Analysis

The No Action and Proposed Action intersection operations were analyzed using existing and 2040 forecasted peak hour turning movement volumes at the Vasquez Boulevard/60th Avenue and Vasquez Boulevard/62nd Avenue intersections.

Peak hour traffic analysis for the intersections was completed using Synchro Studio and TransModeler software. Synchro was used to optimize signal timing and TransModeler provided output for the level of service, delays, queues and travel times. Traffic operations performance in the study area was analyzed for the AM peak hour, 7:00 to 8:00 AM, and the PM peak hour, 4:30 to 5:30 PM. These analysis periods are based on the approximate peak travel periods along Vasquez Boulevard based on traffic counts compiled for the study.

The following transportation operation measures of effectiveness were documented for the evaluation of the intersection and corridor conditions during the AM and PM peak hours:

- Level of service (LOS) and overall intersection delay for signalized intersections as defined by the Highway Capacity Manual (HCM) 7th Edition (Transportation Research Board, 2022)
- Queue lengths for longest/most congested approach
- Travel times along Vasquez Boulevard

Based on the HCM, LOS is a method of describing traffic operations in general and comparable terms based on a letter grading of A through F. LOS A describes the best operations with little or no delay, and LOS F describes over-capacity conditions with poor traffic operations and high delay. Generally, LOS D is a reasonable expectation for peak hour traffic operations in urban areas where reasonable roadway capacity is provided.



Safety

A safety assessment for the project area was conducted based on an analysis of five years of crash history on Vasquez Boulevard from south of the 60th Avenue intersection through the 62nd Avenue intersection to the overpass that connects Highway 2 to southbound Vasquez Boulevard. The crash history included in the safety assessment covered January 1, 2015 through December 31, 2019. Crash data from 2020 and later was excluded from the analysis due to the lower traffic volume impacts of the COVID-19 pandemic.

Multimodal

Existing transit service and bicycle and pedestrian resources within the study area were identified using local and state-wide transportation planning documents and visual inspection along with public GIS data. The current multimodal facilities reflect existing conditions collected and observed in April of 2022.

Existing Conditions

Vasquez Boulevard is a principal arterial that is a continuation of US 85 as well as US 6, with a speed limit of 45 miles per hour (mph) through the study area. This project encompasses approximately 1.5-miles of Vasquez Boulevard from 58th Avenue to 64th Avenue. The cross section for Vasquez Boulevard has six through lanes from I-270 to the Highway 2 ramps near the 62nd Avenue intersection and four through lanes north of the Highway 2 ramps. The existing travel lanes measure 12-feet wide across Vasquez Boulevard within the study area. There is no sidewalk along the majority of Vasquez Boulevard, except for approximately 500 feet of existing meandering five-foot-wide sidewalk south of 62nd Avenue.

In the Commerce City C3 Vision Transportation Plan, 60th Avenue and Parkway Drive are classified as minor/residential collectors. The Vasquez Boulevard/60th Avenue intersection is shared with Parkway Drive and adjacent frontage roads, creating a signalized intersection with eight approaches ([Figure 1](#)). There are two-way frontage roads on both sides of Vasquez Boulevard - Dexter Street is west of Vasquez Boulevard while Dahlia Street is east of Vasquez Boulevard. The multi-leg layout as well as heavy left-turning movements result in an unusually large intersection. The intersection has pedestrian crossings on all legs except the south leg. There is a red-light camera system in place.



Figure 1: Vasquez Boulevard/60th Avenue Intersection



The City of Commerce City has a long-term vision for the area surrounding the Vasquez Boulevard/60th Avenue intersection to become a regional hub for commerce. The area west of Vasquez Boulevard and north and south of 60th Avenue consists of older industrial properties with street connections limited to Clermont Street, 63rd Avenue, and the two frontage roads Dexter Street and Dahlia Street. There are currently no local streets serving the area south of 60th Avenue and west of Vasquez Boulevard, limiting property access to be directly to 60th Avenue or via the frontage road. The limited local roadway network constrains the efficiency of the local transportation network and limits redevelopment planned by the City as a community resource. The existing local streets also puts traffic on Dexter Street at the Vasquez Boulevard/60th Avenue signal, contributing to the conflicts at the intersection.

The Vasquez Boulevard/62nd Avenue intersection is currently an unsignalized, right-in, right-out intersection located on the northbound Highway 2 off ramp with no access to Vasquez Boulevard. 62nd Avenue is classified by the City of Commerce City as a minor/residential collector.



Traffic Operations

In December 2019, daily and AM and PM traffic counts at ten locations within the study area were conducted. In addition, traffic counts and data was collected by CDOT, the City of Commerce City and the Mile High Greyhound Development project at different locations in the study area (within the same year, prior to COVID-19 pandemic). This data was compiled for additional area coverage and compared to evaluate typical condition counts:

- Vasquez Boulevard carries over 40,000 vehicles per day (vpd) south of 60th Avenue, over 35,000 vpd north of 60th Avenue, and almost 25,000 vpd north of the Highway 2 ramps/62nd Avenue.
- 60th Avenue carries about 6,000 vpd west of Vasquez Boulevard and almost 12,000 vpd east of Vasquez Boulevard.
- 62nd Avenue carries about 7,600 vpd east of Vasquez Boulevard.
- Parkway Drive carries over 8,000 vpd north of the Vasquez Boulevard/60th Avenue intersection.

Peak hour traffic volumes were used to evaluate and quantify traffic operations and capacity of an urban arterial roadway system. Vasquez Boulevard shows strong directional traffic flows during peak periods with almost 70% of traffic traveling southbound during the AM peak period and more than 55% of traffic traveling northbound during the PM peak period. Traffic volumes build and hold steady throughout the day with peak hours at 7:00 - 8:00 AM and 4:30 - 5:30 PM. Truck traffic makes up 10 to 12% of traffic during peak and off-peak periods along Vasquez Boulevard. 60th Avenue also has trucks traveling into the industrial areas east and west of Vasquez Boulevard with truck traffic almost five percent of traffic east of Vasquez Boulevard and over six percent of traffic west of Vasquez Boulevard.

An assessment of traffic operations was completed for the existing peak hour traffic volumes for intersection delay and level of service at the Vasquez Boulevard/60th Avenue and Northbound Highway 2 Off Ramp/62nd Avenue intersections. The output from the TransModeler analysis is summarized in [Table 1](#).



Table 1: Peak Hour Intersection Operations - Existing (2019)

Intersection	AM Peak LOS	AM Peak Delay (Seconds/Vehicle)	AM Peak Maximum Queue (Feet)	PM Peak LOS	PM Peak Delay (Seconds/Vehicle)	PM Peak Maximum Queue (Feet)
Vasquez Boulevard/ 60 th Avenue	F	101.3	2,174 (southbound Vasquez)	F	109.3	1,246 (southbound Vasquez)
Northbound Highway 2 Off Ramp / 62 nd Avenue	A (westbound right)	2.9	80 (westbound 62 nd)	A (westbound right)	9.9	216 (westbound 62 nd)

Source: Muller Engineering TransModeler analysis

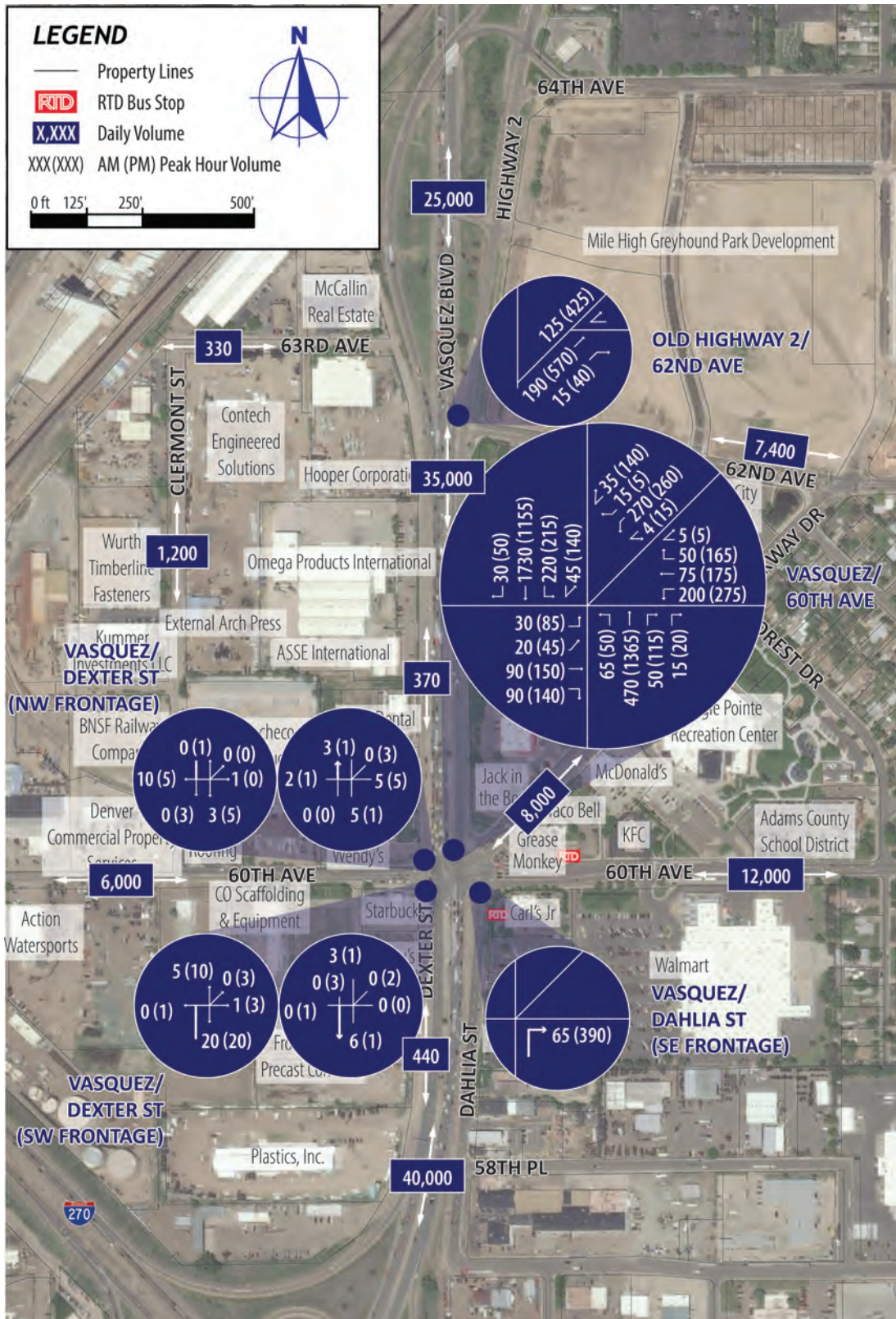
The Vasquez Boulevard/60th Avenue intersection operates at level of service (LOS) F during the AM peak and PM peak hours. The six lanes on Vasquez Boulevard through the intersection, the eight legs of the intersection (with Parkway Drive and the three frontage roads) and six approaches requiring signal phasing greatly impact the amount of green time that can be allocated to the high volumes on Vasquez Boulevard.

Long queues of traffic back up along the highway approaching the 60th Avenue signal, typically extending over 2,100 feet on southbound Vasquez Boulevard in the AM peak hour and over 1,200 feet in the PM peak hour. Northbound Vasquez Boulevard backups into the I-270 interchange during the PM peak hours. The side street approaches also experience high delays with the majority of the delay on the eastbound 60th Avenue approach.

The unsignalized, right-in, right-out Vasquez Boulevard/62nd Avenue intersection operates at LOS A in the AM and PM peak hours.



Figure 2: Existing (2019) Traffic Volumes





The travel time along Vasquez Boulevard through the study area was compiled from the TransModeler model for the corridor. The average travel times for vehicles between the point where 58th Avenue and the southbound I-270 on ramp intersect with Vasquez Boulevard (about 800 feet south of the 60th Avenue intersection) to the railroad underpass (about 1,600 feet north of the Highway 2 on/off ramps) are summarized in [Table 2](#).

