MARYLAND 2

Maryland 26 Corridor

TRAFFIC ANALYSIS & TARGETED IMPROVEMENT RECOMMENDATIONS

MD 32 to the Liberty Reservoir | JULY 2020

MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

ACKNOWLEDGMENTS

This report is the result of collaboration between the Carroll County Planning Department and the Maryland Department of Transportation State Highway Administration (MDOT SHA) Office of Planning and Preliminary Engineering and the MDOT SHA District Seven Office. The MDOT SHA project team conducted analysis, provided technical expertise and developed this report. County staff were instrumental in guiding analysis and developing the tool-box of options for managing operational needs along MD 26 that are presented in this document.

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Photo: “Liberty Reservoir, Maryland (USA) May 2013” by *SridharSaraf* (*CC BY-SA 2.0*)

EXECUTIVE SUMMARY

The Maryland Department of Transportation State Highway Administration's (MDOT SHA) Office of Planning and Preliminary Engineering (OPPE), along with the District 7 Office, worked in conjunction with the Carroll County Department of Planning to review the *2002 MD 26, MD 32 to the Liberty Reservoir, Corridor Planning Study* (the "2002 Study"). The objectives of this effort included updating the traffic and safety analysis, redefining existing and future roadway needs, and developing strategies to assist with gradual implementation of targeted improvements as needs and opportunities are identified.

In August 2018, MDOT SHA completed an updated traffic analysis of the MD 26 corridor. The analysis indicated that the existing corridor operates at an acceptable level of service (LOS) with no signalized intersections operating in failing conditions. An analysis of crash data from 2015 through 2017 concluded that the number of crashes per year has been relatively stable and crashes are at or below the statewide averages for similar types of roadways.

However, under the existing rate of development, full build-out is assumed to occur beyond 2040 and, as such, would bring intersection LOS to failing conditions for all corridor intersections in the evening peak hour. A sensitivity analysis shows that deteriorating conditions would be reached around 2040, and the evening peak condition between MD 32 and Ridge Road/Oklahoma Road would experience the worst delays.

The 2018 traffic analysis led MDOT SHA and the Carroll County planning team to identify three needs for the MD 26 corridor:

- Address prevalent crash patterns and operational issues that are present in the corridor today.
- Update future capacity needs for the MD 26 corridor.
- Reduce the width of the typical section for the MD 26 corridor.

The strategies included in this report address the above needs and are divided into three categories, as follows:

IMPROVING SAFETY & OPERATIONS

Strategies to improve overall safety, reduce crashes in the corridor, and improve operations at intersections are grouped into four categories: access management, pedestrian accommodations, traffic signal analysis, and intersection operations.

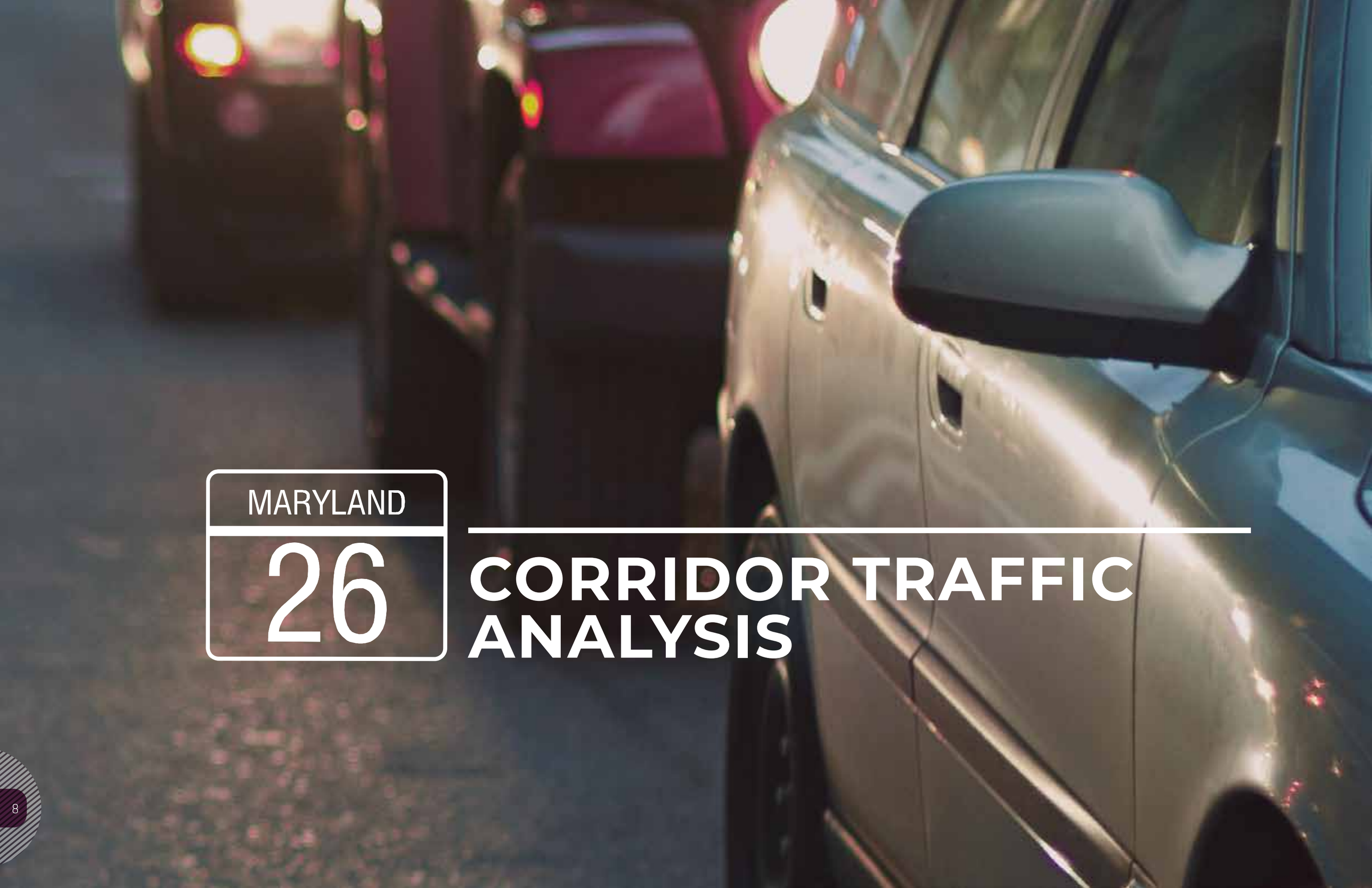
MEETING FUTURE CAPACITY

While future capacity improvements will not be needed until beyond 2040, strategies in the interim to improve individual intersections as they reach failing LOS is recommended. In addition, revised recommendations for future capacity improvements were identified based on a review of corridor capacity needs.

REVISING THE TYPICAL SECTION

To improve the feasibility of strategies identified in this report, the planning team reviewed the typical sections identified in the 2002 Study and identified revisions that economically satisfy future corridor needs and reduce right-of-way impacts.

The Maryland 26 Corridor report details the analyses and development of recommendations. As a toolbox of strategies, this report enables Carroll County to be confident in a future vision for MD 26 and effectively guide development towards that vision. The strategies, estimated at a total cost of $41 million, can be implemented as opportunities arise and specific improvements can be ranked to reflect County priorities.



CORRIDOR TRAFFIC ANALYSIS

MD 26 CORRIDOR EXISTING CONDITIONS

Study Area

The Liberty Road (MD 26) corridor is a Maryland Department of Transportation State Highway Administration (MDOT SHA) highway running east-west across central Maryland. It traverses from Baltimore City through Baltimore, Carroll, and Frederick Counties for approximately 40 miles—connecting the City of Baltimore with the City of Frederick. The study segment is a four-mile stretch of MD 26 in Eldersburg, Carroll County. MDOT SHA classifies the corridor as an urban principal arterial from the intersection of Sykesville Road (MD 32) to the Liberty Reservoir bridge structure (mile point 12.61), to the east of which it becomes an urban minor arterial for a stretch that extends nearly to the Baltimore County line. The corridor has four travel lanes with a center, two-way left-turn lane in addition to auxiliary lanes entering the various shopping centers, stand-alone businesses, and residential developments. There are 10 intersections within the study segment, shown in Figure 1.

Traffic counts from 2018 indicate that the study segment carries an average annual daily traffic (AADT) volume of 35,000 vehicles between MD 32 and Ridge/Oklahoma Road (with average daily weekday traffic (ADWT) at 34,000) (see Table 1). This drops to 19,000 east of Ridge/Oklahoma Road. Commercial development in the corridor is concentrated at the western end of the segment, while the character of development turns predominantly residential east of Ridge/Oklahoma Road. Increased commercial activity near MD 32 has resulted in a 7% increase in traffic since 1998. Over the same period, the largely residential-only areas surrounding the Liberty Reservoir have seen traffic decrease by 10% (see Figure 2).

The study corridor is located within a designated County priority funding area (PFA).[1] The zoning map in Figure 3 (page 10) shows that businesses (shades of red) cluster along the MD 26 corridor with a higher concentration nearest MD 32. The eastern half of the corridor, particularly east of Locust Lane, is primarily zoned residential except for a small concentration of commercial properties around Oakland Mills Road. In an area along MD 32, north of MD 26, there's a pocket of restricted industrial zoning (shades of purple). Overall, a majority of the study area along MD 26 is zoned general or suburban residential (shades of yellow).

1 "Priority Funding Areas (PFAs) are targeted areas to receive state funds for infrastructure and are designated based on availability of existing and planned water/sewer services, a permitted residential density of 3.5 dwelling units per acre, and designation as a growth area in a master plan." (*2014 Carroll County Master Plan*, page 3).

TABLE 1. Study Corridor

Functional Class	Principal Arterial
AADT/ADWT	35,000 /34,000
Length	4.0 miles
Number of Lanes	4 lanes plus a two-way left turn lane

