

### **3. TRANSPORTATION COMPARISON OF THE ALTERNATIVES**

Section 3 evaluates each alternative's transportation advantages and its ability to achieve the project's purpose and need. This section compares the alternatives in terms of their transportation effectiveness only. Other factors used in the evaluation of the alternative such as , social and economic effects, environmental impacts, cultural resource impacts, cost and the comments of the affected public, resource agencies, and elected officials are provided in Sections 4-9.

#### **3.1 The MD 355/ I-270 Technology Corridor**

To understand the effectiveness of each alternative in meeting the Purpose and Need for the project, it is helpful to have an understanding of the economic importance of the MD 355/ I-270 Technology Corridor to Montgomery County.

The MD 355/I-270 Technology Corridor accounts for 60% of the County's jobs, 73% of the County's industrial acreage, 81% of its office space, and 56% of its retail sales. Between 1998 and 2004, the corridor added new business establishments at double the pace of the rest of the County. More than 300,000 people work in the corridor's 18,000+ businesses. The corridor also provides a significant portion of the County's remaining development capacity; 72% of the County's future residential development and 83% of future jobs. Today, the MD 355/I-270 Technology Corridor includes a wide variety of centers that serve separate and often unique roles. These centers include clusters of bioscience, advanced technology industries, education, residential, central business districts, and corridor cities. M-NCPPC's plan for the MD 355 corridor is to create a coordinated system of distinct centers which, based on the role, location, land use, and amount of development, will create communities with unique character and economic position throughout the MD 355/I-270 Technology Corridor. MD 355 would retain its role as "main street."

The plan for the MD 355/I-270 Technology Corridor also calls for clustering future development into compact, mixed-use centers near federal agencies and higher education facilities to increase job creation and innovation, and foster collaboration. Improvements in operations and mobility along MD 355 would contribute to the interaction between centers. The plan includes increasing the balance between housing and employment. Within each center, there will be a focus on community design with attention to livability, character, and varied open spaces that will encourage people to reside near their place of employment. This will foster the goal of reducing travel distance, conserving energy, and reducing emissions. Transit-oriented development is a cornerstone of the county planning effort to encourage transit usage, and MCDOT's role in that effort is to improve vehicular, pedestrian, and bicycle access to Metro stations, MARC stations, and bus stops. The vision also calls for



building bikeways along MD 355 and extending to stream valley parks and other bikeways to provide a fully connected system.

Montgomery County's economic niche is in the research and development of prototypes of bioscience. The Technology Corridor is well positioned to remain internationally competitive in the basic and more advanced sectors of the knowledge-based economy, but must keep pace with the competitive advantages being offered by California, Massachusetts, New Jersey, North Carolina, and Pennsylvania, which all have at least a 30 percent greater concentration than the national average in bioscience industry jobs. With a mere 7 percent higher level of bioscience industry job concentration than the national average, Maryland has work ahead of it to achieve specialization in the overall bioscience industry.

The bioscience industry is promoted by the State of Maryland through the following: (1) tax subsidies to early-stage bioscience ventures, (2) a State venture capital fund (the Maryland Venture Fund) of which 40 percent goes to bioscience companies, (3) a Maryland Stem Cell Research Commission, and (4) the Maryland Industrial Partnership which accelerates the commercialization of technology by funding collaborative R&D projects between companies and universities. The State's *BioMaryland 2020* plan released in May 2009 calls for significant expansion of assistance to the bioscience R&D companies to convert their discoveries into marketable products. These initiatives include the following:

- Establishment of the Maryland Biotechnology Center to bring a statewide focus to the bioscience industry in Maryland;
- Establishment of the Bioentrepreneur Resource Program to provide state funding, facilitate private investment, assist with permitting, access to intellectual property resources, and other assistance to emerging companies;
- Development of bioscience infrastructure such as incubators, research parks, and multi-tenant commercial facilities;
- Creation of the Maryland Bioscience Product Development Loan Fund to help bioscience companies progress from seed stage through product development to commercialization.
- Expansion of the Maryland Biotechnology Investment Tax Credit to encourage investment in Maryland bioscience companies;
- Expansion of the R&D tax credit to bioscience companies with fewer than 50 employees;
- Establishment of the Maryland Life Sciences Venture Capital Trust to create a vehicle for pension funds to invest in life sciences companies in Maryland;
- Expansion of the Maryland Industrial Partnership program;
- Promoting investment in emerging fields of bioscience R&D such as stem cell research and bio-nanotechnology; and

- Funding the expansion of university laboratories necessary for their researchers to compete for federal grants for bioscience R&D.