Table 2: Peak Hour Travel Time along Vasquez Boulevard - Existing (2019)

Vasquez Travel Direction	AM Peak Travel Time (Minutes)	PM Peak Travel Time (Minutes)
Southbound	3.9	2.2
Northbound	1.9	2.8

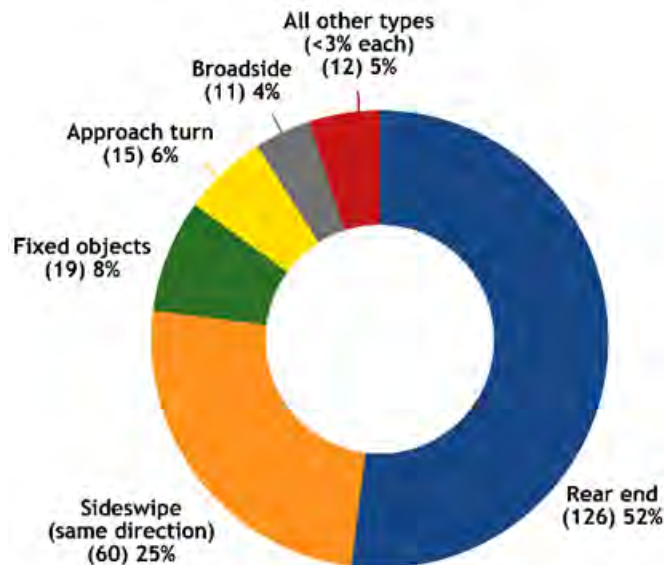
Source: Muller Engineering TransModeler analysis

Safety

Vehicular Traffic

During the five-year period from January 1, 2015 to December 31, 2019, there were 243 crashes along Vasquez Boulevard between south of 60th Avenue and north of 62nd Avenue/Highway 2. Rear-end crashes were most predominant (52%) followed by sideswipe (same direction) crashes (25%) and fixed object crashes (eight percent). [Figure 3](#) shows the crash distribution by type for the corridor.

Figure 3: Vasquez Boulevard Crash Distribution (2015 - 2019)

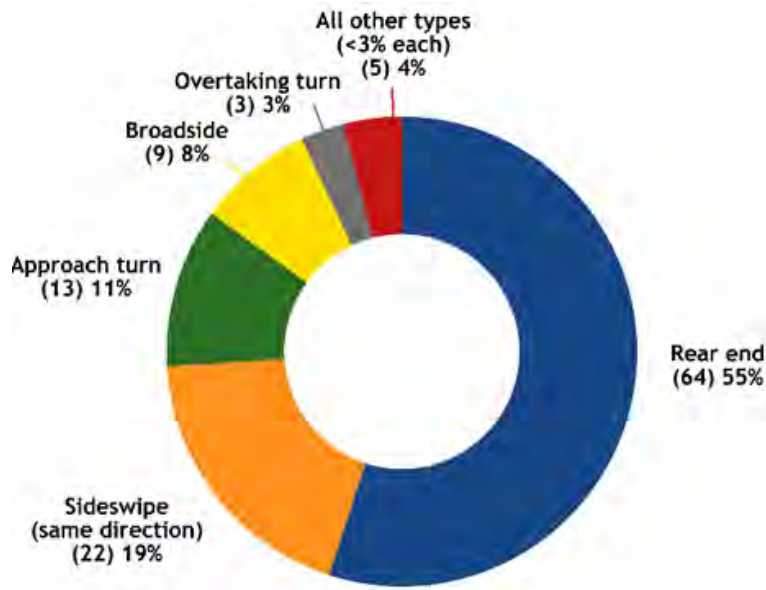




Source: State Highway 6H Safety Assessment Report: MP 292.94 – MP 293.67 (September 2022), Muller Engineering

Crashes that can be attributed to intersections (located at intersections or that are intersection-related) accounted for 54% of the total crashes (131 of 243 crashes). Most of these crashes occurred at the Vasquez Boulevard/60th Avenue intersection (116 of 131 crashes, 89%). [Figure 4](#) shows the crash distribution by type at the Vasquez/60th Avenue intersection.

Figure 4: Vasquez Boulevard/60th Avenue Intersection Crash Distribution (2015 - 2019)



Source: State Highway 6H Safety Assessment Report: MP 292.94 – MP 293.67 (September 2022), Muller Engineering

There were 64 rear end type crashes at the Vasquez Boulevard/60th Avenue intersection and 11 of those crashes resulted in injury. Most rear end crashes involved northbound and southbound vehicles failing to stop for the leading vehicles, which slowed to stop with long queues in the through lane far upstream from the intersection. Trucks were involved in 14% of the intersection crashes, in similar proportion to the truck traffic on Vasquez Boulevard. Weather and pavement conditions were not contributing factors.

There were 22 sideswipe (same direction) crashes at the Vasquez Boulevard/60th Avenue intersection; none resulted in injury. Most involved vehicles turning left, and a review of the crashes showed that trucks were involved in 40% of the sideswipe (same direction) crashes (nine of 22 crashes), with most of those involving southbound trucks in the left-turn lane.

The southeast frontage road (Dahlia Street) allows for southbound traffic to enter from the 60th Avenue intersection, but northbound traffic must turn right onto eastbound 60th Avenue. During a project field visit, northbound vehicles from Dahlia Street were observed traveling in



the wrong direction in the southbound lane while entering the intersection to turn left onto Vasquez Boulevard. While wrong-way crashes are not documented in the crash data, these types of wrong-way movements from the frontage roads are likely not isolated incidents and head-on crashes typically have more severity.

Multimodal

High traffic volumes and deficient pedestrian and bicycle facilities create safety concerns for pedestrians and bicyclists traveling through the study area. During the five-year period from January 1, 2015 to December 31, 2019 evaluated for the project, there was one pedestrian-involved crash and no bicyclist-involved crashes along Vasquez Boulevard between south of 60th Avenue and north of 62nd Avenue/Highway 2. The pedestrian-involved crash occurred at the Vasquez Boulevard/60th Avenue intersection in October 2018 at 7:28 PM in dark-lighted conditions with a vehicle traveling southbound and the crash resulted in injuries.

The Vasquez Boulevard/60th Avenue intersection presents a particular challenge. Pedestrian access is especially difficult, with long wait times between signal phases with the multi-leg configuration and wide roadways with multiple lanes. The intersection configuration, frontage road approaches and high traffic volumes makes the intersection and adjacent areas uncomfortable for pedestrians and bicyclists with a perceived reduction in safety.

In general, the relatively incomplete pedestrian/bicyclist network, vehicular turning conflicts and high speeds along and across Vasquez Boulevard in the study area create an environment that is not conducive to safe and comfortable multimodal movements.

Multimodal Connectivity

The pedestrian and bicyclist infrastructure within the study area is limited to sidewalks along 60th Avenue east of Vasquez Boulevard, Parkway Drive, and Dahlia Street (the southeast frontage road along the east side of Vasquez Boulevard). There are short sections of sidewalk adjacent to more recently developed properties, but without connections to other existing facilities. There are few pedestrians and bicyclists typically traveling along and across Vasquez Boulevard in the study area. The highest number of pedestrians observed occur at the intersection of Vasquez Boulevard/60th Avenue. However, Vasquez Boulevard serves as a barrier for east/west pedestrian and bicyclist travel. Continued redevelopment of the former Mile High Greyhound Park site will bring additional residential neighborhood population and multimodal infrastructure, increasing the demand for safe and comfortable multimodal connections through the area.

Bus stops in the vicinity of Vasquez Boulevard/60th Avenue are located along the southeast frontage road (Dahlia Street) and 60th Avenue. Buses stopped at the southbound stop block the single travel lane, causing traffic to back up into the Vasquez Boulevard/60th Avenue intersection and also block the designated crosswalk for pedestrians to access the bus stop. The northbound stop is located on the east side of Dahlia Street with sidewalk connections along Dahlia Street and 60th Avenue.



Sidewalk Coverage

Sidewalk facilities either connected to or adjacent to the roadways within the study area were identified and are illustrated in [Figure 5](#). There is no consecutive route for non-motorized north/south travel along Vasquez Boulevard or other parallel routes within the study area. Starting from the I-270 interchange, there is no sidewalk on either side of Vasquez Boulevard up to 60th Avenue. North of 60th Avenue there is an attached four-foot sidewalk that connects into a more formal path along the King Soopers (4850 62nd Avenue) property. North of 62nd Avenue there is a non-designated path used by pedestrians along Highway 2 (running from 62nd Avenue north to 64th Avenue) where a designated sidewalk begins.

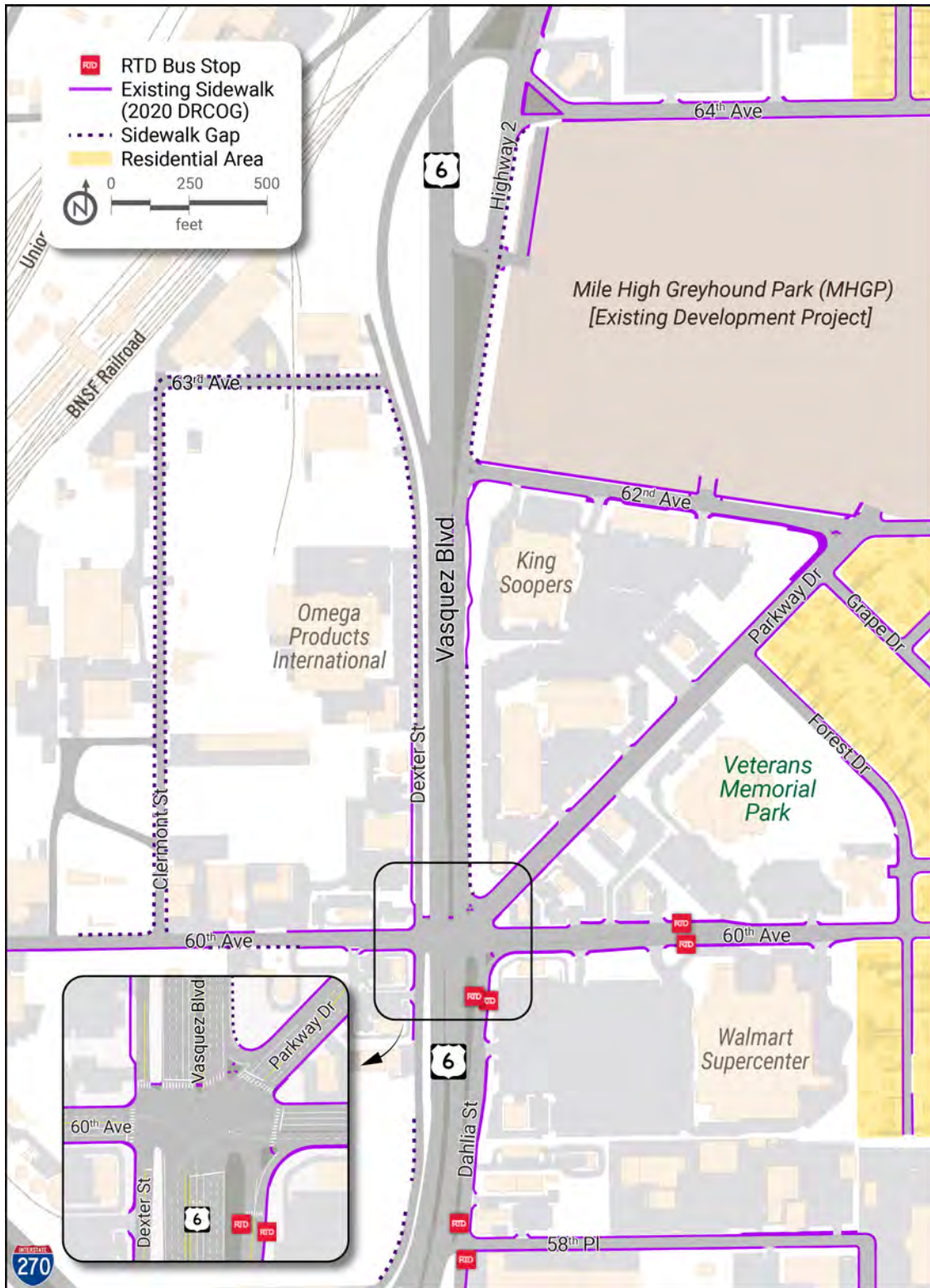
Sidewalks are present along adjacent roadways (Dahlia and Dexter Streets) for a portion of the study area. Along Dexter Street west of Vasquez Boulevard there are sidewalks starting at the Arby's fast-food property (5995 Dexter Street) going north to the Omega Products International property (6101 Dexter Street), with a striped crosswalk at the Vasquez Boulevard/60th Avenue signal. On Dahlia Street east of Vasquez Boulevard, there are sidewalks starting at the southern end of the study area north to the Vasquez Boulevard/60th Avenue intersection.

On 58th Avenue, 58th Place, 60th Avenue, Parkway Drive and 62nd Avenue east of Vasquez Boulevard, there are attached six-foot sidewalks present, which provide connections to the area businesses and Veterans Memorial Park. West of Vasquez Avenue, there are limited sidewalks present on the local streets and the sidewalks along 60th Avenue are discontinuous.