FIGURE 2. Change in Traffic Volumes along MD 26 and area Roadways, 1998 – 2018

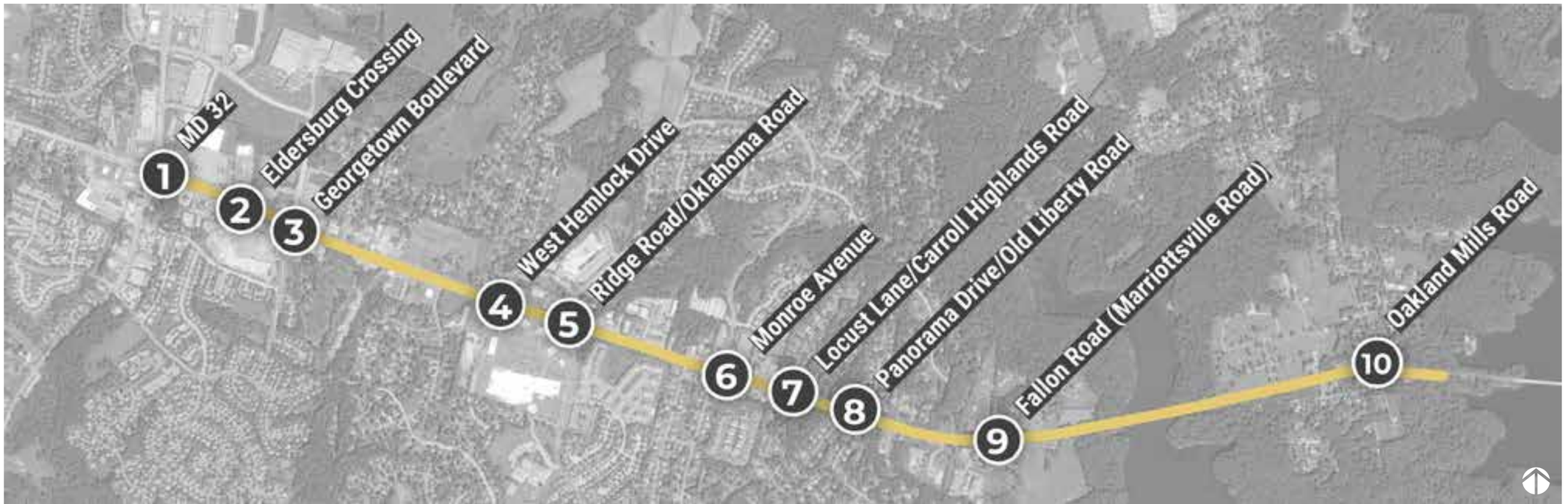


FIGURE 1. MD 26 Study Segment Showing Study Intersections

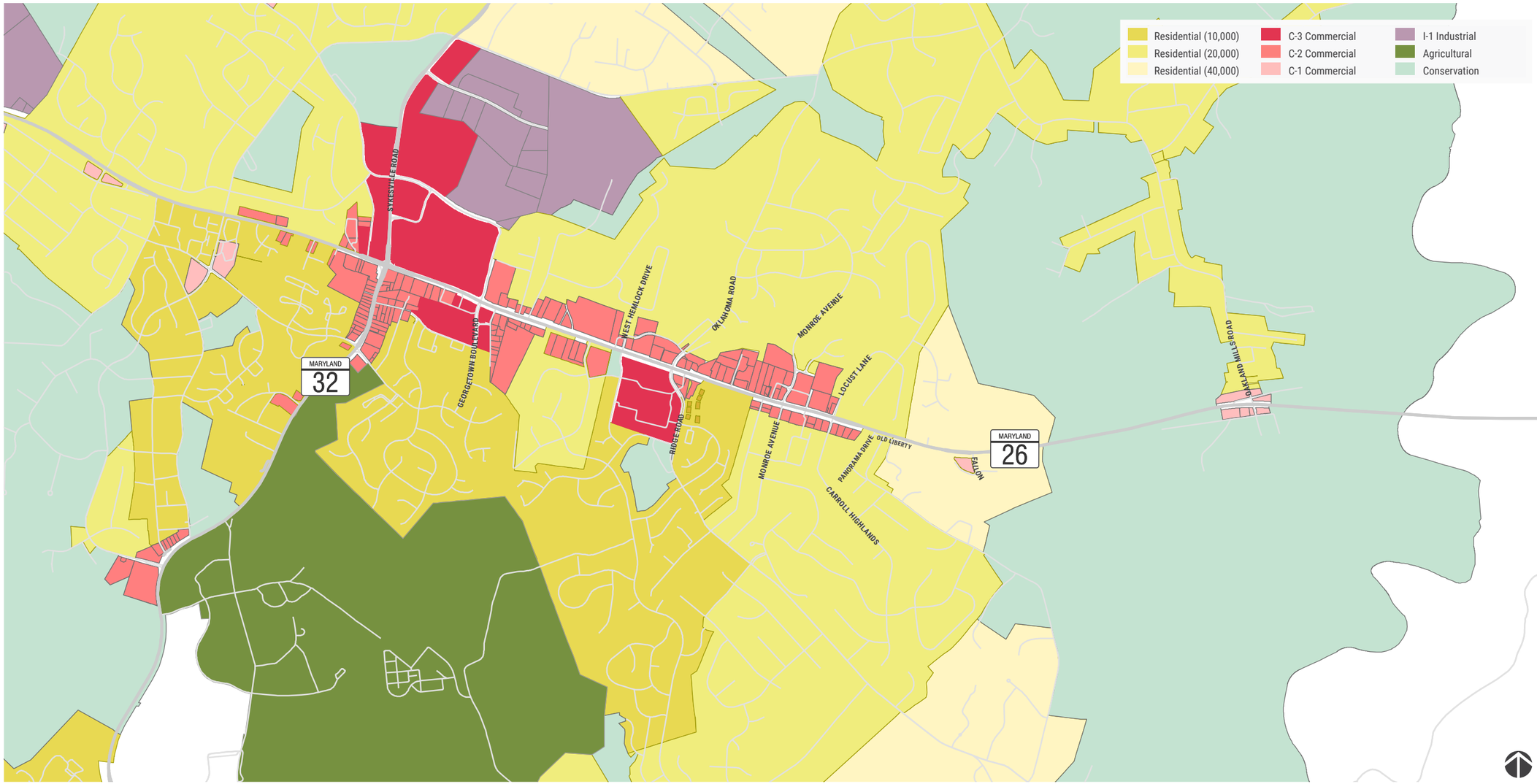


FIGURE 3. Carroll County Zoning Map Centered on Study Corridor

Assessing the 2002 MD 26 Corridor Planning Study

In 2002, the *MD 26, MD 32 to the Liberty Reservoir, Corridor Planning Study* (the "2002 Study") was published, identifying needs "to improve the physical appearance, pedestrian and bicycle connectivity, traffic circulation and safety/operational processes…while supporting the existing and future commercial viability of the community."

The purpose of the study arose from observations of relatively high population growth (compared to population growth over the same period in the remainder of the County) between 1980 and 2000 and the addition of several new commercial establishments developing along the corridor.

The 2002 Study limits are slightly smaller than the limits of this study, extending between MD 32 and the bridge at the Liberty Reservoir (Figure 4). In this plan's updated study, the corridor limits were extended east to Oakland Mills Road to ensure that any future mitigation strategy does not result in a bottleneck in that direction. To the west of MD 32, no identified bottlenecks were apparent, thus the studied area limit remained at MD 32. The crash history and patterns are similar between the two study areas; however, the 2020 forecasted average daily traffic (ADT) from the 2002 Study is significantly higher than current traffic and the ADT has dropped between 2000 and 2018. Table 2 highlights a few comparisons between the two studies.

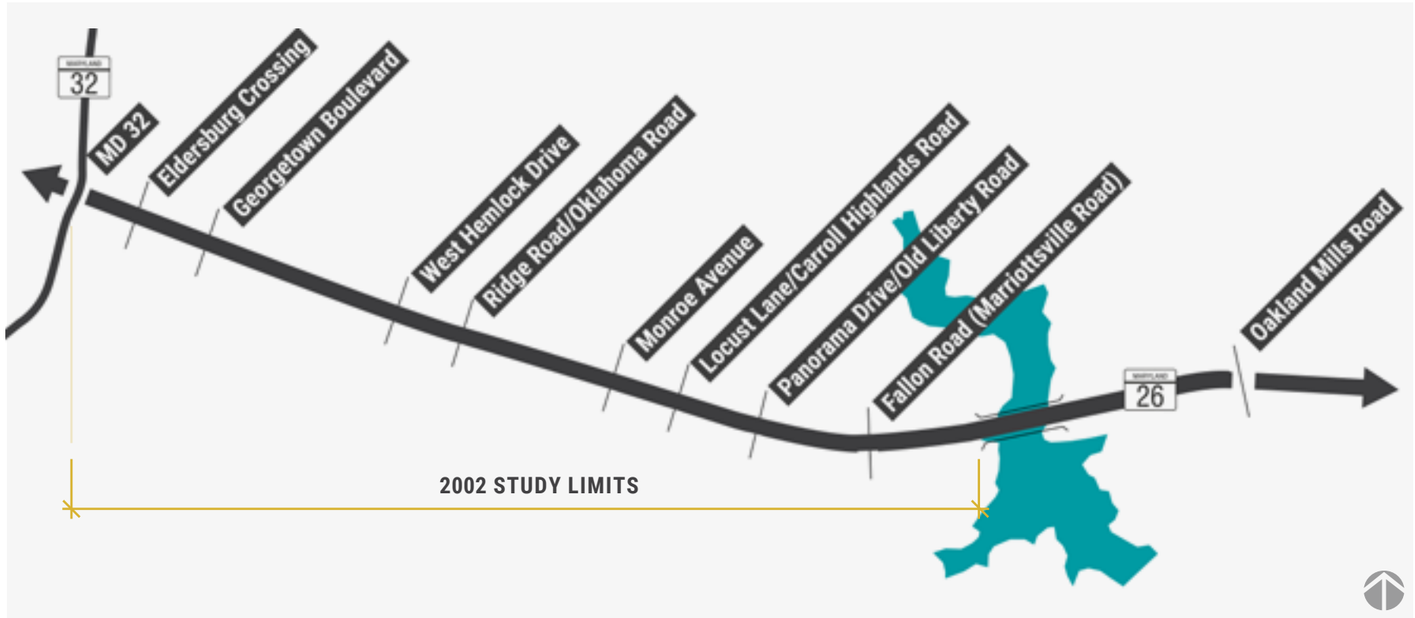


FIGURE 4. Comparison of this Study's Limits and the 2002 Study

TABLE 2. Comparison of Existing Conditions in 2002 & 2018 MD 26 Corridor Studies

	2002	2018
Functional Class	Other Principal Arterial/Minor Arterial	Principal Arterial
Study Length	2.5 miles	4.0 miles
ADT/AADT	33,100	32,000
Forecasted AADT - 20 years	37,500 (2020)	N/A*
Number of Crashes Over 3 Years	163 (1997-1999)	187 (2015-2017)
Crash Rate	193.6	229.9
Most Predominate Type of Crash	Rear End at 27%	Rear End at 29%

**A specific build year was not defined in this study but rather a full build out of available land, thus no volumes are reported here.*

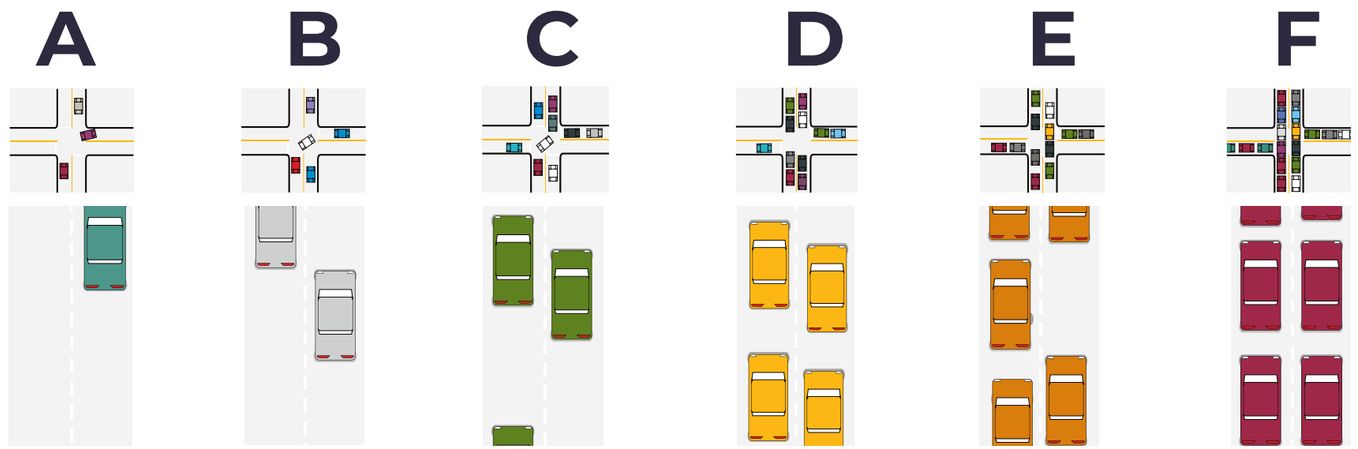


FIGURE 5. Illustration of Level of Service

TABLE 3. Intersection Level of Service Comparison

MD 26 INTERSECTING ROAD	2002	2020 Projected	2018 Existing	2002	2020 Projected	2018 Existing
	AM			PM		
MD 32	C	D	D	C	F	D
Eldersburg Crossing	A	A	A	C	E	A
Georgetown Boulevard	A	A	C	B	D	C
Long Meadow Drive*	A	A	N/A	A	C	N/A
West Hemlock Drive	A	B	B	B	C	C
Ridge Road/Oklahoma Road	A	B	C	B	D	D
Marvin Avenue*	A	A	N/A	A	A	N/A
Monroe Avenue	A	A	A	A	C	A
Locust Lane/Carroll Highlands Road	A	A	C	A	B	C
Panorama Drive/Old Liberty Road	B	D	D	C	E	D
Old Liberty Road/ Marriottsville Road #2*	B	D	N/A	C	E	N/A
Fallon Road	N/A	N/A	C	N/A	N/A	C
Oakland Mills Road	N/A	N/A	C	N/A	N/A	A

Intersection not a focus of this study

Level of Service

Level of Service (LOS) is a letter grade assigned to a section of roadway that measures the quality of traffic flow, ranging from LOS A to LOS F (Figure 5). An LOS A represents optimal, free-flow conditions, while LOS F represents failing conditions where demand exceeds capacity.