As recently as March 2012, Maryland raised \$84 million through an auction of premium tax credits to insurance companies operating in Maryland. This money will be made available to start-up companies under the authority of “Invest Maryland” – an initiative passed by the General Assembly in 2011.

In 2010, Montgomery County created its own investment tax credit for bioscience companies. In addition, the Montgomery County Technology Growth Program provides grants for emerging technology-based companies. The Montgomery County Office of Economic Development has constructed five Innovation Centers to provide office, lab space, and business support services to emerging life sciences/advanced technology companies. The Germantown Innovation Center, which was opened in 2008 adjacent to the Montgomery College’s Germantown Campus, provides 32,000 square feet of floor space to accommodate 20 to 30 emerging companies. Montgomery County is also being assisted by BioHealth Innovation, Inc. a regional nonprofit that assists start-up companies in obtaining capital to bridge the gap from R&D to production, marketing, distribution, and sales.

The bioscience industry in Montgomery County was born out of the federal research laboratories at the National Institutes of Health, the Food and Drug Administration, the federal government-operated Uniformed Services University of Health Sciences, and the National Institute of Standards and Technology. The founders of The Institute for Genomic Research, Human Genome Sciences, and Celera Genomics came from these facilities. In addition, three education institutions (University of Maryland at Shady Grove, Johns Hopkins University at the Shady Grove Life Sciences Center, and Montgomery College) provide industry training and the labor force for bioscience companies. Among corridor residents ages 25 and older, 66% are college graduates, and 37% have advanced degrees.

The cornerstone of the bioscience industry in Montgomery County is the Shady Grove Life Sciences Center, which includes the Shady Grove Adventist Hospital, Johns Hopkins University, the Universities at Shady Grove (part of the University of Maryland), a planned complex for the National Cancer Institute, and 50 of the County’s nearly 300 bioscience companies. In June 2010, the Life Sciences Center had nearly 7 million square feet of commercial development and 3.7 million additional square feet of approved development not yet constructed. To the west of Shady Grove Life Sciences Center is a proposed life sciences development known as Science City, which will include expanded medical, academic, and research facilities complemented by an array of housing, services, and amenities so that researchers can live where they work. This would expand the commercial development in Shady Grove to 17.5 million square feet. Industry leaders such as MedImmune, Human Genome Sciences, United Therapeutics, Qiagen, Otsuka America Pharmaceutical, and

Emergent BioSolutions are developing vaccines, drugs, and diagnostic tests for H1N1 virus, anthrax, hepatitis C, lupus, HPV, and brain cancer. Each of these companies has grown and added new jobs and office space since moving to Montgomery County. Qiagen is completing construction of a 117,000 square foot expansion of their North American headquarters that will result in 90 new jobs.