Signalized pedestrian crossings are located on the east, north and west quadrants of the Vasquez Boulevard/60th Avenue intersection. This is the only east/west pedestrian crossing of Vasquez Boulevard within the study area and for 1.75 miles (between the 56th Avenue signal south of the I-270 interchange and the 69th Avenue signal to the north).



Figure 5: Study Area Sidewalk Facilities





Bicycle Facilities

According to the DRCOG Denver Regional Bicycle Map, there are three bicycle facilities adjacent to the study area. There is an on-street bicycle lane on Holly Street from 60th Avenue south to 56th Avenue. Pioneer Loop Trail is a shared use path located around Pioneer Park, along 60th Avenue east of Holly Street. This trail connects to the Holly Street on-street bicycle lane.

The Sand Creek Greenway Trail is an off-street, shared use path that is used as a regional bikeway connecting many cities and bike trails around the metropolitan Denver area. The Sand Creek Greenway Trail is adjacent to I-270 and connects the South Platte River Greenway Trail (west) to the High Line Canal Trail (east). This off-street route is a vital connection for safety of bicyclists traveling through and around the area. Multiple trailheads and access points are located near the study area. The Dahlia Trailhead is approximately 0.3 mile southeast of the study area, located east of the Vasquez Boulevard/56th Avenue intersection. The Wetland Park and Trailhead is located off of 52nd Avenue off of Vasquez Boulevard. Fernald Trailhead is over 0.5 mile northwest from the study area off of Colorado Boulevard. All trailheads connect to the Greenways for easy and safe access for recreational use.

The regional bikeway allows for bicyclists to safely enjoy traveling the area without needing to cross a highway or interstate. I-76, I-270 and the surrounding highways are large barriers for pedestrians and bicyclists, and without the trail system it would nearly be impossible to navigate.

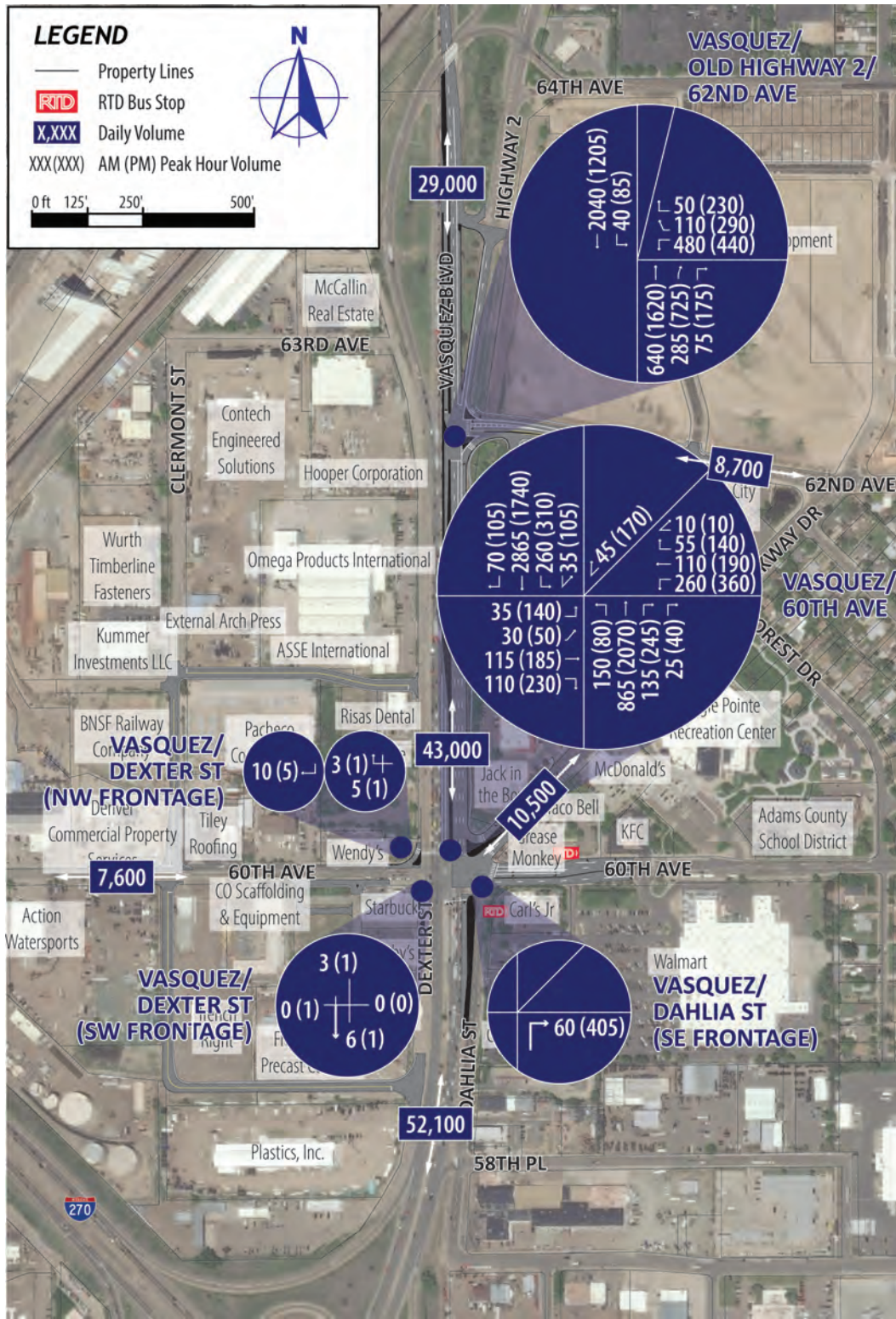
Impacts

By 2040, the average daily traffic (ADT) on Vasquez Boulevard is expected to increase about 24% to approximately 52,100 vpd north of the I-270 interchange and the ADT on Vasquez Boulevard is expected to increase about 20% to about 43,000 vehicles between 60th Avenue and 62nd Avenue. Daily traffic on 60th Avenue is expected to increase about 28% to 7,600 vpd west of Vasquez Boulevard while the ADT on 60th Avenue east of Vasquez Boulevard is expected to increase about 19%. Due to the capacity constraints of the area roadways and intersections, the increases in volumes may result in longer peak periods to accommodate the additional daily traffic. Future travel demand estimates are expected to remain the same with or without the project.

[Figure 6](#) details the expected volume by 2040.



Figure 6: Projected 2040 Traffic Volumes





No Action

The No Action would not improve Vasquez Boulevard operations, safety and access needs, but maintenance activities would continue. The existing roadway network and lane configurations were analyzed under the 2040 traffic conditions. The 2040 No Action intersection traffic operations are summarized in [Table 3](#). The signal timing at the Vasquez Boulevard/60th Avenue intersection was optimized for the future operational analysis. This shows that a limited improvement signal alternative, which would include only signal timing and coordination types of improvements along Vasquez Boulevard, would not provide operational benefits for the future horizon year.

Table 3: Peak Hour Intersection Operations - No Action 2040

Vasquez Intersection	AM Peak LOS	AM Peak Delay (Seconds/Vehicle)	AM Peak Maximum Queue (Feet)	PM Peak LOS	PM Peak Delay (Seconds/Vehicle)	PM Peak Maximum Queue (Feet)
60 th Avenue	F	148.4	3,610 (southbound Vasquez)	F	214.4	3,572 (southbound Vasquez)
62 nd Avenue	A (westbound right)	3.6	107 (westbound 62 nd)	F (westbound right)	147.0	1,164 (westbound 62 nd)

Source: Muller Engineering TransModeler analysis

Traffic growth results in increased intersection delays and queues with degraded traffic operations along the Vasquez Boulevard corridor by 2040, particularly for southbound Vasquez Boulevard at 60th Avenue. The average delay at Vasquez Boulevard/60th Avenue intersection would increase by over 96% in the PM peak hour to over 3.5 minutes per vehicle and maximum southbound queues would extend past the railroad underpass in both the AM and PM peak hours.

The average travel times along Vasquez Boulevard through the study area expected under 2040 No Action conditions are summarized in [Table 4](#). With the expected increases in traffic volumes and no intersection improvements, the peak hour travel times are anticipated to increase from the existing (2019) operations. In the PM peak hour, the southbound travel time is expected to increase almost 90% in the northbound direction and more than double in the southbound direction.



Table 4: Peak Hour Travel Time along Vasquez Boulevard - No Action 2040

Vasquez Travel Direction	AM Peak Travel Time (Minutes)	PM Peak Travel Time (Minutes)
Southbound	6.5	5.2
Northbound	2.1	5.3

Source: Muller Engineering TransModeler analysis

Crashes due to congestion would increase with traffic volumes through the study area under the No Action conditions. Rear end, sideswipe and fixed object crashes would continue to be a significant crash pattern along Vasquez Boulevard. The existing pedestrian and bicyclist safety concerns would be worsened, and pedestrians and bicyclists would feel increasingly uncomfortable traveling through the study area with increased vehicular congestion and lack of multimodal connections. The area would continue to be avoided by non-motorized travel due to the disconnect of pedestrian and bicycle facilities. With the lack of adequate facilities within the study area, residents who rely on non-motorized modes of transportation would not have the proper and safe access to local shopping centers, restaurants and recreational centers. The growing population and redevelopment would bring additional traffic and residents to the area, increasing the demand for safe and comfortable multimodal connections, which would not be available.

Proposed Action

With the Proposed Action, the number of through lanes on Vasquez Boulevard and the local streets in the study area would remain the same as existing. The Proposed Action would simplify the traffic movements and signal phasing at the Vasquez Boulevard/60th Avenue intersection, provide a new traffic signal with full movements at the Vasquez Boulevard/62nd Avenue intersection, and provide intersection turn lane improvements at both intersections. The Proposed Action also includes new local roadway connections west of Vasquez Boulevard.

The Proposed Action includes the elements listed below for the Vasquez Boulevard/60th Avenue and Vasquez Boulevard/62nd Avenue intersections:

- No left turn allowed from Parkway Drive to southbound Vasquez Boulevard or 60th Avenue.
- All inbound movements from Vasquez Boulevard/60th Avenue to frontage roads remain as they exist now, but outbound movements are restricted.
- New local access connections to Clermont Street west of Vasquez Boulevard constructed north and south of 60th Avenue to provide full access between frontage roads and 60th Ave.
- New traffic signal at the Vasquez Boulevard/62nd Avenue intersection that provides full access to/from 62nd Avenue and Vasquez Boulevard/Highway 2.



The new traffic signal at the Vasquez Boulevard/62nd Avenue intersection is included in the project to maintain full access to Vasquez Boulevard from the residential and retail area along 62nd Avenue and Parkway Drive with the removal of the left turn from Parkway Drive to southbound Vasquez Boulevard at the Vasquez Boulevard/60th Avenue intersection. Corner curb bulb-outs would be added at the Parkway/Forest intersection as a deterrent to drivers who may think Forest Drive is an alternate route to 60th Avenue. The bulb-outs and crosswalk will provide visual indication of Forest Drive as a neighborhood street.

The new local roadway connections west of Vasquez Boulevard are included in the project to maintain the area property's full access to 60th Avenue, with the movement restrictions of the Dexter Street/frontage roads at the Vasquez Boulevard/60th Avenue intersection. It also enhances the local circulation and multimodal connectivity of the local street network. The new local roadways were located to provide safe, efficient and effective transportation connections to and from 60th Avenue, away from the queues and high volumes at the Vasquez Boulevard/60th Avenue intersection. The new roadway connections, including multimodal facilities, would improve the safety and efficiency of the local transportation network and would be instrumental in accommodating the City's long-range vision for area growth.

The new roadways are two-lane, two-way local roads with the potential for direct property driveway access as approved by the City of Commerce City. The new connections with two-way access in the northwest and southwest quadrants of the Vasquez Boulevard/60th Avenue intersection will reduce congestion and improve safety by providing alternate local routes and reducing the turning movements at and adjacent to the complicated intersection. In order to meet the purpose and need for the project related to multimodal connectivity, the connections include pedestrian/bicyclist facilities as sidewalks. All of the local road connections remain as the City of Commerce City Local Industrial roadway classification. While the new local roadway connections would enhance the circulation in the area west of Vasquez Boulevard, they are not expected to substantially change the traffic volume on any of the existing roads.

Operations

An assessment of 2040 traffic operations was completed for the Proposed Action for peak hour traffic volumes with the proposed intersection configurations and traffic control. With the Proposed Action, the Vasquez Boulevard/62nd Avenue intersection is converted from an unsignalized, right-in, right-out intersection to a full movement continuous-T signalized intersection. The continuous-T configuration allows southbound Vasquez Boulevard through traffic to travel through the intersection without stopping.