The 2018 traffic analysis shows that no intersections are currently failing or have an LOS E in the morning or evening peak hours. Table 3 compares the 2018 existing intersection LOS to the 2020 forecasted[2] LOS from the 2002 Study. Compared to the existing conditions, the forecasted morning peak hour LOS is unchanged for five intersections (MD 32, Eldersburg Crossing, Hemlock Drive, Monroe Avenue, and Old Liberty Road) and is slightly better than existing conditions for four intersections (Georgetown Boulevard, Ridge Road/Oklahoma Road, and Locust Lane/Carroll Highlands Road). In the evening peak hour, the 2020 forecast anticipated worse conditions for five intersections (MD 32, Eldersburg Crossing, Georgetown Boulevard, Monroe Avenue, and Old Liberty Road/Carroll Highlands Road), with one failing intersection (MD 32) and three intersections at LOS E (Eldersburg Crossing, Old Liberty Road/Panorama Drive, and Old Liberty Road/Marriottsville Road.

Traffic Volumes

Analysis to develop a balanced set of 2018 volumes for the morning peak hour of 7:00 AM and the evening peak hour of 5:00 PM used historical and recent turning-movement counts (Table 4). Traffic moves primarily eastbound during the morning peak period, with a directional distribution of approximately 65%. During the evening peak period, there's a more even split of traffic volumes, with a slightly higher westbound movement of 53% of total volume.

2 The growth rate used is not noted in the 2002 report.

TABLE 4. 2018 Traffic Volumes by Direction

	Eastbound	Westbound
Morning	1,220	670
Evening	1,210	1,380
Directional Distribution	65%	53%

Crash History

The study requested crash data for all study intersections from MDOT SHA's Office of Traffic and Safety – Traffic Development and Support Division (OOTS-TDSD). MDOT SHA provided three years of crash data for the period from January 1, 2015, to December 31, 2017 (Figure 6 and Table 5). A total of 187 crashes occurred along MD 26 within the study limits between 2015 and 2017, with a concentration of crashes where MD 26 intersects with MD 32 and with Georgetown Boulevard. This highly commercial roadway segment at the western edge of the study corridor had a 7% increase in traffic between 1998 and 2018, as noted on page 9, Study Area.

Between 2015 and 2017, the numbers of crashes per year had been relatively stable. Of the 187 crashes, 29% were rear-end collisions, 20% were listed as an unknown accident type, and 19% were angle collisions. The major contributing factors of crashes included failing to give full attention (29%) and failing to yield the right-of-way (16%). Most of the crashes (66%) occurred during daylight hours and peak commuting times (40%). Most of the crashes occurred under dry surface conditions. While a majority of crashes (66%) resulted in property damage only (66%), 61 crashes (32%) resulted in injury and three of the crashes (2%) resulted in fatalities

Each of the three fatal crashes in that time happened at night or under dark/low visibility conditions. Two of the fatal crashes were vehicle-pedestrian crashes while the third was a cited as a vehicle traveling too fast under dark and wet conditions. The overall crash rates for the study area are generally at or below the statewide average, except for fatalities. The statewide rate of fatalities is 1.3 while the study corridor rate is 4.1, significantly higher.

TABLE 5. Intersection Crash Summary (2015—2017)

	MD 26 INTERSECTING ROAD	TOTAL # OF CRASHES
1	MD 32 (Sykesville Road)	30
2	Eldersburg Crossing	6
3	Georgetown Boulevard	30
4	West Hemlock Drive	21
5	Ridge Road / Oklahoma Road	20
6	Monroe Avenue	19
7	Locust Lane / Carroll Highlands Road	13
8	Panorama Drive / Old Liberty Road	16
9	Fallon Road	11
10	Oakland Mills Road	21

FIGURE 6. Map of Crash Locations

MD 26 CORRIDOR FUTURE CONDITIONS

Full Build-Out Analysis

A future build-out assessment forecasts development that could occur in the future given current conditions. Future conditions assume a full build-out of the parcels provided by Carroll County. The scenario does not define a horizon year; however, this study assumes that the build-out is representative of a condition come 2040 or beyond. Interim sensitivity analysis for a 2040 condition—assuming MD 32 either is or is not dualized and upgraded to a four-lane, divided highway—is based upon the *2017 MD 32 Planning Study, I-70 to MD 26*. The Ridenour Way connection was considered in the development of future volumes; however, the Dickenson Road connection was not included. In general, creating a more connected grid network through local road connections would help improve safety and operations along the MD 26 corridor.

Land Use & Buildable Parcels

The County's Buildable Land Inventory database was used to derive full build-out future traffic volumes. The database identifies parcels with potential for development, including vacant parcels and parcels capable of redevelopment. The database assigns a future land use to each parcel, along with a series of build-out categories (i.e., low, medium, or high-density development). This data reflects the relative number of units on a residential parcel,[3] or available 'new acres' of a commercial/industrial parcel. The parcels used in the traffic analysis only include those within the study corridor's influence area as shown in Figure 7 The parcels were further grouped by location (and termed 'developments') to support efficiency of the analysis. Table 6, outlines the process for selecting analyzed parcels. In total, 276 parcels were identified as being located within the MD 26's influence area, which yields 1,556 new residential lots and 54.78 acres of land available for commercial or industrial development or redevelopment.

The map shows the 33 development clusters within the study influence area and the individual buildable parcels, illustrated by land use. The 33 development clusters are labeled with dwelling units for residential or thousand-square feet for commercial/industrial land uses.

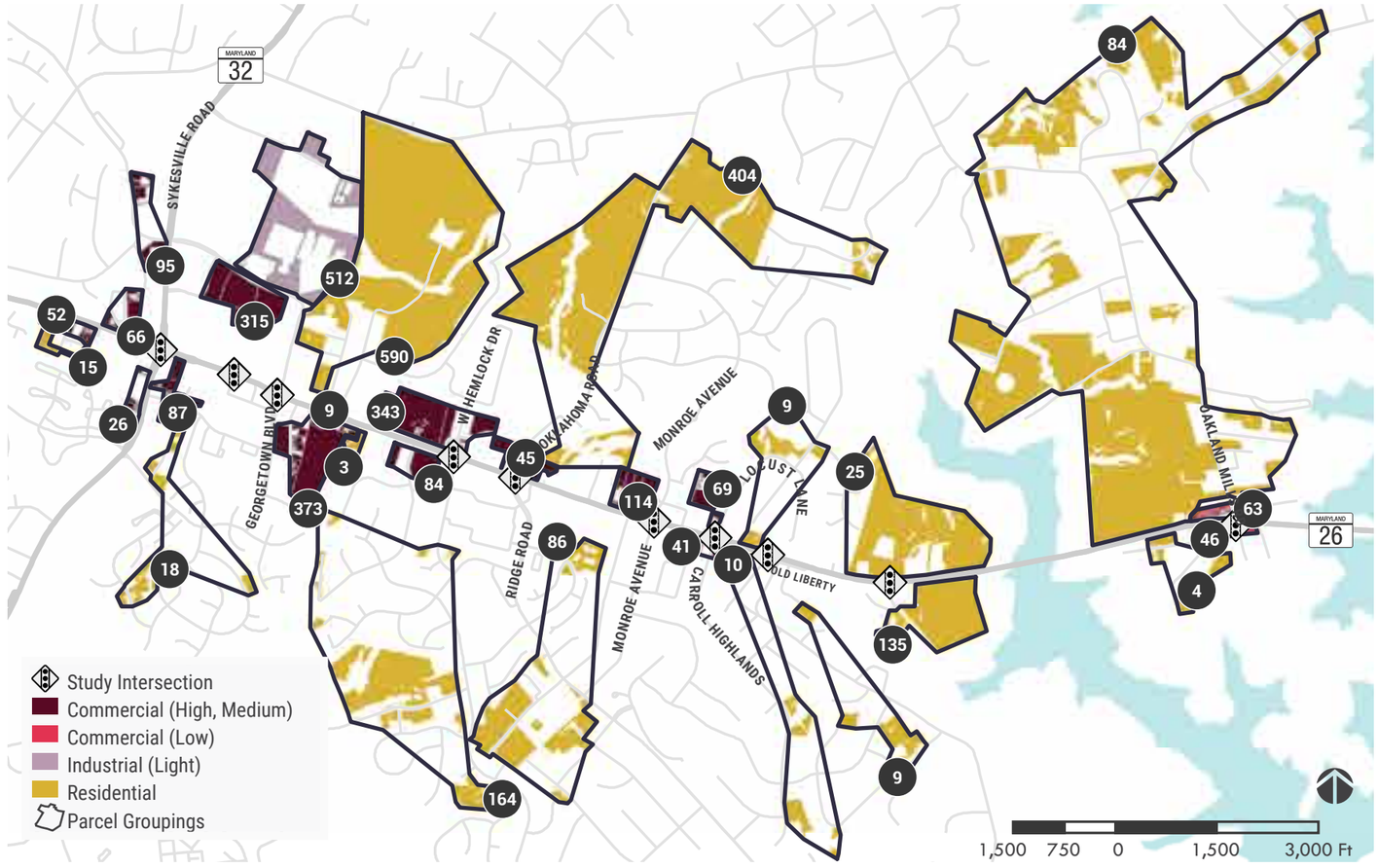


FIGURE 7. Buildable Land Inventory Symbolized by Future Land Used & Grouped Developments

Labels show total dwelling units for grouped residential parcels, or total thousand square-feet for grouped commercial/industrial parcels.

TABLE 6. MD 26 Area of Influence Land Use

	County Wide	Size County Wide	Influence Area	Grouped	Analyzed Size
Residential	912 Parcels	5,683 Lots	195 Parcels	14 Devts.	1,556 Lots
Commercial/ Industrial	135 Parcels	477 Acres	81 Parcels	19 Devts.	54.78 Acres

3 As requested by the County, the INT_LOTS_M field from the *BLI_Freedom_Accepted FLU_Parcels* database was utilized in a one-to-one ratio to determine the number of dwelling units and the NewAcres field from the *Commercial_Industrial_EmplCampus_BLI_FLU_Accepted041718* was utilized to estimate the future building square feet.

Future Trip Generation

This study used the Institute of Transportation Engineers (ITE) *Trip Generation Manual, 10th Edition* to convert future development into future trips, making the following assumptions when converting land build-out to roadway trips.

RESIDENTIAL PARCELS:

- Used the medium lots figure from the County's Buildable Land Inventory database as the number of dwelling units.

COMMERCIAL & INDUSTRIAL PARCELS:

- Assumed half of the 'new acres' attribute from the County's Buildable Land Inventory database equates to building square footage. The 50% reduction accounts for other elements of a developed site, including: parking lots, internal roadways, stormwater management, and open land around buildings.
- Assumed primarily one-level development.
- Applied a 30% pass-by discount to commercial parcels, which is an average pass-by discount sourced from the *ITE Trip Generation Manual*.

Table 7 shows the total morning and evening peak hour trips estimated at full build-out. Development on buildable parcels is forecasted to produce 2,700 new trips during the morning peak period, and 6,200 new trips in the evening peak period. While this represents the total forecasted trips generated by the cumulative buildable parcels within the study's influence area, not all trips will utilize MD 26 when traveling between their origin and destination.