### **3.2 Expansion of the Technology Corridor within the Project Study Area**

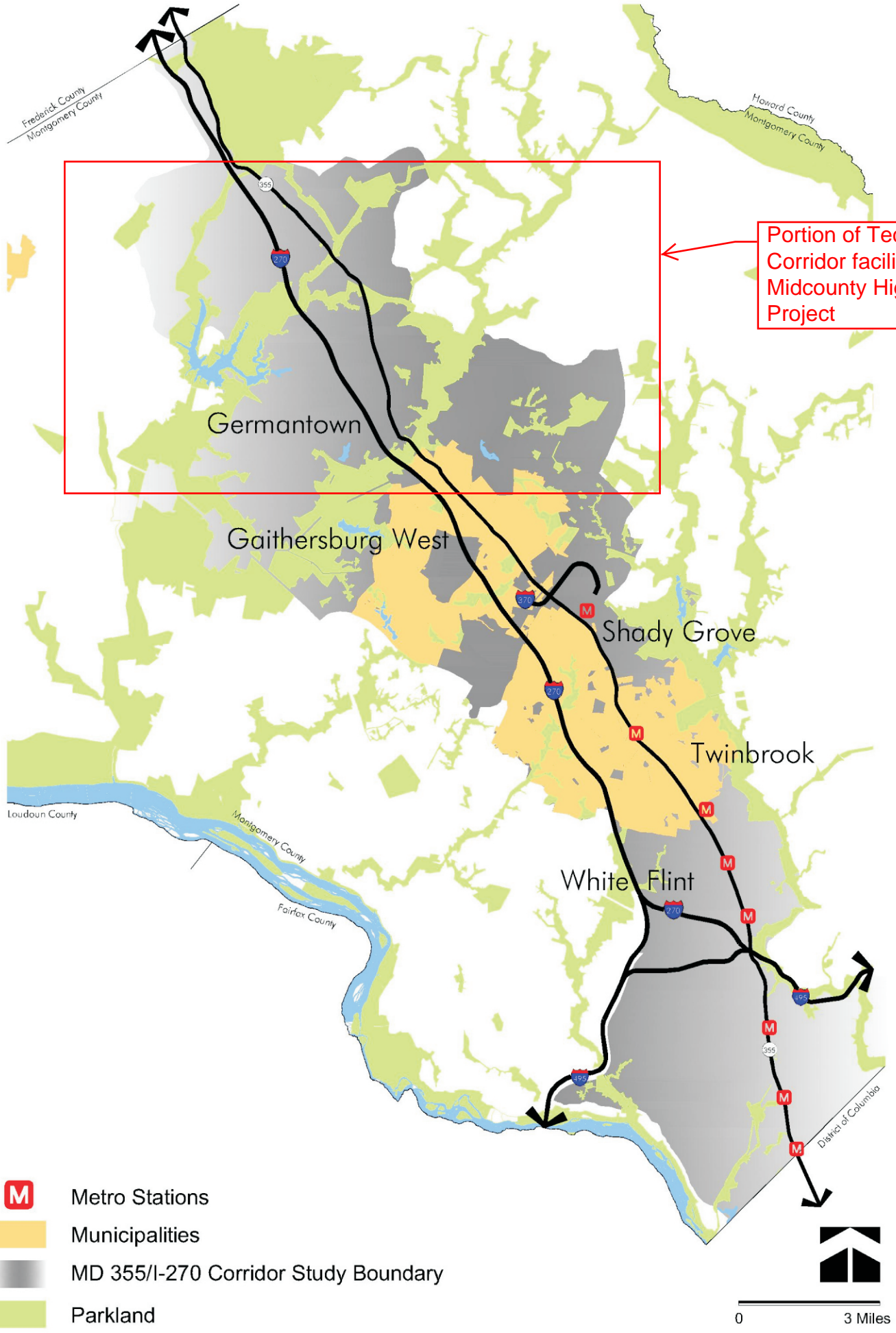
Major employers within the project study area (with their 4<sup>th</sup> quarter fiscal year 2011 employment figures shown in parentheses) include the following: IBM (1,423), Lockheed Martin (4,759), and Kaiser Permanente (2,604), which are all located on MD 355 in Gaithersburg; Montgomery College (3,500) located south of MD 118 and west of MD 355 in Germantown, and Hughes Communications (1,200) located north of Middlebrook Road and east of I-270 in Germantown. Kaiser Permanente has also just completed a new 200,000 square foot medical office building at their location on MD 355, which will further expand their employment figures.

The portion of MD 355 evaluated by this project serves three major growth centers; the corridor cities of Gaithersburg, Germantown, and Clarksburg (see **Figure 3-1**).





Within the City of Gaithersburg, construction has begun on a proposed 200-acre, mixed-use development known as the Watkins Mill Town Center, which is centered around the proposed I-270/Watkins Mill Road interchange. The Town Center will include 1.9 million square feet of office space and high-rise residential and hotel towers with a total of 225,000 square feet of first-floor retail, a 475-unit residential community, and a 40-acre mixed-use urban village (adjacent to MD 355) with a strong emphasis on restaurants and retail.