The results from the 2040 Proposed Action AM and PM peak hour intersection traffic analysis are shown in [Table 5](#). The limited traffic movements, simplified signal phasing, and increased green time for the heavy volumes on Vasquez Boulevard reduces the congestion at the 60th Avenue intersection. The LOS for the Vasquez Boulevard/60th Avenue improves to LOS E in the AM peak hour and the intersection delay is cut in half as compared to the No Action conditions. The analysis shows that the peak hour intersection delay and queues under the



Proposed Action 2040 conditions are less than experienced at the intersection under existing (2019) conditions.

Table 5: Peak Hour Intersection Operations - Proposed Action 2040

Vasquez Intersection	AM Peak LOS	AM Peak Delay (Seconds/Vehicle)	AM Peak Maximum Queue (Feet)	PM Peak LOS	PM Peak Delay (Seconds/Vehicle)	PM Peak Maximum Queue (Feet)
60 th Avenue	E	64.3	1,091 (southbound Vasquez)	F	99.6	609 (southbound Vasquez Boulevard)
62 nd Avenue	B	10.1	530 (westbound 62 nd)	C	31.9	453 (westbound 62 nd)

Source: Muller Engineering TransModeler analysis

The installation of a traffic signal at the Vasquez Boulevard/62nd Avenue intersection increases the overall delay for that intersection in the AM peak hour, although it is still expected to operate well at LOS B. In the PM peak hour, the LOS would improve to LOS C and the maximum queue on westbound 62nd Avenue would be cut to almost a third of the length under the No Action condition.



The average travel times along Vasquez Boulevard through the study area expected under 2040 No Action conditions are summarized in [Table 6](#). The intersection configuration changes are expected to greatly improve the travel times along southbound Vasquez Boulevard, with travel times less than half the travel times under the No Action conditions. The new traffic signal at Vasquez Boulevard/62nd Avenue introduces a new stop condition for northbound traffic on Vasquez Boulevard. However, the increased travel time is minor compared to the future No Action condition, at less than a 30-second increase in the PM peak hour.

Table 6: Peak Hour Travel Time along Vasquez Boulevard - Proposed Action 2040

Vasquez Travel Direction	AM Peak Travel Time (Minutes)	PM Peak Travel Time (Minutes)
Southbound	2.2	2.0
Northbound	2.2	5.8

Source: Muller Engineering TransModeler analysis

Safety

Congestion reduction would improve safety along Vasquez Boulevard and at the Vasquez Boulevard/60th Avenue intersection. The Proposed Action also provides substantial safety benefits with a large reduction in turning movement conflicts at the Vasquez Boulevard/60th Avenue intersection over the No Action condition, as certain movements are restricted.

The restriction of the Dexter Street frontage road connections on the west side of the intersection and restricting the Parkway Drive connection to right-in/right-out would reduce vehicular conflict points where drivers have the possibility of collision. These changes also eliminate signal phases. This would allow more green time to be allocated to other movements, reducing the delay at the intersection and thereby reducing the frequency of rear-end type crashes. Improving the intersection configuration with the intersection re-design and the approach restrictions would also improve the turning paths for trucks and other vehicles, reducing the sideswipe type crashes.

The new local roadway connections west of Vasquez Boulevard would improve the safety of the local transportation network by dispersing local traffic within the area and providing access to 60th Boulevard farther away from the queues and high volumes at the Vasquez Boulevard/60th Avenue intersection.

The reconfiguration and signalization of the Vasquez Boulevard/62nd Avenue intersection will substantially change the operational conditions with full-access movements between Vasquez Boulevard and 62nd Avenue. The introduction of a new traffic signal on Vasquez Boulevard would cause more crashes, specifically for northbound Vasquez Boulevard. The reconfiguration includes making the outside lane of northbound Vasquez Boulevard a right turn lane to 62nd Avenue, reducing the number of lanes leading from northbound Vasquez



Boulevard to northbound Highway 2 to one lane. This would allow for the right turn lane from 62nd Avenue to operate as a free-flow right turn to northbound Highway 2, reducing the likelihood of rear-end crashes for this movement, which is a current safety issue.

Multimodal Connectivity

As part of the Proposed Action, sidewalk improvements and expansions are planned along 60th Avenue, 62nd Avenue, Clermont Street and the new local street connections on the west side of Vasquez Boulevard. Corner curb bulb-outs added at the Parkway/Forest intersection would reduce the pedestrian crossing distance across Forest Drive. The sidewalk would be expanded along Vasquez Boulevard where there is a break between Parkway Drive and the start of the King Soopers property. There would be improved signal phasing and timing at the Vasquez Boulevard/60th Avenue intersection for safer and more comfortable pedestrian and bicyclist crossings. The addition of the sidewalks would provide connectivity along the study area for non-motorized travel by filling gaps in the existing sidewalk network. These connections would allow for residential areas to connect to commercial properties, parks and trails in the area. For example, residents in the new residential neighborhoods of the Mile High development would be able to utilize the sidewalk along Vasquez Boulevard to travel to the businesses surrounding the Vasquez Boulevard/60th Avenue intersection.

The bus stop at the southeast frontage road (Dahlia Street and 60th Avenue) would be improved with ADA compliant ramps.

On-street bike facilities are not proposed with this project; however, the addition of the sidewalks and enhanced crosswalks would allow for a more connected access and route to regional trails in the area. Connectivity from the residential area to the regional trails would be enhanced with the proposed sidewalk additions and improvements.

Mitigation

The Proposed Action has been developed to provide transportation benefits to the multimodal and vehicular travelers of the study area. Vasquez Boulevard and existing surrounding streets will remain open to traffic during construction. Short-term road closures may be allowed for construction activities. Adequate and safe vehicle and pedestrian/bicycle detours will be in place to allow mobility to be maintained throughout the Study Area. The new local roadways shall be constructed before work on Vasquez Boulevard begins. Maintaining access to all local businesses is also recommended to minimize impacts during construction. A robust public outreach strategy to alert multimodal and vehicular travelers of impacts will be required.



Permits

During construction, several permits may be required for access, lane closures and construction traffic control procedures. Construction access permits are required to be obtained by the construction contractor for detours and lane closures. Permits may be required for construction from City of Commerce City. The construction contractor will also be required to contact CDOT Traffic Section for any additional permitting required within CDOT right-of-way as design is finalized.

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Attachment A.

Project Information





Attachment A:

Project Information

June 2023

Project Number: NHPP 006A-06

Subaccount number: 22922

Introduction and Background

The Vasquez Boulevard (United States Route 6 [US 6]) I-270 to 64th Avenue project (Project) is located within the limits of the City of Commerce City (Commerce City) in Adams County. The Colorado Department of Transportation (CDOT), in cooperation with the Federal Highway Administration (FHWA) and local agencies including Adams County, the City of Commerce City, City and County of Denver, Denver Regional Council of Governments (DRCOG) and the Regional Transportation District (RTD), conducted a Planning and Environmental Linkages (PEL) study in 2018. The Vasquez Boulevard PEL study provided a framework for the implementation of transportation improvements along the corridor between 52nd Avenue and 64th Avenue and along I-270 for a ½-mile north and south of the I-270/Vasquez Boulevard interchange. The Project falls within the limits of the PEL study and is now following the NEPA process to prepare an Environmental Assessment to identify a preferred alternative based on the needs identified in the PEL.

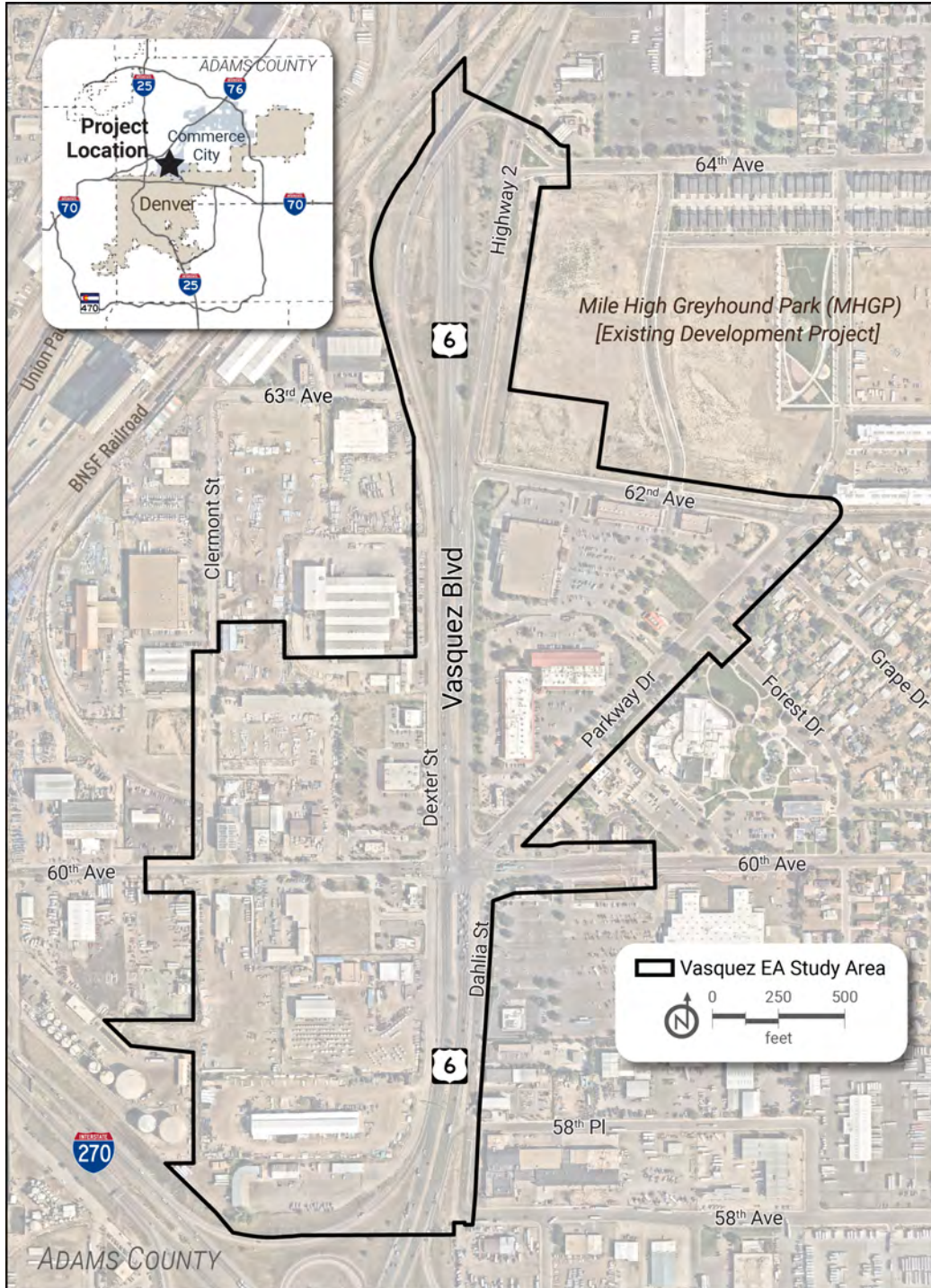
The PEL study identified long-term transportation improvements and evaluated potential projects that could be implemented with available funding as near-term improvements. Potential near-term improvements were identified to improve operations, safety, and connectivity along Vasquez Boulevard, focusing on the Vasquez Boulevard/60th Avenue and Vasquez Boulevard/62nd Avenue intersections. Transportation Improvement Program (TIP) funding, state funding and other sources were obtained for this current Project to construct these near-term improvements along Vasquez Boulevard.

Study Area

The study area extends along Vasquez Boulevard from 58th Avenue (just north of the I-270 interchange) north to the BNSF Railroad bridge. West of Vasquez Boulevard, the study area extends to Clermont Street, between the on-ramp to I-270 and just north of 60th Avenue. East of Vasquez Boulevard, the study area includes Parkway Drive, 60th Avenue and 62nd Avenue. The study area also includes proposed drainage work to an existing water quality pond within the Mile High Greyhound Park (MHGP) property at the corner of 62nd Avenue and Highway 2. Some environmental resources evaluated for the NEPA process may have a slightly different study area depending on specific resource requirements.



Figure 1: Project Study Area





Purpose and Need

The purpose of the Vasquez Boulevard I-270 to 64th Avenue Project is to address the following needs:

- improve operations for vehicles and freight;
- improve safety;
- improve multimodal connections.

Proposed Action

The Proposed Action includes improvements at the Vasquez Boulevard/60th and Vasquez Boulevard/62nd intersections, as well as the local street network and multimodal facilities, as shown in [Figure 2](#).