TABLE 7. MD 26 Trips Generated Under Full Build-Out

		Morning Peak			Evening Peak		
Land Use Type	**Size**	**Entry**	**Exit**	**Total**	**Entry**	**Exit**	**Total**
Residential Single Family	1,556 du	273	819	1,092	971	570	1,541
Commercial Low Density	109,000 sf	45	38	83	96	108	204
Commercial Medium/High Density	1,765,000 sf	811	394	1,205	1,617	2,477	4,094
General Light Industrial	512,000 sf	155	136	358	155	168	323
Total		2,737			6,163		

DU: Dwelling Units; SF: Square Feet

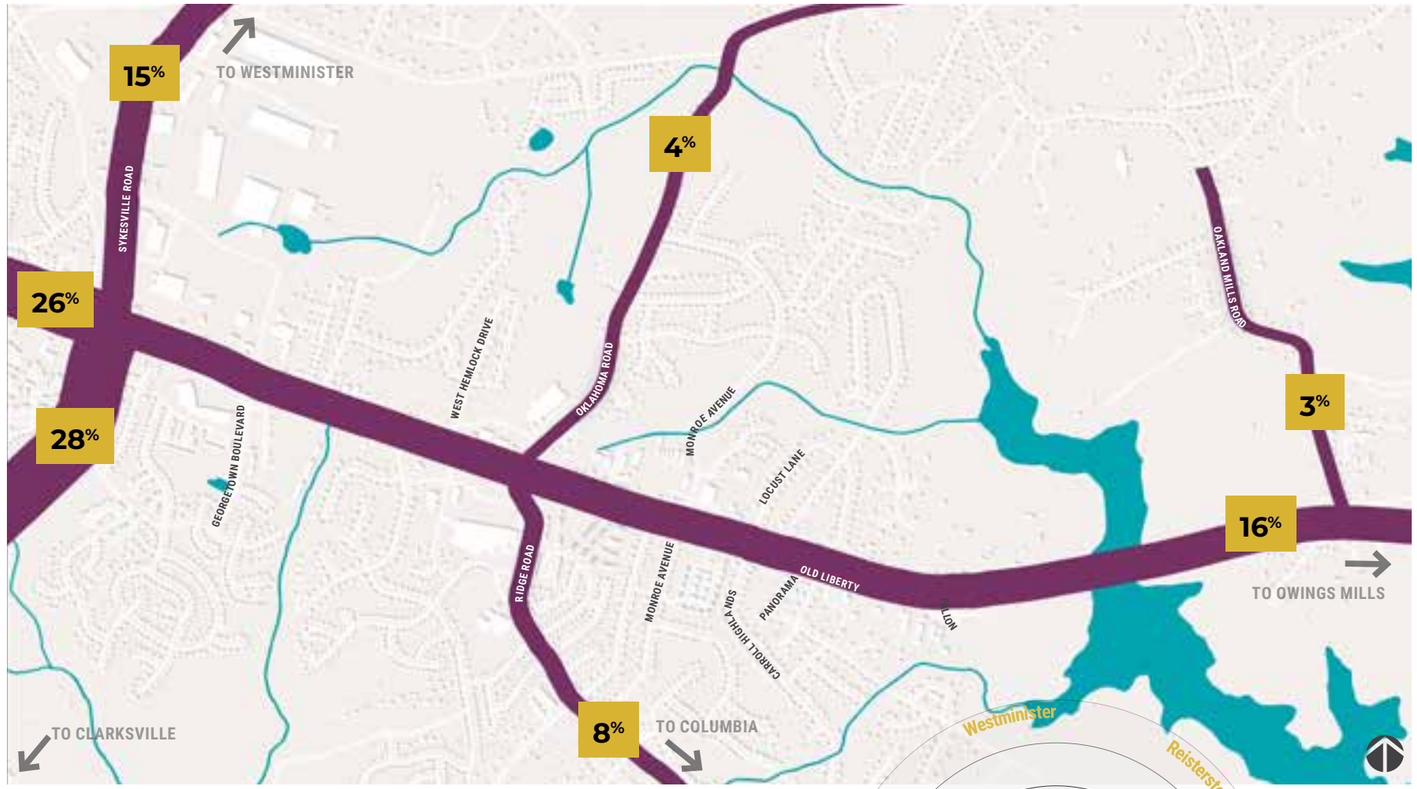


FIGURE 8. AADT of Highlighted Roadways

Future Trip Distribution

Selected trip distribution is based on the AADT of primary roadways in the study corridor, as shown in Figure 8. Almost 40% of traffic in the study area will be coming from/going to the south—toward I-70 and further south toward Howard and Montgomery counties via MD 32, MD 97, and Ridge Road/Marriottsville Road. Almost 30% of traffic was anticipated to travel west of Eldersburg and beyond, toward MD 97. Approximately 20% of traffic will travel east along MD 26, toward Owings Mills, Randallstown, and further to I-695. A moderate amount of traffic (10%) will travel north to Westminster via MD 32 to Old Westminster Pike.

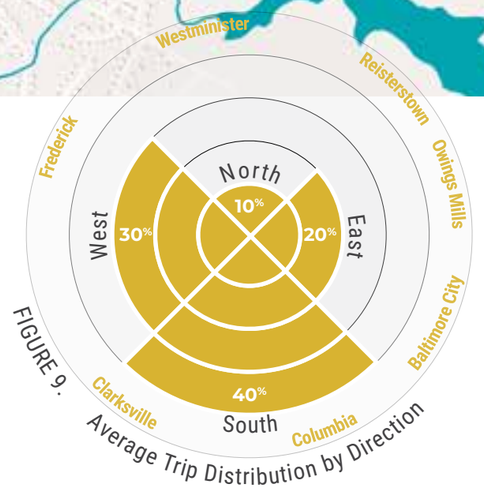


FIGURE 9.

Intersection Level of Service

In 2040 estimates and under the full build-out scenario, the commercially dense segment of the MD 26 corridor between MD 32 and Ridge/Oklahoma Road experiences failing intersections in the evening peak period. Also under both scenarios, unsignalized intersections show failing side street delay in the evening peak period.

Intersections experiencing the most delay are located between MD 32 and Ridge/Oklahoma Road, where the highest volumes are generally recorded for the corridor. Under the 2040 conditions, the traffic fails under evening peak period conditions more often than the morning peak, with the intersection at MD 32 consistently operating poorly (LOS E or F) during both morning and evening peak periods (see Table 8).

Sensitivity Analysis

This study conducted a sensitivity analysis to better assess a timeline for needed improvements. The progression of development and its resulting impact to traffic operations was evaluated in two manners: 1) the volume to capacity ratio of through movements and 2) the reduction of trips until acceptable intersection LOS is reached.

Volume to Capacity

This study assessed a projection of through volumes to evaluate the remaining capacity of MD 26. This assessment isolates the through volumes from the interactions of side streets and turning movements to help differentiate needed capacity improvements at intersections or for turn lanes from mainline. It is based on the static assessment of comparing volume or demand to available lane capacity. With increases at an annual rate of 0.7%[4], the volumes were plotted against eastbound-westbound through movement capacity along MD 26 to determine the timeframe in which volume will exceed capacity. This calculation was performed for each segment between signalized intersections to obtain a block-by-block picture of evolving or deteriorating corridor operations. During the evening peak hour, through volumes will not reach through-lane capacity along any segment prior to 2040. The westbound approach to MD 26 at MD 32 begins to reach capacity just after 2040. It is important to note that this evaluation does not consider impact to corridor operations as a result of intersections that fail (in either existing or future conditions).

4 The 0.7% growth rate was sourced from the growth analysis included in the 2017 MD 32 Planning Study, which used the regional travel demand model to determine expected growth along MD 26 at MD 32.

TABLE 8. Intersection PM Level of Service for MD 26 Under Existing and Projected Scenarios

	MD 26 INTERSECTING ROAD	Level of Service for AM (PM)				
		Control	2018 Existing	2040[5] MD 32 non-Dualized	2040[5] MD 32 Dualized	Full Land Use Build-Out*
1	MD 32	Signalized	D (D)	E (F)	E (F)	E (F)
2	Eldersburg Crossing	Signalized	A (A)	A (B)	A (C)	A (F)
3	Georgetown Boulevard	Signalized	C (C)	C (E)	C (E)	C (F)
4	West Hemlock Drive	Signalized	B (C)	C (D)	C (E)	C (F)
5	Ridge Road / Oklahoma Road	Signalized	C (D)	D (E)	D (E)	D (F)
6	Monroe Avenue	Signalized	A (A)	B (B)	B (B)	B (D)
7	Locust Lane / Carroll Highlands Road	Stop	C (C)	E[4] (C)	E (E)[4]	E[4] (F)[4]
8	Panorama Drive / Old Liberty Road	Stop	D (D)	D (D)	E[4] (D)	E[4] (F)[4]
9	Fallon Road	Stop	C (C)	F[4] (C)	F[4] (D)	F[4] (F)[4]
10	Oakland Mills Road	Signalized	C (A)	C (B)	C (B)	F (E)

**Full Land Use Build-Out assumes volumes based on the development or redevelopment of all buildable parcels within the study area as opposed to defining a horizon year and growing volumes to the associated year. MD 32 is assumed to be non-dualized.*

4 Reported level of service represents an approach level of service of the stopped controlled side-street. Although the amount of delays translates to a level of service of F under HCM thresholds, the approach volumes experiencing the delay are 50-100 vehicles. Signalization is an option to mitigate the delay.

5 This analysis used the 2040 forecasts from the 2017 MD 32 Planning Study at the intersection of MD 26, assuming the Baltimore Metropolitan Council of Governments (BMC) regional demand model only.

Seventy Percent Buildout Scenario

The full build-out scenario is not associated with a defined horizon year, as the numbers represent a theoretical maximum development scenario. However, future trips were systematically and iteratively reduced to assess at which level of development the corridor will begin to fail.

A 70% build-out would allow for a significant amount of development to occur without the need for major corridor widening. However, the analysis showed that, when the region reaches 70% of the volumes generated by the full build-out in the future, most of the intersections are nearing or at capacity, as shown in Table 9. Unsignalized intersections have northbound approaches with a failing LOS.

While the application of a blanket increase in volumes provides an idea of which development level will tip the corridor's traffic operations, it is important to note that development does not occur at a consistent rate. Specific intersections or segments may experience deteriorating conditions sooner than others.

This analysis does not account for isolated developer improvements, though it is reasonable to assume such improvements will aid in maintaining acceptable intersection operations. Continuous monitoring of the volumes to precisely understand how close they are to reaching capacity (see Figure 10) is necessary to proactively mitigate failure of intersections.

TABLE 9. Intersection PM Level of Service for MD 26 Under Seventy Percent Buildout Scenario

	MD 26 INTERSECTING ROAD	Level of Service for AM (PM)			
		Control	Volume/ Capacity Ratio	Delay sec/veh	70% Build-out Level of Service
1	MD 32	Signalized	1.02	71.5	E
2	Eldersburg Crossing	Signalized	0.96	37.8	D
3	Georgetown Boulevard	Signalized	1.18	78.5	E
4	West Hemlock Drive	Signalized	1.07	56.5	E
5	Ridge Road / Oklahoma Road	Signalized	1.06	73.2	E
6	Monroe Avenue	Signalized	0.96	23.4	C
7	Locust Lane / Carroll Highlands Road	Stop	0.76	95.2	F
8	Panorama Drive / Old Liberty Road	Stop	0.47	57.8	F
9	Fallon Road	Stop	0.54	68.8	F
10	Oakland Mills Road	Signalized	>1.50	49.9	D

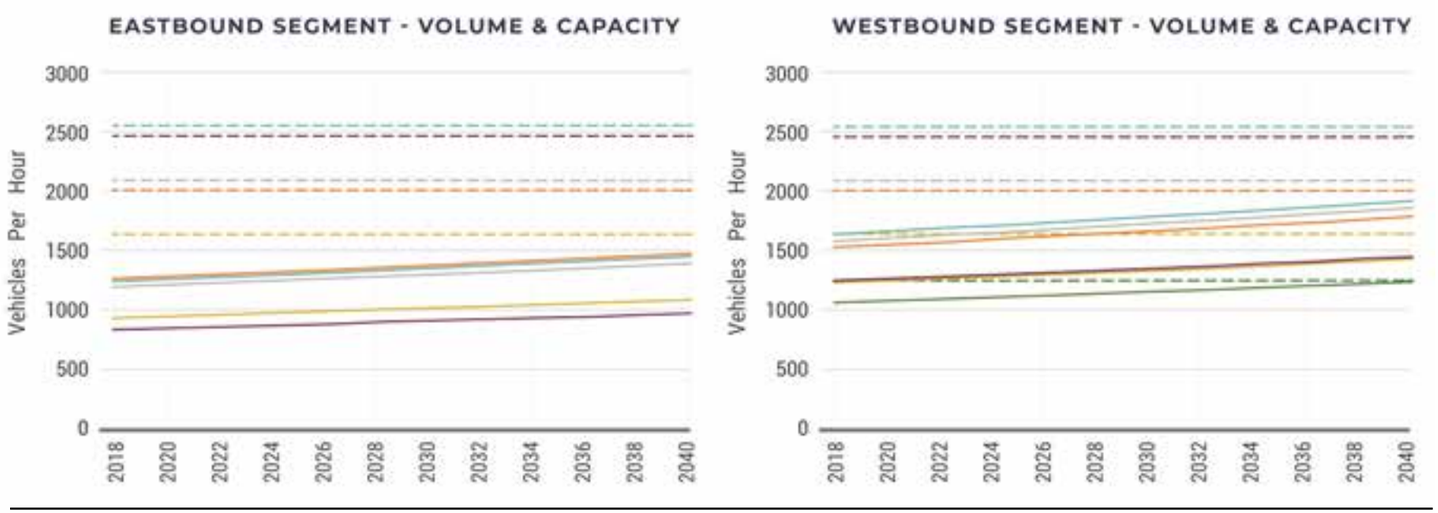


FIGURE 10. Plots of Through Volume-Capacity

Note volume graphs do not intersect with capacity graphs for respective segments (same color lines) except for MD 32 (grey line)