In Germantown, the Germantown Employment Center will be a comprehensive, connected urban center extending from the MARC Station on the west side of I-270 to MD 355. The October, 2009 Germantown Employment Area Sector Plan proposes 24 million square feet of commercial development with approximately 68,800 jobs and 16,400 housing units. The Employment Area is divided into eight development districts, of which three are adjacent to MD 355; the Seneca Meadows/Milestone District, the Montgomery College District, and the Fox Chapel District. The Seneca Meadows Corporate Center is under development, and will include more than 1.6 million square feet of office and retail space when completed. A new 162,000 square foot office and manufacturing facility is currently under construction in the Milestone Business Park for Digital Receiver Technology, a subsidiary of Boeing. The Milestone Regional Shopping Center will be expanded westward to Observation Drive. The Montgomery College District, south of MD 118, will expand the existing academic facilities to 1.1 million square feet and provide up to 1 million square feet for the Montgomery College Life Sciences Park, which will be anchored by the 237,000 square foot Holy Cross Germantown Hospital currently under construction. Montgomery College recently completed

Figure 3-1



Portion of Technology Corridor facilitated by Midcounty Highway Project

-  Metro Stations
-  Municipalities
-  MD 355/I-270 Corridor Study Boundary
-  Parkland

0 3 Miles

a 130,000 square foot Bioscience Education Center. The Fox Chapel District will become the commercial hub straddling MD 355 south of the MD 355/Middlebrook Road intersection. The 2009 Germantown Employment Sector Plan calls for higher density development around the transit stations of the future Corridor Cities Transitway. This area is intended to provide an employment pattern that is supportive of I-270 as a high-technology corridor.

In Clarksburg, another 9 million square feet of commercial space and almost 10,000 additional residences are planned at build-out. A Town Center District is proposed which is zoned for mixed-use development. This District would include transit and pedestrian-oriented neighborhoods centered around a Corridor Cities Transitway station. Adjacent to I-270, Gateway 270, an office park approved for one million square feet of floor space, is the major employment center. Immediately west of I-270 are 175 acres zoned for mixed use. This area is intended to provide an employment pattern that is supportive of I-270 as a high-technology corridor. Clarksburg's 571 acres of industrial zoned (I-3) land are attractive to bioscience and other R&D developers.

### **3.3 Planned Development and Transportation**

In Montgomery County, development levels are established by M-NCPPC during the process of updating each Area Master Plan or Sector Plan. Land use and transportation are balanced by undertaking a area-wide transportation analysis called Transportation Policy Area Review (TPAR). Key inputs to this process are (1) the master plan-recommended land use densities and the master plan-recommended transportation network, and (2) the Metropolitan Washington Council of Government's latest adopted regional Cooperative Land Use Forecast and Constrained Long Range Plan (CLRP). The second part of the analysis is a Local Area Transportation Review (LATR) analysis of the intersections in the planning area. The traffic volumes established by the area-wide transportation analysis are added to the local trips generated by the proposed development. These trips are then assigned to a sub-area transportation network, and the level of intersection congestion is determined using the Critical Lane Volume (CLV) method. Each planning area has an intersection congestion standard which must be satisfied.

The Germantown Master Plan (July 1989) and the Gaithersburg Vicinity Master Plan (July 1990) include the Midcounty Highway Master Plan alignment as part of the proposed transportation network which would be needed to balance the land use proposed for these two planning areas. In both master plans, the Midcounty Highway is proposed as a major highway with four lanes of capacity. In addition, the Clarksburg Master Plan (June 1994) shows the extension of Midcounty Highway (i.e., Snowden Farm Parkway) as part of the proposed transportation network. The recently completed Germantown Employment Area Sector Plan (October 2009) includes both Midcounty Highway and the Corridor Cities Transitway as elements of the proposed transportation network.

As stated in the Germantown Master Plan, “Each roadway provides a necessary transportation link in the network and, therefore, the construction of each is essential to the implementation of this Plan. The road alignments and the number of lanes recommended in this Plan are intended to provide adequate capacity for the end-state development.” Because the M-NCPPC land use assumptions are balanced by the capacity of the transportation network, any reduction in the 22.3 lane miles of new highway capacity that would be provided by the Master Plan Midcounty Highway would necessitate either the provision of alternative transportation facilities or a down-sizing of land use densities.