Vasquez Boulevard/60th Avenue

The Proposed Action includes the elements listed below for the Vasquez Boulevard/60th Avenue intersection:

- Only right turn movements to northbound Vasquez Boulevard from Parkway Drive. No access to other roads.
 - All inbound movements to Parkway Drive remain open as they exist now.
- All inbound movements from Vasquez Boulevard/60th to frontage roads remain as they exist now, but outbound movements are restricted.
 - Right turn only from southeast frontage road and all in movements allowed (all movements remain as they exist)
 - Right turn only from northwest frontage road and all in movements allowed (in movements remain as they exist)
 - No movement out from southwest frontage road and all in movements allowed (in movements remain as they exist)
- Two new local road connections to Clermont Street west of Vasquez Boulevard provide full access between frontage roads and 60th Avenue.
- Driveways on 60th Avenue, Parkway Drive and frontage roads remain as currently structures or have minor changes
- Restriping of existing crosswalks and new pedestrian refuges improve safety and accessibility of pedestrian infrastructure
- Corner curb bulb-outs would be added at the Parkway/Forest intersection as a deterrent to drivers who may think Forest Drive is an alternate route to 60th Avenue. The bulb-outs and crosswalk will provide visual indication of Forest Drive as a neighborhood street.



Vasquez Boulevard/62nd Avenue

The Proposed Action includes the elements listed below for the Vasquez Boulevard/62nd intersection:

- New traffic signal required at 62nd Avenue with the Vasquez Boulevard/60th Avenue intersection improvements to provide movements restricted from Parkway Drive to Vasquez Boulevard.
- Traffic signal provides full access to/from 62nd Avenue and Vasquez Boulevard/Highway 2.
- Southbound Highway 2 off ramp remains in existing configuration.
- Southbound traffic on Vasquez Boulevard and the Highway 2 off ramp have continuous green time without stopping at the signal for 62nd Avenue traffic.

Vasquez Boulevard Improvements

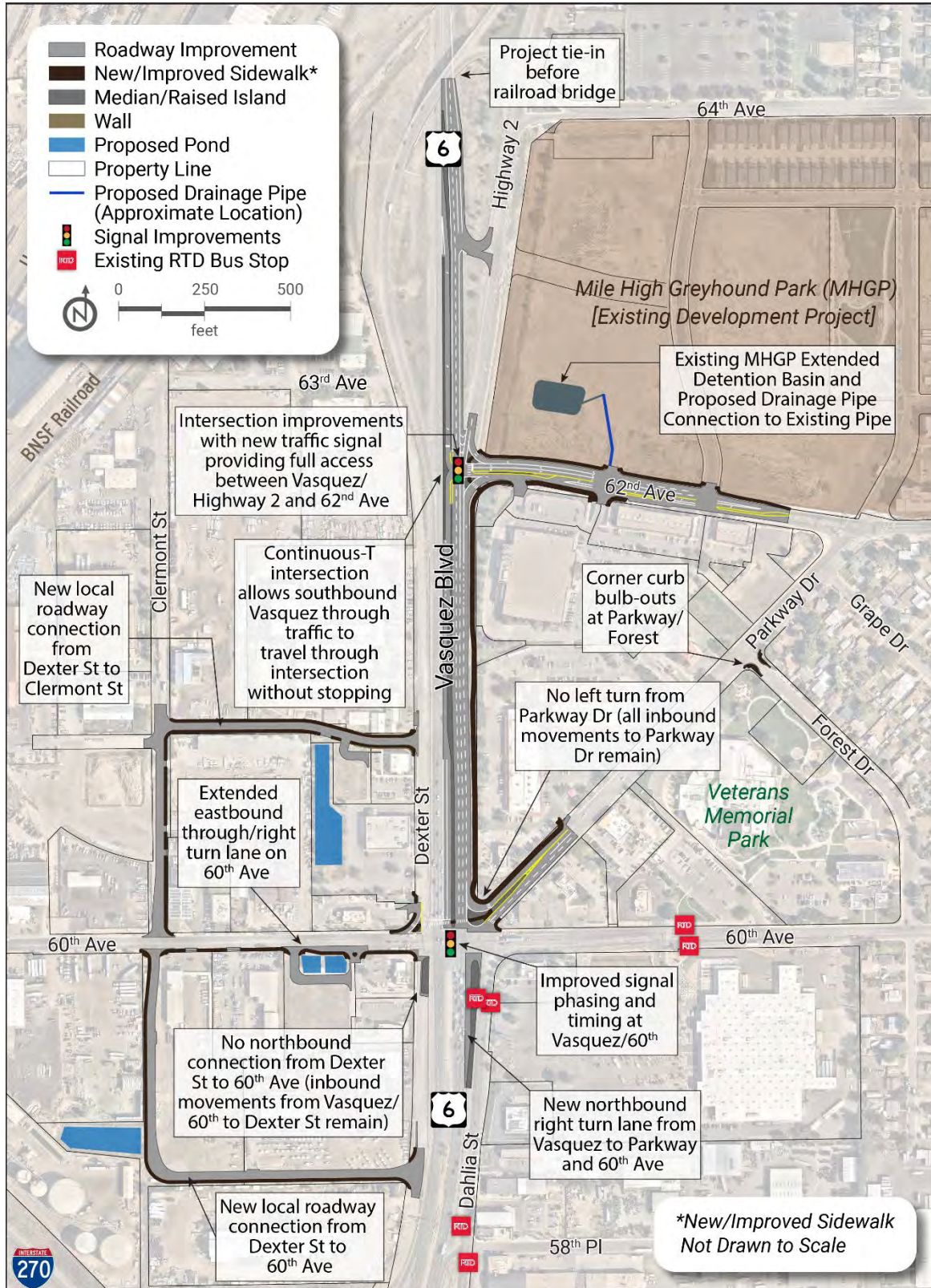
In addition to the improvements at the Vasquez Boulevard/60th Avenue and 62nd Avenue intersections, a portion of Vasquez Boulevard will be reconstructed. The southbound lanes of Vasquez Boulevard will remain as they currently exist (12-foot travel lanes; roadway width varies from 24-feet to 60-feet). Northbound Vasquez Boulevard will be widened a maximum of two feet between 60th Avenue and 62nd Avenue and a maximum of 20 feet north of 62nd Avenue, and the existing median will be modified to add left turn lanes into and out of the new 62nd Avenue intersection. A 10-foot detached multi-use path will be constructed along the eastern side of Vasquez Boulevard, between 60th Avenue and 62nd Avenue.

Local Road Connections

New local roadway connections west of Vasquez Boulevard are part of the Project to enhance the local circulation and pedestrian and bicyclist connectivity of the local street network. The new roadways are two-lane, two-way local roads with the potential for direct property driveway access as approved by Commerce City.



Figure 2: Proposed Action

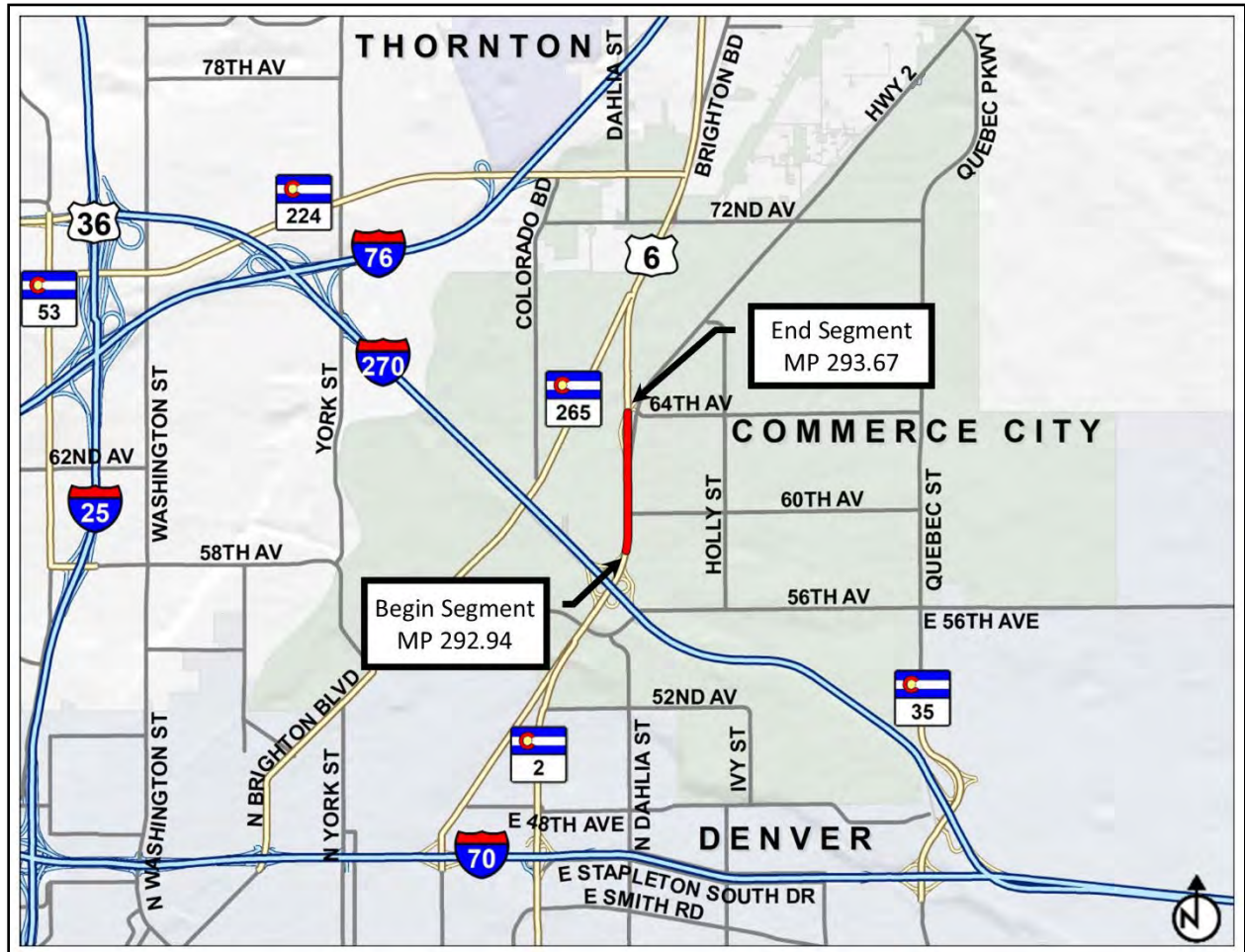


Attachment B.

Safety Assessment Report



State Highway 6H Safety Assessment Report MP 292.94 to MP 293.67 Vasquez Boulevard Project



Prepared by: Muller Engineering Company

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Written Authority from the Colorado Department of Transportation.

This report is prepared solely for the purpose of identifying, evaluating, and planning safety improvements on public roads. It is subject to the provisions of 23 U.S.C. 407, and therefore is not subject to discovery and is excluded from evidence. Applicable provisions of 23 U.S.C. 407 are cited below:

Notwithstanding any other provision of law, reports, surveys, schedules, lists, or data compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential accident sites, hazardous roadway conditions, or railway-highway crossings, pursuant to sections 130, 144, and 148 of this title or for the purpose of developing any highway safety construction improvement project which may be implemented utilizing Federal-aid highway funds shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

Any intentional or inadvertent release of this report, or any data derived from its use shall not constitute a waiver of privilege pursuant to 23 U.S.C. 407.



A Statement of Philosophy

The efficient and responsible investment of resources in addressing safety problems is a difficult task. Since crashes occur on all highways in use, it is inappropriate to say of any highway that it is safe. However, it is correct to say that highways can be built to be safer or less safe. Road safety is a matter of degree. When making decisions effecting road safety it is critical to understand that expenditure of limited available funds on improvements in places where it prevents few injuries and saves few lives can mean that injuries will occur and lives will be lost by not spending them in places where more crashes could have been prevented¹. It is CDOT's objective to maximize crash reduction within the limitations of available budgets by making road safety improvements at locations where it does the most good or prevents the most crashes.

Introduction

The Colorado Department of Transportation (CDOT) is resurfacing State Highway 6H (SH 6 or US 6) between milepost (MP) 292.94 and MP 293.67. In conjunction with this reconfiguration project, an opportunity exists for the detection of safety problems and the implementation of selected improvements at locations where it is justified by crash experience.