**Westbound Direction Only*

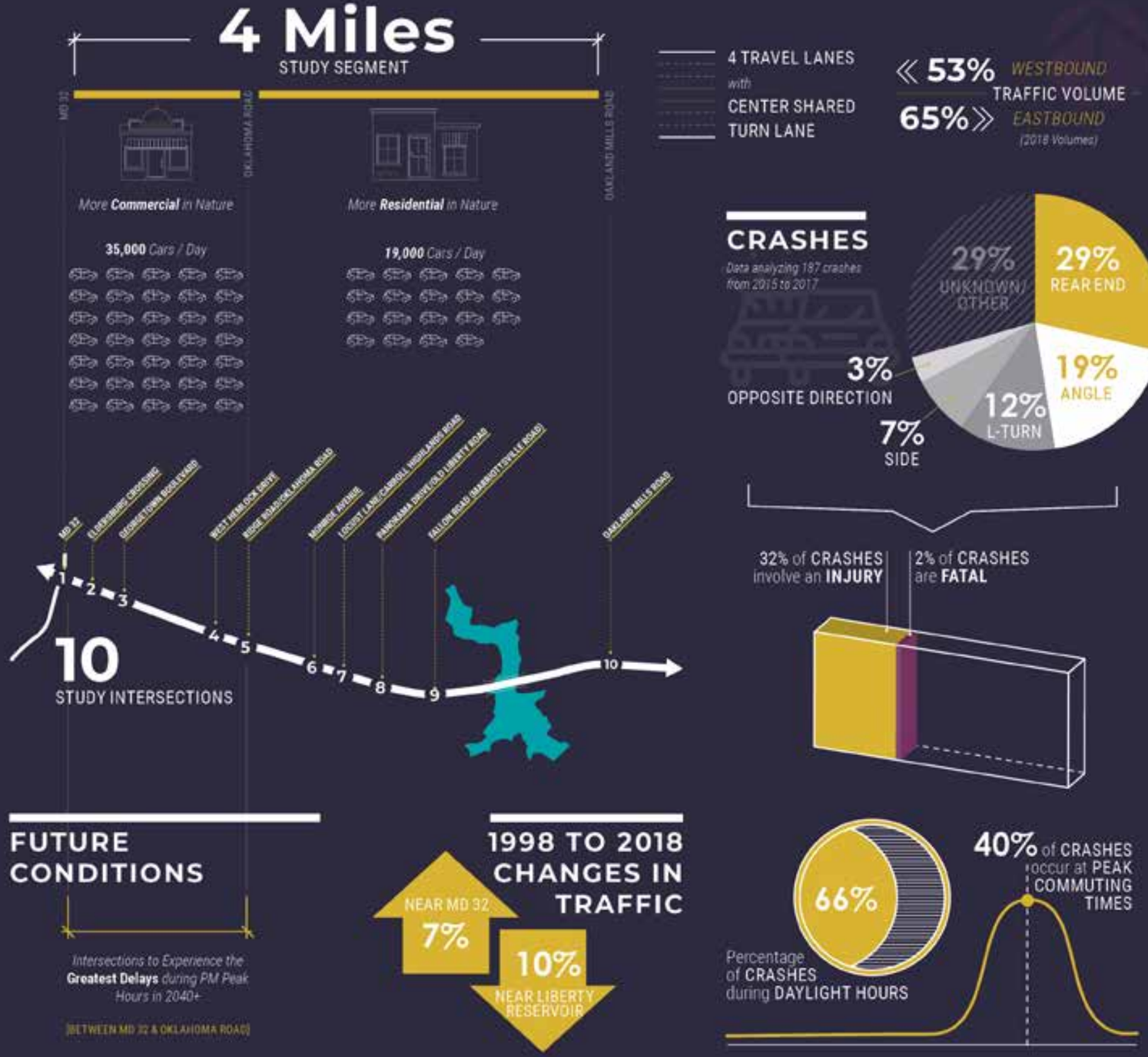


FIGURE 11. Infographic Summary of Traffic Analysis

Photos of Existing Conditions along the MD 26 Corridor

MD 26 CORRIDOR TRAFFIC ANALYSIS CONCLUSIONS

From the traffic analyses, we can summarize key conclusions (Figure 11). The MD 26 corridor currently operates at an acceptable LOS. The number of crashes per year has been relatively stable between 2015 and 2017. Out of the 187 crashes, 29% were rear-end collisions, 20% were listed as an unknown accident type, and 19% were angle collisions. The major contributing factors of crashes included failing to give full attention (29%) and failing to yield the right-of-way (16%). Most of the crashes occurred during daylight hours (66%) and during peak commuting times (40%). Most of the crashes occurred under dry surface conditions. Crashes are at or below the statewide averages for similar types of roadways except fatalities. (See page 13 for a discussion of fatal crashes.) The high percentage of rear-end and angle collisions in the corridor are associated with peak hour congestion and frequent left turns. Additionally, there are a high number of crashes along MD 26 at the MD 32 and Georgetown Boulevard intersections. Evaluation of strategies is warranted to mitigate these crash patterns.

According to an assessment of full build-out of the County's Buildable Land Inventory—and based on a higher assumption than in the currently adopted *2014 Carroll County Master Plan, 2019 Amendment*—the MD 26 corridor study area is anticipated to experience 2,700 new trips during the morning peak and 6,200 new trips in the evening peak. The study assumes that full build-out will occur beyond 2040 and such development would bring intersection LOS to failing conditions for all corridor intersections in the evening peak hour. A sensitivity analysis shows that deteriorating conditions would be reached around 2040, and the evening peak condition between MD 32 and Ridge Road/Oklahoma Road would experience the worst delays.

MARYLAND

26

CORRIDOR RECOMMENDATIONS

MD 26 CORRIDOR RECOMMENDED IMPROVEMENTS

Using the updated 2018 traffic analysis, the Maryland Department of Transportation State Highway Administration's (MDOT SHA) Office of Planning and Preliminary Engineering (OPPE), along with the District 7 Office, worked in conjunction with the Carroll County Department of Planning to review the *2002 MD 26, MD 32 to the Liberty Reservoir, Corridor Planning Study* (the "2002 Study") to redefine corridor needs and reevaluate recommendations. The result of this collaborative approach is an updated statement of needs and a toolbox of targeted strategies that can address safety and congestion concerns today and through 2040. The objective of this effort and the following recommendations is to facilitate Carroll County in making consistent and feasible MDOT Priority Letter requests, reasonable developer traffic mitigation requests, and future investment by the County and MDOT with the aim of proactively addressing MD 26 corridor traffic issues in the present and into the future.

Updated MD 26 Corridor Needs

Conclusions of the 2018 MD 26 traffic analysis led the MDOT SHA and Carroll County planning team to identify three needs:

IMPROVING SAFETY & OPERATIONS

Address prevalent crash patterns and operational issues in the corridor.

Of the 187 crashes in the study limits between 2015 and 2017, 60% were classified as rear-end, angle, or left-turn collisions. At both MD 26 intersections at MD 32 and Georgetown Boulevard, 30 crashes occurred with similar conditions prevalent. Rear-end crashes are indicative of a congested corridor and the existing continuous center left-turn lane is identified as a major factor in angle and left-turn crashes.

MEETING FUTURE CAPACITY

Update future capacity needs for the MD 26 corridor.

The MD 26 corridor intersections are projected to approach failing LOS around 2040. In addition, the updated traffic analysis predicted slower traffic growth through 2040, less than the 2002 Study projected. These findings indicate a need to evaluate and revise recommendations for through capacity widening and traffic.

REVISING THE TYPICAL SECTION

Reduce the width of the typical section for the MD 26 corridor.

County staff requested that MDOT SHA identify possible width reductions to the proposed typical section, where appropriate, to increase the feasibility of improvements by the County and MDOT. A typical section that minimizes right-of-way impacts while meeting corridor needs would facilitate setting predictable setback requirements, right-of-way reservation and developer traffic mitigation measures.

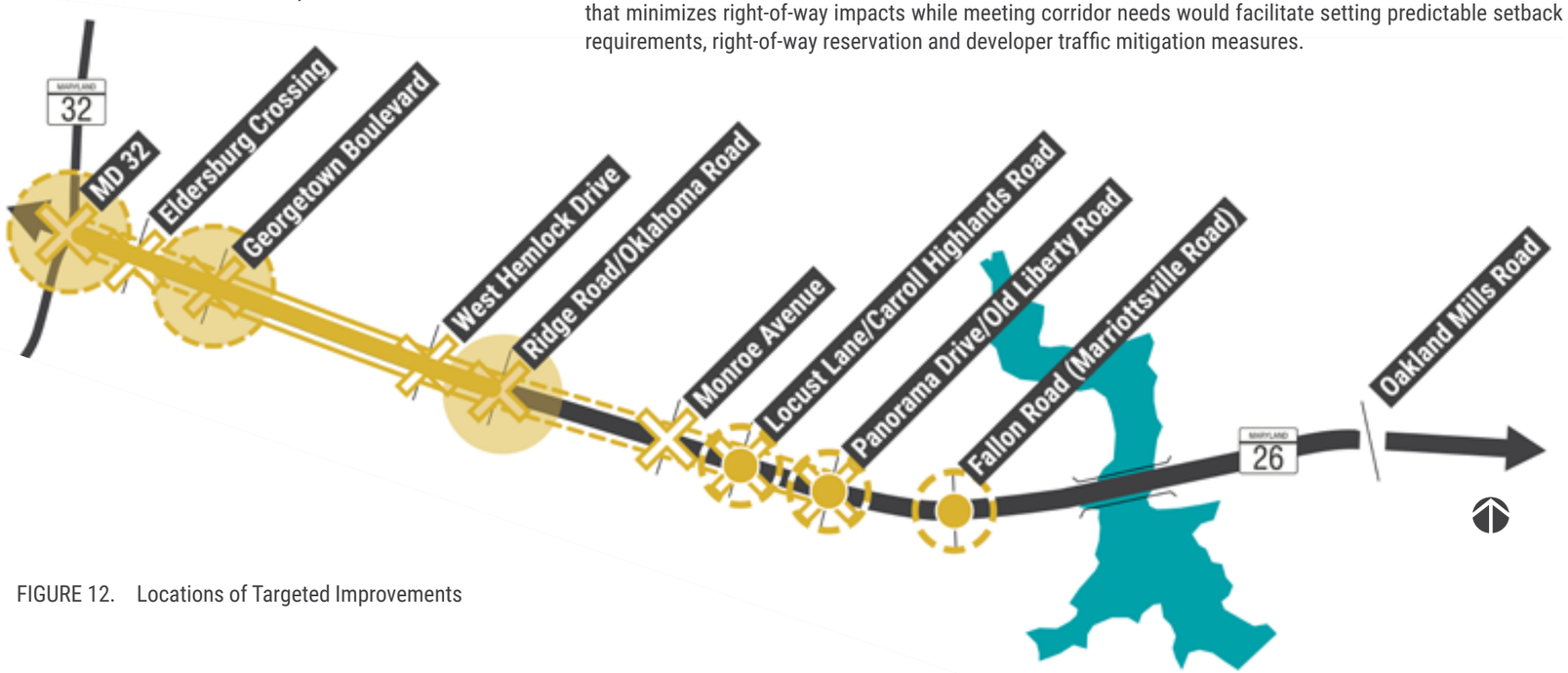


FIGURE 12. Locations of Targeted Improvements

Proposed MD 26 Targeted Improvement Strategies

The following strategies are options to be considered and prioritized by the County's planning team and officials to meet the MD 26 corridor needs identified above. It is a toolkit that can be utilized as opportunities arise through a combination of MDOT SHA initiatives, developer improvements, and county planning and capital projects. A total of seven strategies (Figure 12) are outlined on the following pages, categorized by the three areas of need.

SAFETY & OPERATIONS

FUTURE CAPACITY

REVISED TYPICAL SECTION

Safety + Capacity Recommendation Locations

- A1/B1 (pg. 22/pg. 24)
- A2 (pg. 23)
- A2 (pg. 23)
- A2 (pg. 23)
- A3 (pg. 23)
- A4 (pg. 23)
- B2 (pg. 25)

See pg. 26 for Typical Section Strategies

A - SAFETY & OPERATIONAL STRATEGIES

Safety and operational improvements will reduce crashes in the corridor and enhance intersection operations. These strategies are grouped into three categories: access management, pedestrian accommodations, and traffic signal analysis.