### **3.4 Ability to Satisfy the Purpose and Need**

Each of the Build Alternatives has been evaluated in terms of its ability to satisfy the seven elements of the project’s Purpose and Need Statement. The seven elements are as follows:

1. Reduce existing and future congestion
2. Improve vehicular safety
3. Enhance network efficiency and connections between economic centers
4. Accommodate planned land use and future growth
5. Facilitate and provide bicycle and pedestrian travel connections
6. Enhance homeland security
7. Improve Quality of Life

Although Environmental Sensitivity, was not one of the needs formally approved in the January, 2007 Purpose and Need Statement, it has been an underlying objective as the alternatives were being developed. Therefore, the efforts undertaken to avoid and minimize environmental impacts are described below as the eighth element of the Purpose and Need.

#### ***Need No. 1: Reduce Existing and Future Congestion***

Congestion can increase the cost to transport goods and services, affect customer base and market share, disrupt scheduling, increase employee commuting time, increase labor costs, reduce employee satisfaction, reduce traffic safety, and detract from quality of life. Therefore, traffic congestion in the corridor is one of many factors evaluated by the private sector when deciding whether to locate, expand, or relocate to Montgomery County versus other locations in the Washington metropolitan region. Attracting new workers and employment to the Technology Corridor is essential to maintaining the tax base of the County and maintaining a low unemployment rate.<sup>1</sup>

Level-of-service (LOS) is one common measure of congestion. LOS is a measure of how efficiently traffic flows along a roadway segment or through an intersection. LOS is represented by letter grades ranging from A (free-flowing) to F (gridlock).

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<sup>1</sup> The monthly Bureau of Labor Statistics for the last ten years consistently report Howard County and Montgomery County having the lowest monthly unemployment rates in the state.



While there are various methods for calculating level-of-service, Montgomery County’s policy is to use the Critical Lane Volume (CLV) method. The CLV method is a method that sums the highest lane volume of the through-movement plus the opposing left turn volume, for each signal phase, and compares this to a theoretical maximum capacity of 1600 vehicles per hour. Table 3-1 shows the relationship between CLV and LOS.

**Table 3-1: Relationship Between CLV and LOS**

LOS	A	B	C	D	E	F
CLV (vehicles)	≤ 1000	1001-1150	1151-1300	1301-1450	1451-1600	>1600

To evaluate the ability of each alternative to reduce congestion, a traffic analysis of each alternative was initiated in 2011 and completed in 2012 which analyzed LOS at 65 intersections throughout the study area, as well as 8 new intersections which would be created under Alternatives 8 and 9. The traffic analysis used the latest version of the Washington Metropolitan Council of Governments regional travel demand model, Version 2.2, with Round 8.0 land use forecasts to project traffic volumes in year 2030 for the No-Build Alternative and each of the Build Alternatives. In Montgomery County, the M-NCPPC’s Local Area Transportation Review (LATR) Guidelines are used to establish the intersection congestion standards for each of the policy areas, and these are reported in the Annual Growth Policy. In accordance with the 2009-2011 Growth Policy, the policy areas that fall within the project study area all have an intersection congestion standard of 1425, using the CLV method. In the City of Gaithersburg, a CLV of 1450 is considered acceptable. As noted in **Table 3-1** above, a CLV of 1425 corresponds to the low end of the range for LOS D. The No-Build traffic projection (depicted on **Figure 3-2**) shows that 16 of the 65 intersections studied would be at an unacceptable level of congestion by the design year (2030), and 8 of these would be along MD 355.