- Assess the magnitude and nature of the safety problem within the project limits
- Relate crash causality to roadway geometrics, roadside features, traffic control devices, traffic operations, driver behavior, and vehicle type
- Suggest cost effective counter measures to address identified problems
- Provide guidance on how to maximize crash reduction

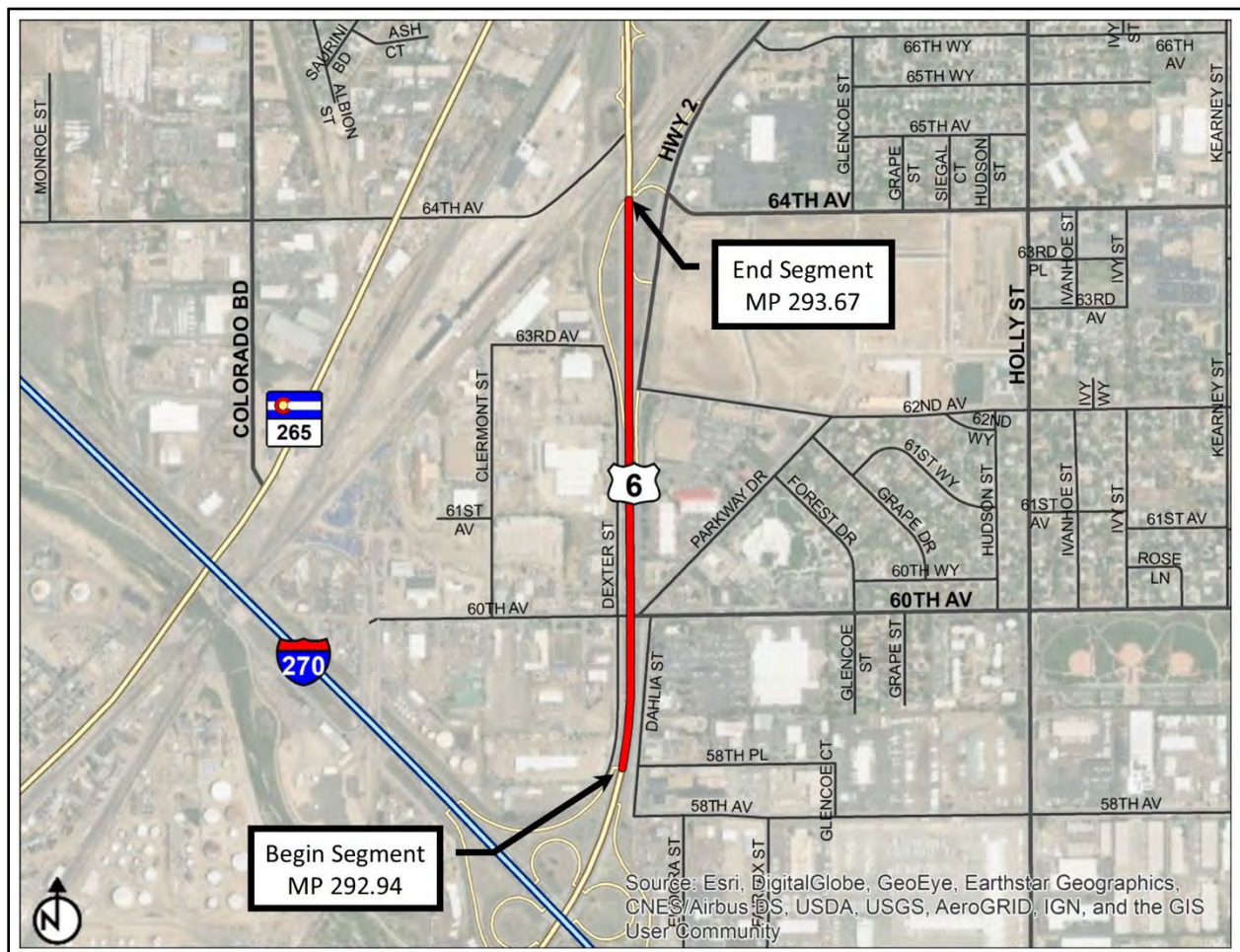
This report is based on the comprehensive analysis of five years of crash history on US 6 between MP 292.94 and MP 293.67, and video log review. The Region is advised to verify through field survey, the information included in this report regarding physical features and roadside characteristics in the study area.

¹ Hauer, E., (1999) Safety Review of Highway 407: Confronting Two Myths. TRB

Site Location and Conditions

This assessment addresses US 6 in Adams County from MP 292.94, at the southbound US 6 off-ramp to westbound I-270, to MP 293.67, at the overpass that connects HWY 2 to southbound US 6. The included distance is approximately 0.76 miles. This segment of US 6 is classified as an urban 6-lane divided principal arterial highway over flat terrain. A vicinity map showing an aerial view of the study corridor is provided in **Figure 1**.

Figure 1: Vicinity Map



The 2022 average daily traffic (ADT) ranges from 40,000 to 24,000 vehicles per day (VPD) with approximately 13% truck traffic. The speed limit is 45 mph. There are several key roadway connections in the immediate area.

- Dexter Street serves as a west-side frontage road, connecting at 60th Avenue.
- Dahlia Street serves as an east-side frontage road, connecting at 60th Avenue.
- Parkway Drive connects at 60th Avenue, extending northeast to end at 62nd Avenue.
- Hwy 2, formerly CDOT State Highway 2, splits from northbound US 6 just north of 60th Avenue.
 - 62nd Avenue connects to Hwy 2 approximately 300-ft north of the split from US 6.

Proposed Improvements

The Colorado Department of Transportation (CDOT) completed a Planning and Environmental Linkages (PEL) Study for Vasquez Boulevard in August 2018 to provide a framework for the long-term implementation of transportation improvements along the Vasquez Boulevard corridor between 52nd Avenue and 64th Avenue and to be used as a resource for future project National Environmental Policy Act (NEPA) documentation. CDOT, in cooperation with the Federal Highway Administration (FHWA) and local agencies including Adams County, Commerce City, City and County of Denver, Denver Regional Council of Governments (DRCOG), and the Regional Transportation District (RTD), conducted the PEL study following FHWA and CDOT PEL guidance. The study was informed by broad public outreach including a public open house and community focus groups, stakeholder interviews, as well as frequent agency coordination.

Vasquez Boulevard (US 6) at East 60th Avenue

The recommended improvements include the elements listed below:

- No left turn allowed from Parkway Drive to southbound Vasquez Boulevard or 60th Avenue.
 - All inbound movements to Parkway Drive remain open as exists now.
- All inbound movements from Vasquez/60th to frontage roads remain as exists now, but outbound movements are restricted.
 - Right turn only from southeast frontage road and all in movements allowed (all movements remain as exists)
 - Right turn only from northwest frontage road and all in movements allowed (all movements remain as exists)
 - No movement out from southwest frontage road and all in movements allowed (in movements remain as exists)
- New local access connections to Clermont Street west of Vasquez Boulevard constructed to provide full access between frontage roads and 60th Avenue.
- Driveways on 60th Avenue, Parkway Drive, and frontage roads remain as exists or have minor changes.

Vasquez Boulevard (US 6) at East 62nd Avenue

The recommended improvements include the elements listed below:

- New traffic signal required with Vasquez/62nd intersection improvements to provide movements restricted from Parkway Drive to Vasquez Boulevard.
- Traffic signal provides full access to/from 62nd Avenue and Vasquez Boulevard/Highway 2.
- Southbound Highway 2 off ramp remains in existing configuration.
- Southbound traffic on Vasquez Boulevard and the Highway 2 off ramp have continuous green time without stopping at the signal for 62nd Avenue traffic.

Local Connections

Due to the changes in the direct connections for the west side frontage road (Dexter Street) at the Vasquez/60th intersection, new and improved local road connections are included in the recommendations to maintain and improve access for vehicular, truck, and multimodal access to the properties located west of Vasquez Boulevard between 58th Avenue and 63rd Avenue.

Crash Summary

The crash history for the period of January 1, 2015 through December 31, 2019 was examined to locate crash clusters and identify collision causes. Two hundred forty-three (243) crashes were reported along US 6 during the study period; 41 crashes resulted in 58 injuries and there were no fatal crashes. **Table 1** summarizes the crash totals for this segment of US 6 over the five-year study period.

Table 1: US 6 Crash History from MP 292.94 to MP 293.67 by Year

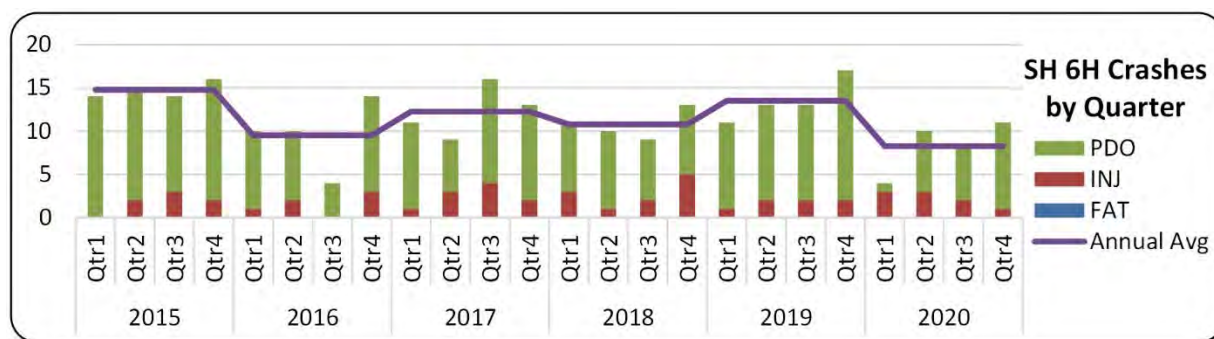
Year	Crashes				Persons	
	PDO*	Injury	Fatal	Total	Injured	Killed
1/1/2015 to 12/31/2015	52	7	0	59	8	0
1/1/2016 to 12/31/2016	32	6	0	38	6	0
1/1/2017 to 12/31/2017	39	10	0	49	17	0
1/1/2018 to 12/31/2018	32	11	0	43	18	0
1/1/2019 to 12/31/2019	47	7	0	54	9	0
Total	202	41	0	243	58	0
Average/Yr	40.4	8.2	0.0	48.6	11.6	0.0

*PDO - Property Damage Only

Annual Crashes

The available 2020 crash data was reviewed in the initial stages of the study. **Figure 2** shows the crash trends by quarter between 1/1/2015 and 12/31/2020. The average quarterly crash frequency in 2020 is lower than in the previous years, in all likelihood due to the impact of the COVID-19 pandemic. Since current traffic conditions are much closer to pre-pandemic conditions and there were no fatal crashes, the 2020 data was excluded from this analysis. It should be noted that there was also a lull in 2016 that does not have a readily apparent cause, and while noted it is not expected to have a significant impact on the crash analysis.

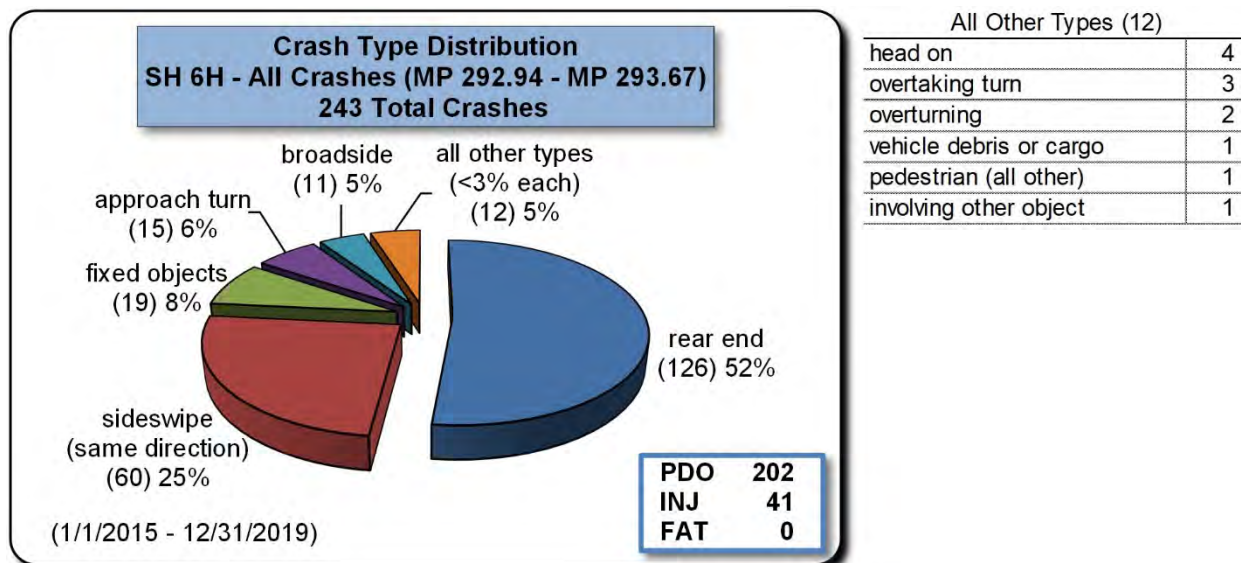
Figure 2: US 6 Crashes by Quarter



Crash Types

Rear end crashes were predominant, accounting for 52% of the total crashes, followed by sideswipe (same direction) type crashes at 25%. **Figure 3** below displays the crash distribution by type for the study segment.