A1 | Access Management

Control access with the construction of a median island from MD 32 to Ridge/Oklahoma Road (to replace the existing continuous two-way center left-turn lane) and by consolidating access points within these limits (Figure 13). The conflict between left-turning vehicles and through traffic is a driving factor of angle, left-turn, and rear-end crashes in the corridor.

Construction of a median and the resulting reduction in the frequency of left turns in the commercial core will reduce the risk of such conflicts. Median considerations include the following:

- A median's width should be between three and six feet with a widening to approximately 14 feet at intersections to accommodate turning movements (Figure 14).
- The limits of the recommended median, MD 32 to Ridge Road/Oklahoma Road, include the commercial district, which is characterized by a density of destinations and frequent access points. The median is not recommended east of Ridge Road/Oklahoma Road due to a shift to low-density residential land use and a documented drop in traffic volumes and crash incidences.
- Development of an access management plan is recommended to establish an overall access vision for the corridor and inform developer access requests and mitigation measures. The MDOT SHA Regional and Intermodal Planning staff are available to assist in this potential effort as it is reflected in the annual Carroll County transportation priority letter.

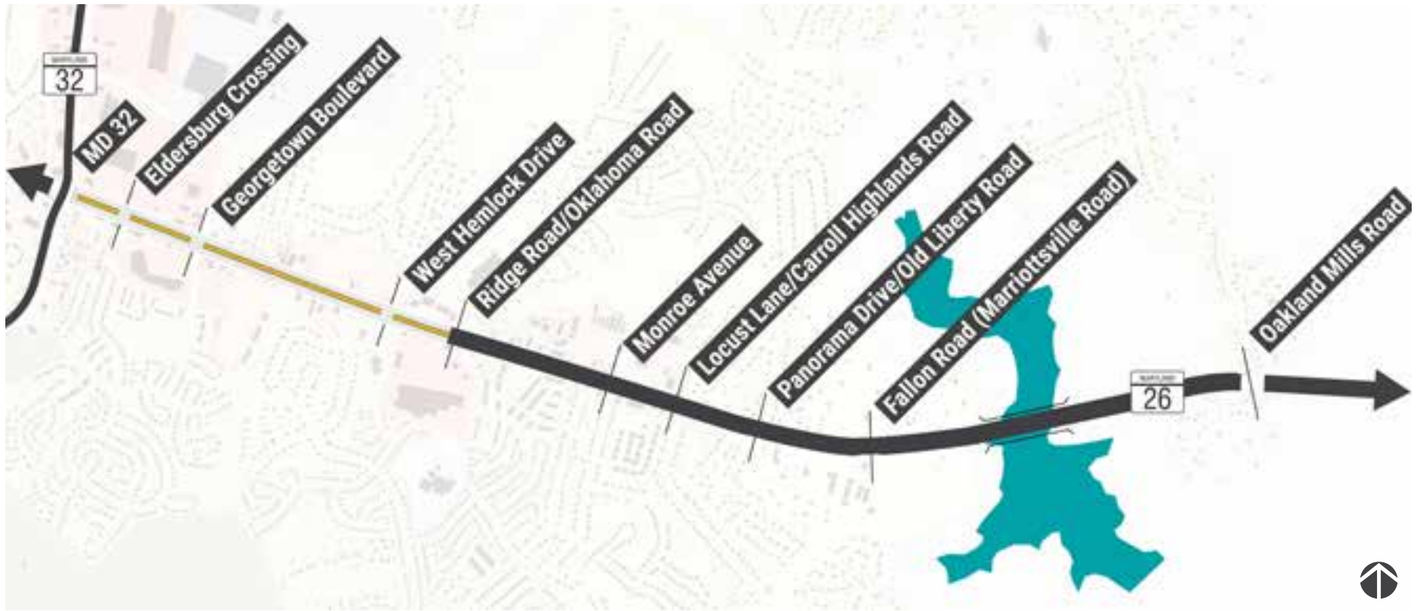


FIGURE 13. Location of Access Management Improvements

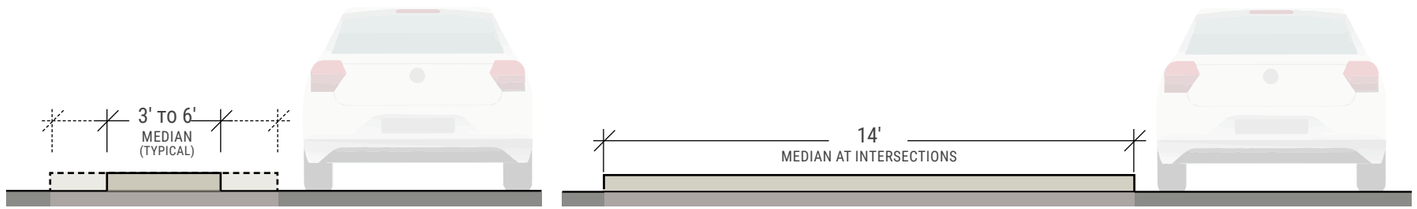


FIGURE 14. Median Widths

A2 | Pedestrian Accommodations

Carroll County staff prioritized pedestrian-only facilities in lieu of the costlier shared-use path included in the 2002 Study. The presence of commercial development between MD 32 and Panorama Drive calls for better pedestrian facilities. The County continues to support MD 26 as a designated bicycle route and identifies on-road, shared-lane bicycle accommodations (as is appropriate, given the consistently low presence of bicycles in the corridor). Sidewalk considerations include the following:

- A five-foot-wide sidewalk with a three-foot buffer is proposed to fill the gap between Georgetown Road and Ridge/Oklahoma Road (Figure 15).
- Upgrades to address sidewalk gaps compliant with the Americans with Disabilities Act (ADA) are recommended for the existing sidewalk facilities between MD 32 and Georgetown Boulevard and between Ridge/Oklahoma Road and Panorama Drive.
- Upgrades to intersection crosswalks between MD 32 and Panorama Drive are recommended to increase pedestrian safety and comfort. The MDOT SHA's *2019 Context Driven Design Guidelines* can provide guidance regarding crosswalk treatments appropriate to a suburban commercial corridor.
- A sidewalk feasibility study is recommended as a follow up effort to this planning effort to refine current sidewalk needs, costs, and impacts. This information can facilitate incremental sidewalk improvements through Carroll County and MDOT SHA system preservation projects, as part of mitigation for future development, and through the MDOT SHA Sidewalk Retrofit Program (Fund 79).

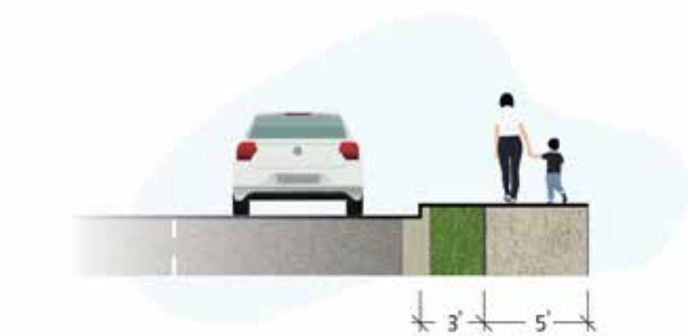


FIGURE 15. Sample Section Showing Sidewalk and Buffer

A3 | Traffic Signal Analysis

At this time, new traffic control signals are not currently recommended for any existing unsignalized intersection in the MD 26 corridor. As travel volumes and density increase, three locations were identified for future consideration of traffic control signals. These include Carroll Highlands Road, Panorama Drive, and Fallon Road (see Figure 16, below, and Figures 32 and 33).

As with all intersections, improvements must meet signal warrant standards, which consider factors such as vehicular and pedestrian volumes, crash experiences, nearby land uses, and other roadway features. Once warranted at a future date, consider traffic signals at these locations.

FIGURE 16. Locations for Traffic Signal Analysis

A4 | Intersection Operations

The following recommendations address current safety, pedestrian, and operational concerns. Updated recommendations to address future failing traffic conditions are discussed in section B, Future Capacity Improvements, on the next page.

MD 26 at MD 32 Intersection: The 2015-2017 crash data indicate 30 crashes have occurred at this intersection. Approximately one-third were rear-end and another third were left-turn or angle crashes. In addition, there is a lack of sidewalk and pedestrian facilities at this intersection. Updated analysis indicates additional auxiliary lanes would mitigate crashes at this intersection; however, they do not address the overall operational concerns of this intersection. MDOT SHA recommends that Carroll County prioritize this intersection for further study and concept development. The 2019 MDOT SHA Context Driven Design Guide should be consulted during any design process to identify appropriate pedestrian and bicycle facilities and treatment at this intersection within a Suburban Activity Center zone.

MD 26 at Georgetown Boulevard: Approximately 50 % of the thirty crashes at this location involved conflicts between three left-turning, eastbound movements and westbound through movements. The safety and ease of pedestrian travel in the commercial core of the study area is also a County concern. The proposed new median (see recommendation A1, opposite, and Figure 17, below) would reduce the conflict between turning and through movements, reduce related crashes, and be a possible refuge for pedestrians. Additional evaluation of left-turn exclusive phasing is recommended to provide separation of eastbound left turns and westbound through movements.

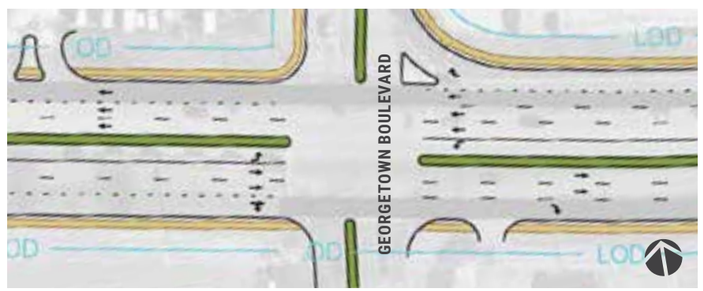


FIGURE 17. Improvements at Georgetown Boulevard

B - FUTURE CAPACITY STRATEGIES

This study's analysis concluded a reduced need for through capacity widening compared to recommendations included in the *2002 MD 26, MD 32 to Liberty the Reservoir, Corridor Planning Study*. Strategies to increase corridor through capacity and improve individual intersections as they reach failing LOS around 2040 include two primary improvement types: auxiliary lanes and intersection improvements.

B1 | Auxiliary Lanes

Auxiliary lanes, or acceleration/deceleration lanes, are operational lanes that give drivers more time to merge in and out of traffic without impacting through traffic. These additional lanes replace the widening for a third through lane between MD 32 and Locust Lane, as was included in the 2002 Study. Updated traffic analysis indicates the longer through lane is unnecessary and auxiliary lanes can provide adequate intersection and through capacity beyond 2040. Auxiliary lanes are illustrated here (Figures 18 and 19) and proposed in the following locations, as warranted by the study corridor needs:

- **Adding a westbound MD 26 through/right-turn lane** from Ridge/Oklahoma Road to Eldersburg Crossing (east of the MD 32).
- **Converting the eastbound MD 26 right-turn lane** to a continuous through/right lane from Eldersburg Crossing (east of the MD 32) to Ridge/Oklahoma Road.

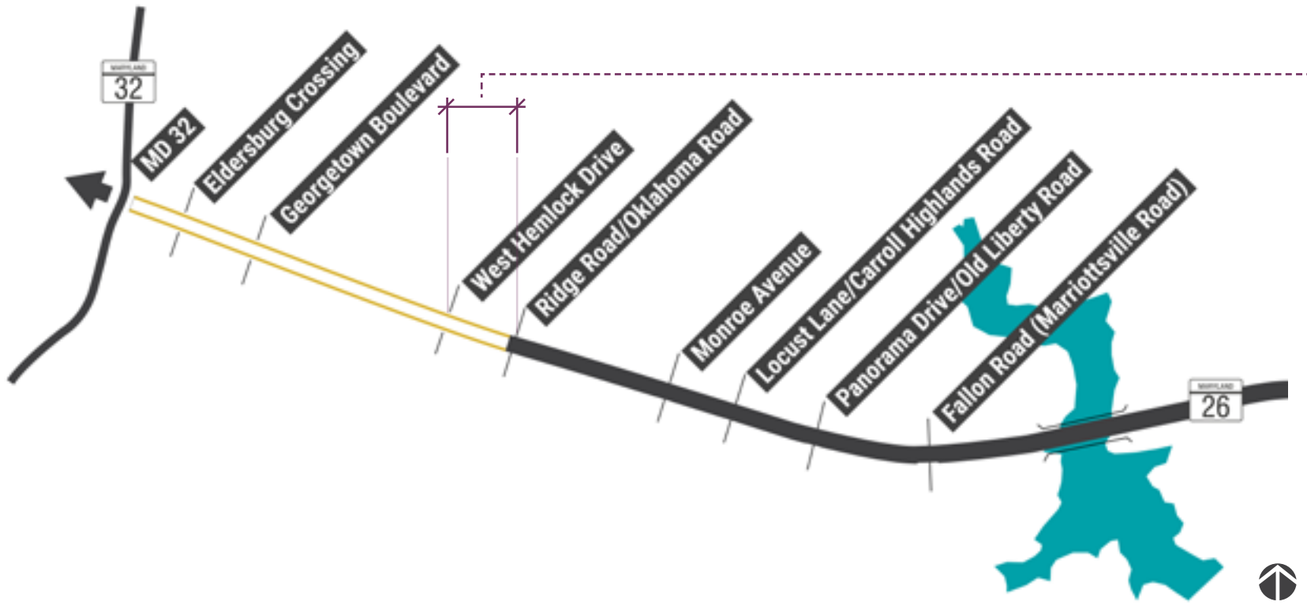


FIGURE 18. Location of Auxiliary Lanes Improvements

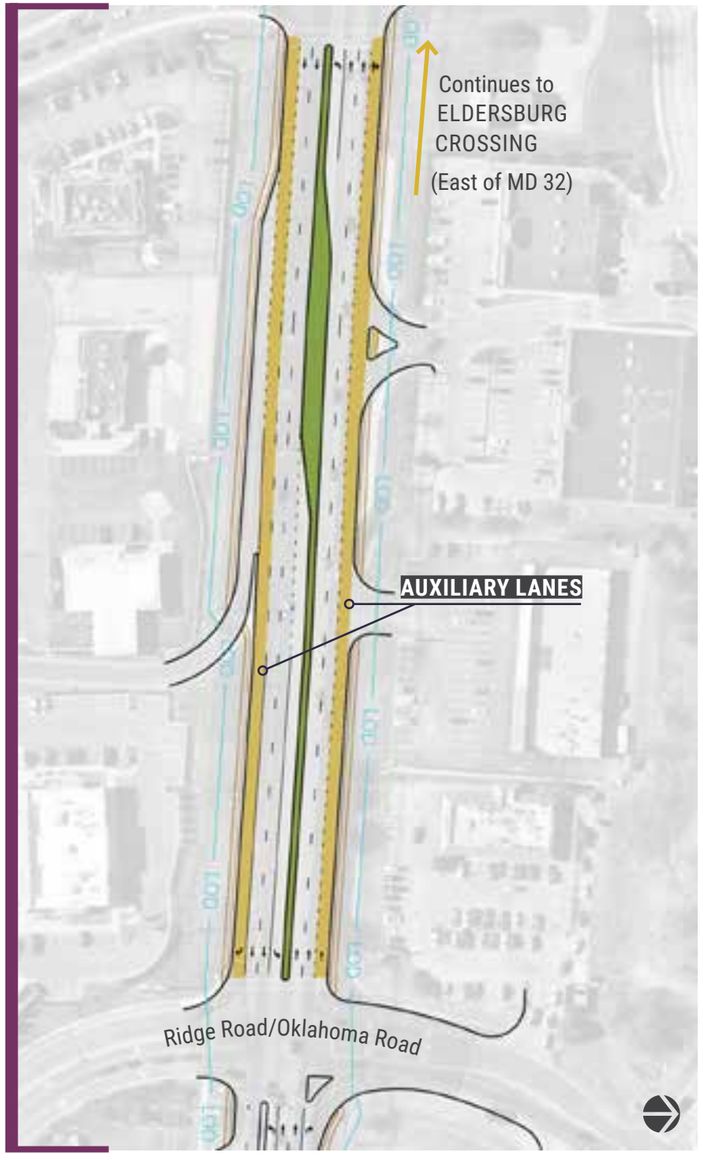


FIGURE 19. Detail of Auxiliary Lane Near Ridge Road/Oklahoma Road

B2 | Intersection Improvements

Forecasted traffic flows for 2040 indicate failing conditions at the MD 26 intersections with MD 32, Georgetown Boulevard, and Ridge/Oklahoma Road. Intersection improvements proposed at these locations are discussed below. These preliminary concepts, based on updated traffic analysis, provide a future vision of MD 26 to Carroll County staff to guide potential developer, state, and county improvements in the future. Additional study of these intersections will be required to refine future improvements along the corridor through the formal MDOT SHA planning and design process.

MD 26 at MD 32

Recommendations: A third westbound MD 26 left-turn lane is added with downstream widening, and a second northbound MD 32 right-turn lane is recommended, along with overlap phasing concurrent with the westbound left-turn phase, to mitigate 2040 forecasted failing intersection conditions (Figure 20).

Benefit: With these improvements, intersection LOS improves from LOS E (58 seconds of delay) to LOS D (43 seconds) during the morning peak hour. While LOS remains at an 'F' during the evening peak hour, intersection delay improves from 132 seconds to 82 seconds, close to the LOS E/F threshold of 80 seconds. During the evening peak hour, the westbound left-turn delay is improved from LOS F (179 seconds) to LOS D (51 seconds), and the northbound right-turn delay is improved from LOS F (360 seconds of delay) to LOS C (124 seconds of delay).

MD 26 at Georgetown Boulevard

Recommendations: Converting the existing eastbound right-turn-only lane into a right/through lane that would extend from Eldersburg Crossing to Homeland Drive is recommended. Additionally, the westbound through lane recommended from Ridge/Oklahoma Road to the Eldersburg Crossing is proposed to extend through this intersection (Figure 21).

Benefit: With these improvements, intersection LOS improves from LOS F (132 seconds of delay) to LOS E (67 seconds) during the evening peak hour. During the evening peak hour, the eastbound approach improves from LOS F (105 seconds) to LOS C (32 seconds) and the westbound approach improves from LOS F (132 seconds) to LOS D (42 seconds). Improvements during the morning peak hour are minimal as the intersection is already projected to operate at LOS C during this hour.

MD 26 at Ridge/Oklahoma Road

Recommendations: A dedicated westbound right-turn lane is recommended at this intersection to mitigate 2040 forecasted traffic operations. To avoid impacts to driveways, this lane is recommended to be less than 300 feet in length (Figure 22).

Benefit: With this improvement, intersection LOS is unchanged at LOS D during the morning peak hour and LOS F during the evening peak hour, but intersection delay improves during the evening peak hour from 102 seconds of delay to 80.2 seconds, just above the LOS E/F threshold of 80 seconds. During the evening peak hour, westbound LOS improves from LOS F (140 seconds) to LOS E (79 seconds).

MD 26 @ MD 32

FIGURE 20. Intersection Improvements at MD 26 and MD 32

While these recommendations address future needs identified in this study, please note additional study will be required to refine recommendations for additional auxiliary lanes at this intersection

MD 26 @ Georgetown Boulevard

FIGURE 21. Intersection Improvements at MD 26 and Georgetown Boulevard

MD 26 @ Oklahoma/Ridge Road

FIGURE 22. Intersection Improvements at MD 26 and Ridge Road/ Oklahoma Road

C - REVISED TYPICAL SECTION STRATEGIES

To improve the feasibility of strategies identified in this report, the planning team reviewed the typical sections identified in the 2002 Study and identified revisions that economically satisfy future corridor needs and reduce right-of-way impacts. In addition, an evaluation of the 2002 typical section facilitates the development review process, until such a time that additional through capacity is needed.

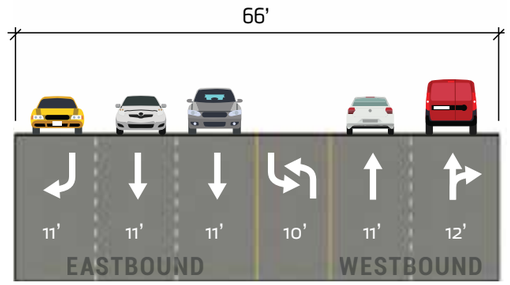
A comparison of the 2002 recommendations with the recommendations of this study (Figure 23) follows to illustrate a proposed reduction in right-of-way impacts and needed capacity improvements.

The 2002 Study typical section is 130 feet wide and includes:

- An 18-foot median, MD 32 to Locust Lane
- 11-foot-wide and 12-foot-wide thru lanes for the outside and inside lanes, respectively
- A third 15-foot eastbound thru lane between MD 32 and Locust Lane
- A 15-foot westbound thru lane between Locust Lane and Georgetown Boulevard
- An 8-foot shared-use path and a 10-foot shoulder between Eldersburg Crossing and Locust Lane
- A 10-foot shoulder, from Locust Lane to Carroll Highlands Road

The recommended typical section varies between 93 feet and 114 feet, depending on the number of auxiliary lanes in specific segments, and includes:

- A 3-foot to 14-foot median from MD 32 to Ridge/Oklahoma Road, with 6 feet typical between intersections
- 11-foot-wide thru lanes for inside and outside lanes
- A third 13-foot eastbound thru lane between Eldersburg Crossing and East Hemlock Drive
- A 12-foot westbound thru lane from Ridge/Oklahoma Road to Eldersburg Crossing
- A 5-footwide sidewalk and a 3-foot buffer from MD 32 to Panorama Drive



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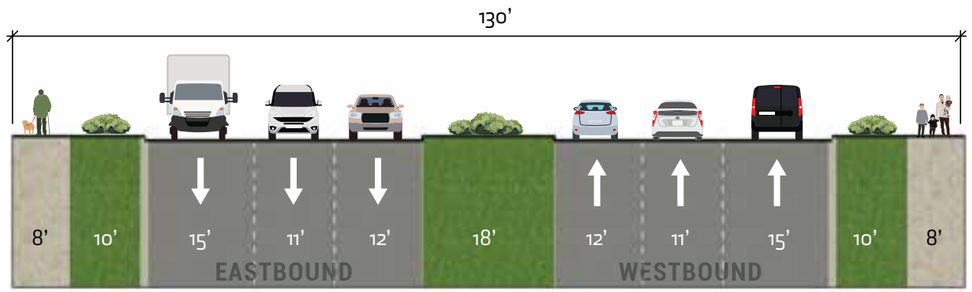

2002 STUDY

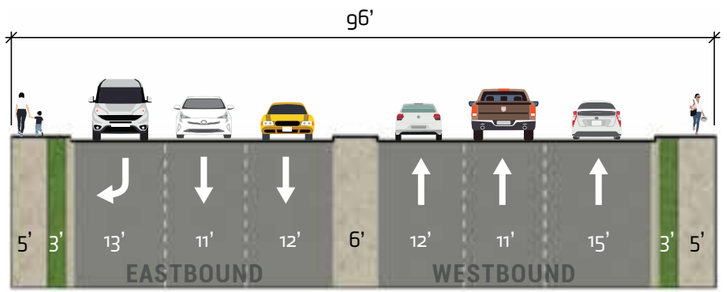

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FIGURE 23. MD 26, Hemlock to Georgetown, Comparison of MD 26 Typical Section

MD 26 Conclusions

The strategies included in this report are divided into three targeted improvement categories—***Safety and Operations***, ***Future Capacity***, and ***Revised Typical Sections***. These strategies are aligned with the updated corridor needs. The safety and operational recommendations address the existing prevalent crash patterns, reduce the frequency of left turns in the commercial core, and improve operational issues at key intersections in the corridor. The future capacity recommendations reflect an updated analysis and a County objective to minimize the right-of-way impacts of long-term capacity improvements in the MD 26 corridor between MD 32 and the Liberty Reservoir. This toolkit enables Carroll County to be confident in a future vision and effectively guide development towards that vision. These strategies, estimated at a total cost of $41 million, can be implemented as opportunities arise and specific improvements can be ranked to reflect County priorities. Table 10 presents a consolidated review of the recommendations and estimated costs.