Figure 3: US 6 Crash Distribution by Type

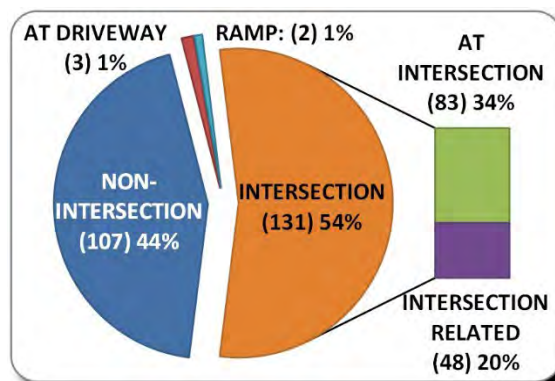


Crash Locations

A little over half of the crashes along the US 6 corridor were coded as at intersection or intersection related (131 of 243, 54%), followed by non-intersection crashes (107 of 243, 44%), with the remaining few crashes coded to driveway locations or ramps (1% each). This breakdown is shown in **Figure 4**.

Safety Performance Function analysis techniques would normally be used as part of an assessment; however, there are none established for urban corridors, and the intersection models do not apply to any of the intersection types included as part of this analysis.

Figure 4: Crashes by Location



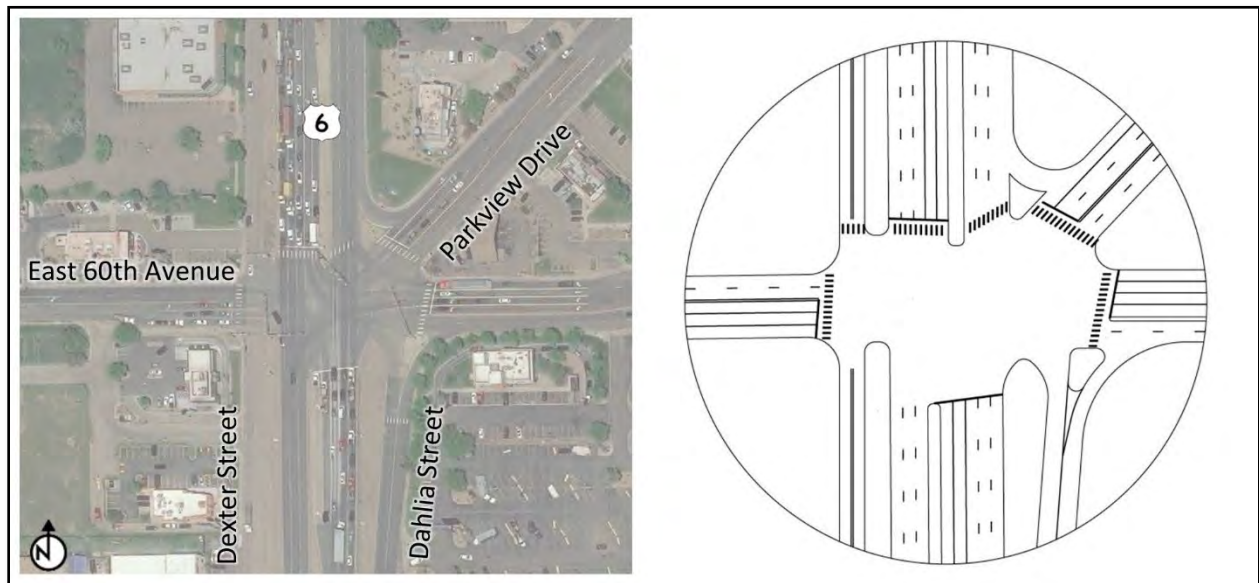
Intersection Collision Analysis

Crashes that can be attributed to intersections (located at intersections or that are intersection related) accounted for 54% of the total crashes (131 of 243). Most of these crashes occurred at the 60th Avenue intersection (116 of 131, 89%), with the remaining 15 crashes at other connections or outside the typical range for intersection crashes.

MP 293.12 – East 60th Avenue: 6-Lane Divided Signalized 5-Leg Intersection

There were 116 crashes during the five-year study period at this 5-Leg intersection. There are also three frontage roads that meet at this intersection; Dahlia Street is on the south leg parallel to the east side of US 6; Dexter Street is on the north and south leg parallel to the west side of US 6 (Figure 5). East 60th Avenue is a 4-lane divided roadway which provides access to commercial developments and residential areas east of US 6, and commercial and industrial developments west of this intersection.

Figure 5: 60th Avenue Intersection Diagram



The following observations related to this intersection were made based on a review of aerial photography, the CDOT video log, and field review:

- The posted speed limit on US 6 is 45 mph.
- The posted speed limit on East 60th Avenue is 35 mph.
- The posted speed limit on Parkway Drive is 30 mph.
- There is a single left-turn lane on the west and south legs of the intersection.
- There are dual left-turn lanes on the north, east, and northeast legs of the intersection.
- The eastbound and westbound East 60th Avenue left-turns have five-section “doghouse” style signal heads with a red left-turn arrow and may operate with protected/permitted phasing; all other left-turns operate with protected-only phasing.
- There are painted crosswalks on all but the south leg of the intersection.
 - There are pedestrian signal heads and push buttons for each crosswalk.

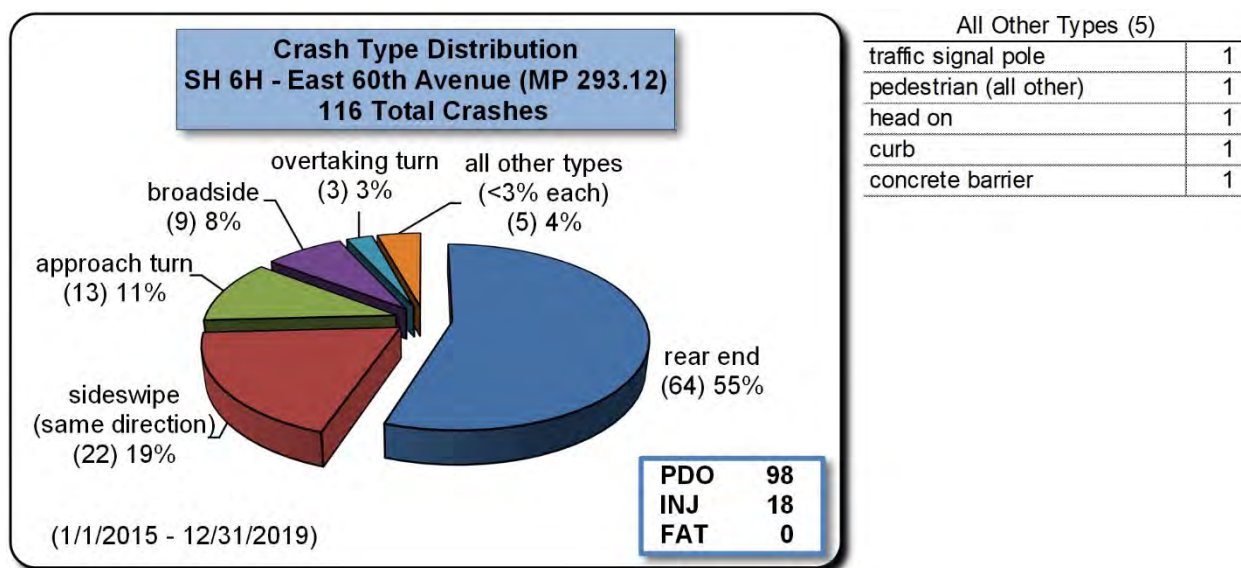
Safety Performance Function Analysis

Due to the complexity of this intersection, SPF analysis is not available.

Crash History

There were 116 crashes at this intersection during the five-year study period; 17 resulted in injury with 28 persons injured and there were no fatal crashes. Rear end crashes were predominant (55%), followed by sideswipe (same direction) and approach turn type crashes (19% and 11%, respectively). **Figure 6** shows the crash distribution by type for this intersection.

Figure 6: East 60th Avenue Crash Distribution by Type



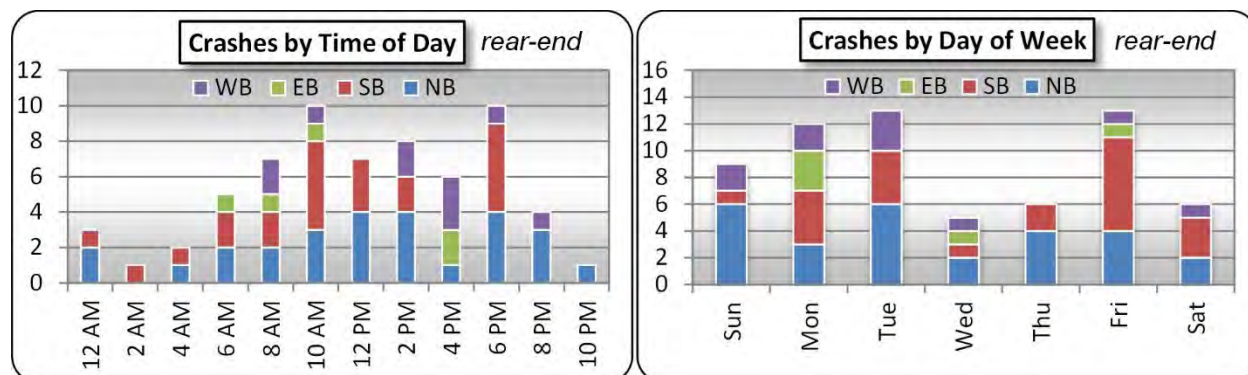
Rear End Collisions

There were 64 rear end type crashes at this intersection; 11 resulted in injury (16 injured). Most rear end crashes involved northbound or southbound vehicles (27 and 22, respectively). There were comparatively few crashes on either of the East 60th Avenue approaches, and only one on the Parkway Drive approach (shown to right). Trucks were involved in 9 of 64 crashes (14%), in similar proportion to the 13% truck traffic on US 6 according to CDOT count data. Weather and roadway conditions were not significant contributing factors as 55 of 64 crashes occurred with no adverse weather and dry roadway conditions noted.

EB	5
WB	9
NB	27
SB	22
SW	1

Figure 7 shows the general directional distribution of crashes by time of day and day of week. Crashes were generally more frequent on weekdays, as might be expected for commuting traffic. The off-peak time period between 10 a.m. and 4 p.m. experienced higher frequencies of crashes than either the AM or PM peak periods, with an additional peak in the 6 p.m. to 8 p.m. time period, which is later in the day than the typical evening peak hour of traffic. This could be related to higher levels of activity on the side-streets in the middle of the day, as there are several fast-food restaurants and retail centers in the immediate vicinity.

Figure 7: Rear End Crashes by Time of Day and Day of Week



The crash records indicated that most rear end crashes occurred when the trailing vehicle failed to stop for slowing or stopped traffic at the East 60th Avenue intersection (57 of 64, 89%). Signal visibility may be a contributing factor in the observed crash pattern. Due to the number of approaches at the intersection, several of the signal heads are placed at varying distances from the approach stop-bars, specifically the northbound and westbound approaches. It should be noted that there were three (3) additional rear end crashes on the westbound approach that were coded to Dahlia Street rather than US 6 (correction pending); the observed pattern for the 12 westbound rear end crashes suggested that signal visibility was a potential concern.

Recommendation

The Region should consider a detailed evaluation of the signal head placement and visibility as part of the reconfiguration project. Where possible, signal heads should be placed at a consistent distance from the approach stop-bars, with side-of-pole signal heads when feasible given the width of the intersection. Highly reflective backplates may also help enhance signal visibility.

With the I-270 interchange to the south and the flyover connection from Hwy 2 to the north, arrivals at the intersection tend to be more random, rather than in platoons. This intersection is heavily congested, as the additional approaches for the Dexter Street frontage road and Parkway Drive limit the amount of signal time that can be dedicated to the US 6 approaches, which carry a significant amount of traffic.