TABLE 10. Recommendation Costs

Improvement Description	Costs (in millions)	Improvement Notes	Rec. Overlap
Corridor Improvements:			
Construct a center raised median, MD 32 to Ridge/Oklahoma Road	$16	Replace existing two-way center left-turn lanes; assumes approximately 6 feet base widening; includes sidewalk not included in other improvements	A1
Add third westbound MD 26 thru lane, Ridge/Oklahoma Road to Eldersburg Crossing	$13	Construct sidewalk along westbound MD 26 within limits; significant right-of-way impacts	B1
Construct sidewalk between Ridge/Oklahoma Road & Panorama Drive	$2	Could be built by developers where appropriate	A2
Add westbound right-turn-only lane at Ridge/Oklahoma Road	$2	Approximately 300 feet long to avoid driveway impacts; includes sidewalk along westbound MD 26	A4
Intersection Improvements:			
Need for auxiliary lanes along MD 26 at MD 32 was identified; to be refined through additional study as recommended below	TBD	The need for sidewalk along MD 26 from MD 32 to Carroll Bank was identified to fill an existing gap, to inform recommended sidewalk study below	A4, B2
Need for auxiliary lanes along MD 32 at MD 26 was identified; to be refined through additional study as recommended below	TBD	The need for sidewalk along westbound MD 26 was identified, to inform recommended sidewalk study below	A4, B2
Convert eastbound MD 26 right-turn-only lane to a thru-right lane at Georgetown Boulevard	$6	Extend lane back to Eldersburg Crossing and east to Homeland Drive; almost entirely within existing right-of-way; allows conversion of right-turn-only lane at Eldersburg Crossing to a thru-right lane; includes sidewalk from Carroll Bank to Georgetown Boulevard	A4, B2
Recommended Studies:			
Complete an Access Management Plan	$0.5	Evaluate consolidated access to corridor commercial centers and develop strategies for incremental installation of median	A1
Complete a Sidewalk Feasibility Study	$0.5	Inventory existing facilities; identify gaps and needed upgrades for system preservation and ADA compliance; and develop an implementation plan	A2
MD 26 at MD 32 Intersection Detailed Study	$1	Evaluate intersection operations and possible improvements; review analysis included in the 2018 MD 32 Planning Study and this updated 2002 MD 26 Corridor Planning Study report	A4
Signal Improvements:			
Traffic Signal at Carroll Highlands Road/Locust Lane	developer funded	To be evaluated as part of future development plans	A3
Traffic Signal at Panorama Drive	developer funded	To be evaluated as part of future development plans	A3
Traffic Signal at Fallon Road	developer funded	To be evaluated as part of future development plans	A3
Total Improvement Costs	**$41**		

MD 26 RECOMMENDATION PLAN SHEETS

The following graphics illustrate the MDOT SHA and Carroll County Planning Department updated recommendations for improvements along the MD 26 corridor, discussed on the preceding pages.

Four map sheets (pages 30 to 33) span the segment of MD 26 west of Ridge/Oklahoma Road, as shown in its entirety in Figure 24, below. The 2002 Study's proposed roadway section improvements, mapped below (Figure 25) and at the right (Figures 26-29) are revised to economically satisfy future corridor needs while reducing right-of-way impacts.

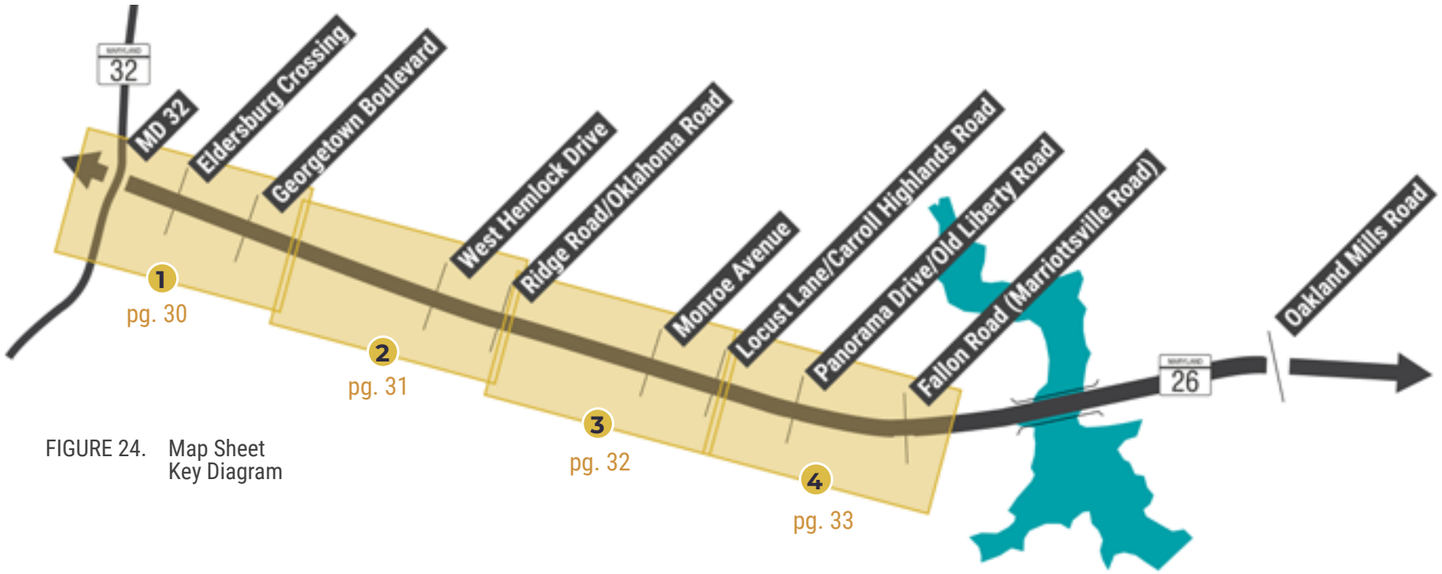
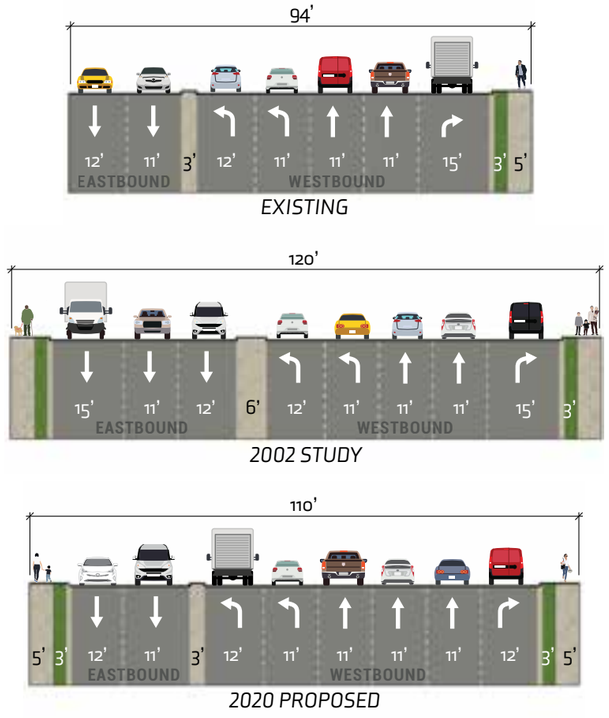


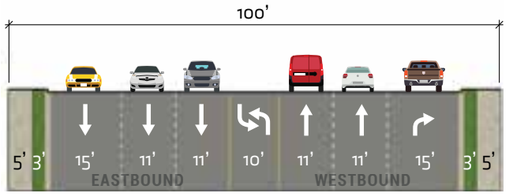
FIGURE 24. Map Sheet Key Diagram



MD 26 @ MD 32

FIGURE 26. Section 1-A

FIGURE 25. Map Location of Roadway Section Improvements



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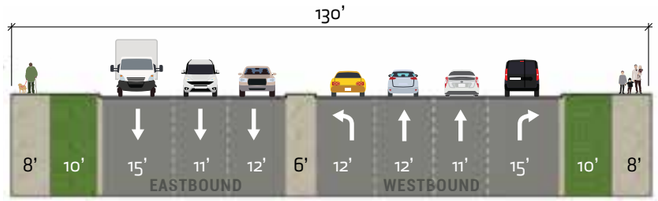

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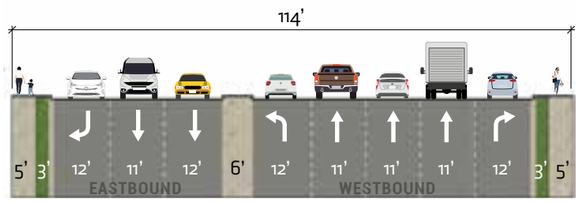

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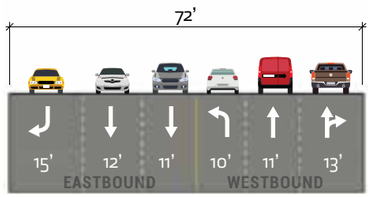
MD 26 @ Georgetown Boulevard

FIGURE 27. Section 1-B



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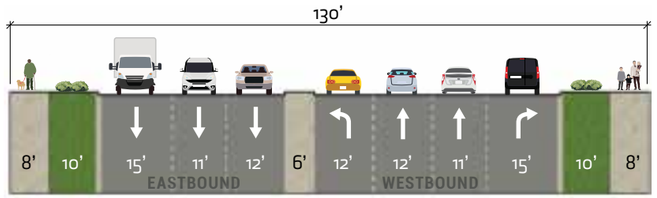

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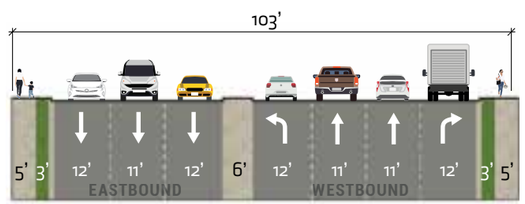

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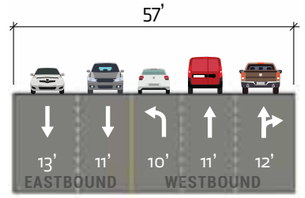
MD 26 @ W. Hemlock Road

FIGURE 28. Section 2-A



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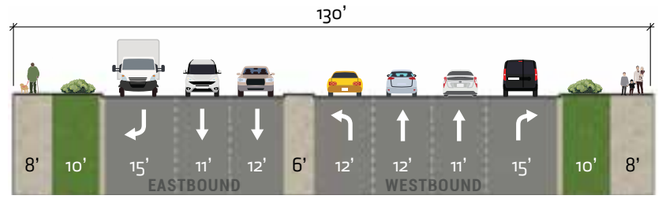

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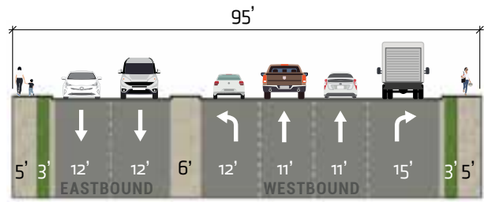

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MD 26 @ Oklahoma/Ridge Road

FIGURE 29. Section 2-B

FIGURE 30. **MD 26 from MD 32 to Georgetown Boulevard**
Sheet 1 of 4

PROPOSED ROADWAY
PROPOSED SIDEWALK
TYPICAL SECTION LOCATION
PROPOSED MEDIAN
PROPOSED LANE IMPROVEMENTS
LOD LIMIT OF DISTURBANCE

FIGURE 31. **MD 26 from Georgetown Boulevard to Ridge/Oklahoma Road**
Sheet 2 of 4

PROPOSED ROADWAY
PROPOSED MEDIAN
PROPOSED SIDEWALK
PROPOSED LANE IMPROVEMENTS
TYPICAL SECTION LOCATION
LOD LIMIT OF DISTURBANCE

FIGURE 32. **MD 26 Improvements from Ridge/Oklahoma Road to Locust Lane/Caroll Highlands Road**
Sheet 3 of 4

PROPOSED ROADWAY
PROPOSED MEDIAN
PROPOSED SIDEWALK
PROPOSED LANE IMPROVEMENTS
TYPICAL SECTION LOCATION
LOD LIMIT OF DISTURBANCE

FIGURE 33. **MD 26 Improvements from Locust Lane/Caroll Highlands Road to Fallon Road**
Sheet 4 of 4

PROPOSED ROADWAY
PROPOSED MEDIAN
PROPOSED SIDEWALK
PROPOSED LANE IMPROVEMENTS
TYPICAL SECTION LOCATION
LOD LIMIT OF DISTURBANCE