Recommendation

Improvements to reduce congestion should be considered to improve safety at this intersection. The removal or relocation of the Dexter Street frontage road connections on the west side of the intersection would eliminate one of the signal phases, and removing the Parkway Drive connection on the northeast would eliminate an additional signal phase. This would allow more green time to be allocated to other movements, reducing the number of stops and delay at the intersection, thus reducing the frequency of rear end type crashes. Dilemma zone detection may also be beneficial and should be considered during signal design. If removing the connections to Dexter Street and Parkway Drive in their entirety is not feasible, converting these to one-way streets carrying traffic away from the intersection would still allow for these phases to be removed.

Sideswipe (Same Direction) Collision Analysis

There were 22 sideswipe (same direction) crashes at this intersection; none resulted in injury. Most involved vehicles turning left (13 of 22), followed by vehicles changing lanes (5 of 22). A review of the crashes showed that trucks were involved in 40% of the sideswipe (same direction) type crashes (9 of 22), of which four (4) were southbound trucks in the left-turn lane.

Recommendation

The Region should evaluate the turning radius for trucks turning from southbound US 6 to Parkway Drive and consider widening the receiving lane on Parkway Drive if it would help trucks turn from the inside left-turn lane without conflicting with traffic in the outside lane. In addition, with the reconfiguration the Region should maintain or enhance the dotted lane extension markings for all dual left-turn lanes as part of the striping plan, with care to adjust for any changes in stop-bar locations.

Other Observations

The southeast frontage road (Dahlia Street) allows for southbound traffic to enter from the East 60th Avenue and US 6 intersection, but northbound traffic is restricted to right-turn only onto eastbound East 60th Avenue. During the field visit, northbound vehicles were observed traveling in the wrong direction in the southbound lane while entering the intersection from Dahlia Street to turn left onto Vasquez Boulevard. **Figure 8** shows the vehicles backing up on Dahlia Street and entering the intersection illegally. While there was no clear indication of crashes caused by this behavior, this behavior should be actively discouraged due to a high risk of head-on or driver-side broadside collision.

Figure 8: 60th Avenue – Southeast Corner Looking Southwest (left) and West (right)

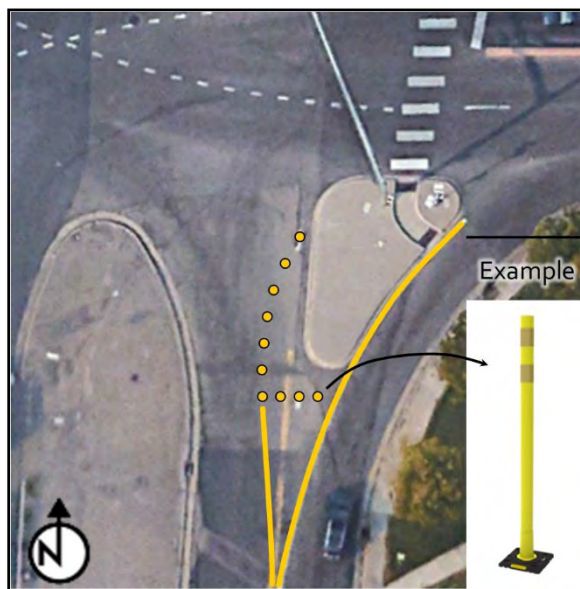


Recommendation

The width of the southbound lane entry to Dahlia Street is approximately 20-ft wide if measured from back-of-curb to the yellow striping; however, the physical restriction between the curbs is at least 26-ft wide at its narrowest, more than wide enough for two full lanes of traffic. The Region should consider reducing this width as much as possible while still allowing enough room for trucks or busses turning onto Dahlia Street from East 60th Avenue. If the curb lines are not to be reconstructed, consider using flex-posts to create a bulb-out to

channelize southbound traffic and discourage wrong-way entry into the intersection. **Figure 9** shows a concept sketch of how this configuration might be implemented at this location. Using yellow striping on the inside edge of the right-turn lane should also help reinforce that crossing is not permitted.

Figure 9: Sketch Flex-Post Bulb-Out



East 62nd Avenue Intersection

The proposed reconfiguration effort would connect East 62nd Avenue directly to US 6 as a “Florida Tee” intersection, which provides a buffer-separated left-turn acceleration lane to allow southbound US 6 traffic to operate without having to stop for the westbound left-turns. Because CO 2 was devolved and no longer a State Highway (named Hwy 2), the 62nd Avenue intersection is not on the state highway system and the crash history is no longer processed by CDOT Traffic Safety.

Crash History

A previous Safety Assessment Report for this area (April 2020) evaluated the crash history between July 1st, 2013 and June 30th, 2018. There were nine (9) crashes at the 3-leg, unsignalized intersection of Hwy 2 and East 62nd Avenue, most of which were rear end crashes (7 of 9). The rear end crashes occurred when a trailing motorist on westbound East 62nd Avenue failed to stop for the leading vehicle, which stopped for traffic before making a right-turn onto northbound Hwy 2.

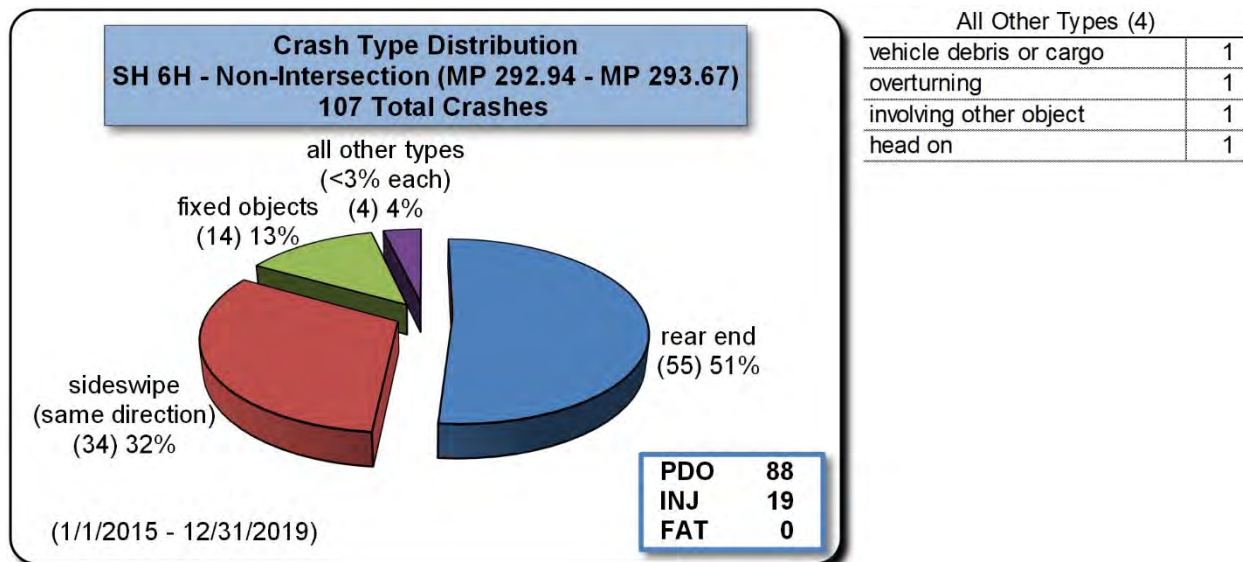
Recommendation

The reconfiguration will substantially change the operational conditions after connecting this intersection to include access to US 6. The Region should evaluate the configuration to limit conflicts between turning traffic and free-flow traffic proceeding through the intersection on green. For example, by eliminating one of the direct-connect lanes from northbound US 6 to northbound Hwy 2, the second lane on Hwy 2 could be configured as an add-lane exclusive to westbound East 62nd Avenue traffic to northbound Hwy 2, allowing for free-flow movements and reducing the likelihood of rear end collisions for this movement.

Non-Intersection Collision Analysis

Non-intersection crashes account for 44% of all crashes (107 of 243) observed on US 6 during the five-year study period. SPF and diagnostic analysis techniques are not available for urban arterials due to the frequency of intersections, driveways, and other factors. **Figure 10** shows the crash type distribution for these crashes. Rear end crashes were predominant (51%), followed by sideswipe (same direction) crashes (32%).

Figure 10: US 6 Non-Intersection Crashes



Rear End Collision Analysis

A review of the crash data indicated that the non-intersection rear end crashes occurred while approaching the East 60th Avenue intersection in heavy traffic conditions; either northbound on the south side of the intersection (26 of 55) or southbound on the north side of the intersection (20 of 55). The proposed improvements at the East 60th Avenue intersection are expected to significantly reduce congestion on US 6 approaching the intersection and should reduce the frequency of rear end crashes as a result. No additional recommendations specific to the non-intersection rear end crash patterns are made at this time.

Sideswipe (Same Direction) Collision Analysis

While a similar pattern of congestion-related crashes was observed on the northbound and southbound US 6 approaches to East 60th Avenue, there were also clusters of sideswipe (same direction) crashes in the southbound direction on the south side of the intersection (6 of 34), and northbound on the north side of the intersection (7 of 34). This subset of crashes generally occurred outside of the peak hours and are not as likely to be related to congestion; most occurred in dark-lighted or dark-unlighted conditions (7 of 13).

Recommendation

The Region should evaluate the conspicuity of the lane markings selected for the project and the clarity of the guide signing used in the vicinity of the East 60th Avenue intersection.

Conclusion and Recommendations

These conclusions and recommendations are based on the analysis of five years of crash history on US 6 between MP 292.94 and MP 293.67, including a review of the video log and field visit. The Region is advised to verify through field survey, the observations made in this report regarding physical features, roadside characteristics, and traffic control devices.

There were 243 crashes reported along US 6 between MP 292.94 and MP 293.67 from January 1st, 2015 and December 31st, 2019. Of which, there were 41 injury crashes (58 persons injured) and no fatal crashes. Rear end collisions were the most common crash type (52%), followed by sideswipe (same direction) crashes (25%). The East 60th Avenue intersection accounted for 48% of the observed crashes (116 of 243).

General Recommendations

The conditions along US 6 between MP 292.94 and MP 293.67 are expected to undergo a significant change following completion of reconstruction project as it is expected to improve traffic flow along US 6 and reduce congestion. The following features typically associated with any construction project should be provided:

- Good skid resistance and drainage of the roadway surface
- Adjustment, repair, and upgrade of existing guardrail to meet current standards
- Elimination of pavement edge drop-offs (Safety Edge Application)
- Crown correction where required
- Replace all button reflectors and guardrail reflectors to ensure good nighttime and inclement weather (fog, snow, rain, etc.) delineation
- All pedestrian signal heads should have countdown displays
- Installation of retroreflective back plates on all overhead signals
- Review signal timing plans to ensure appropriate signal change period

Intersection Specific Recommendations

MP 293.12 –East 60th Avenue

Divided Signalized 5-leg Intersection (with 3 frontage road connections)

116 Total Crashes (18 Injury Crashes)

- Evaluate the signal head placement and visibility, placing the signal heads consistent distance from the stop bars with side-of pole signal heads where feasible.
- Remove or relocate the frontage road and Parkway Drive approaches if possible or restrict these connections to outbound traffic only to eliminate signal phases and allocate more signal time for US 6 and East 60th Avenue.
- Consider incorporating dilemma zone detection into the signal design.
- Consider increasing the receiving lane width on Parkway Drive to allow southbound US 6 to northeast-bound Parkway Drive trucks to turn from the inside lane without conflicting with traffic in the outside lane.
- Reduce the width of the outbound Dahlia Street connection through reconstruction or using flex-post delineators to create a bulb-out, discouraging traffic from attempting to enter the East 60th Avenue intersection from Dahlia Street.
- Use yellow lane striping on the inside edge of the right-turn lane to reinforce that crossing is not permitted.

East 62nd Avenue Intersection (Not on State Highway System)

Future direct connection to US 6

9 Total Crashes (7/1/2013 – 6/30/2018) per April 2020 Safety Assessment

- As part of the reconfiguration project, consider reducing the direct-connect from northbound US 6 to northbound Hwy 2 to a single lane and allow the westbound East 62nd Avenue traffic to connect directly to the outside lane in the northbound direction on Hwy 2.

Non-Intersection Recommendations

Sideswipe (Same Direction) Crashes

13 of 34 crashes involving traffic heading away from the East 60th Avenue intersection.

- Evaluate the conspicuity of lane markings to ensure high visibility at all times as well as the clarity of the guide signing in the vicinity.

Appendix

Detailed Summary of Crash History

- Overall 2015 to 2019 Detailed Summary
- Individual Year General Summary
 - 2015
 - 2016
 - 2017
 - 2018
 - 2019
- Intersection General Summary
 - MP 293.12: East 60th Avenue
- Non-Intersection General Summary

Highway CORIS (Colorado Roadway Inventory System)

Crash Listing January 1, 2015 through December 31, 2019