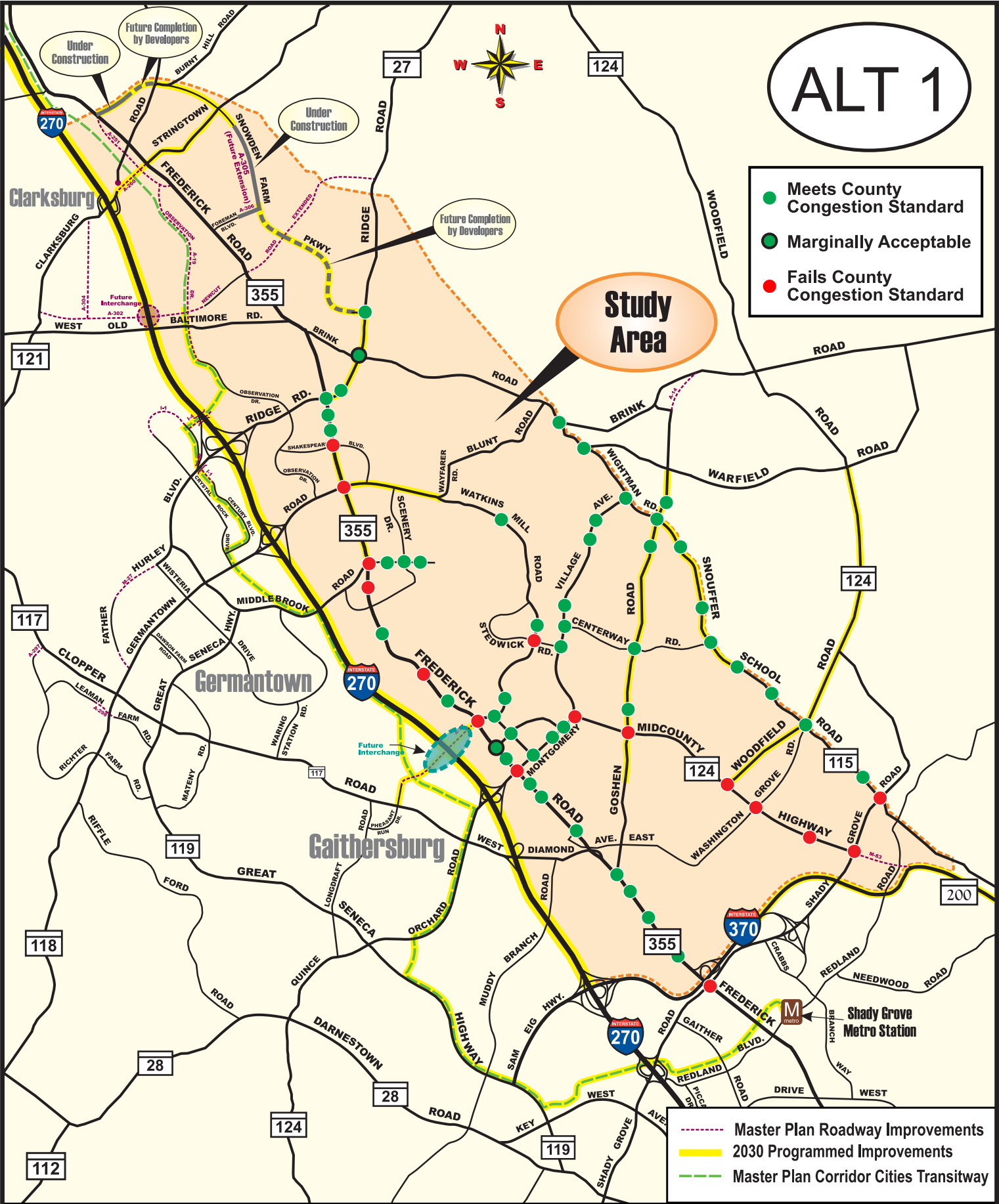
Projections of traffic in the design year (2030) were also prepared for each of the build alternatives. At the intersections along Alternatives 4 Modified, 5, 8, and 9, the number of lanes approaching each intersection was increased until a CLV of 1425 was achieved. In this manner, every alternative was intentionally designed to result in acceptable intersection level-of-service, so that each build alternative would have the best possible chance of satisfying the purpose and need for the project, and all alternatives would be evaluated on a level playing field. Furthermore, designing for an intersection CLV of 1425 is consistent with Montgomery County’s policy for review of proposed development under the LATR Guidelines. Using the CLV method, the results of each build alternative’s effect on intersection congestion at the remaining intersections throughout the study area are portrayed on **Figures 3-3** through **3-7**, and summarized in **Table 3-2**. A green dot indicates the intersection satisfies the County congestion standard in both the AM and PM peak hour. A red dot indicates the intersection fails to meet the County’s congestion standard either in the



# ALT 1

- Meets County Congestion Standard
- Marginally Acceptable
- Fails County Congestion Standard

**Study Area**



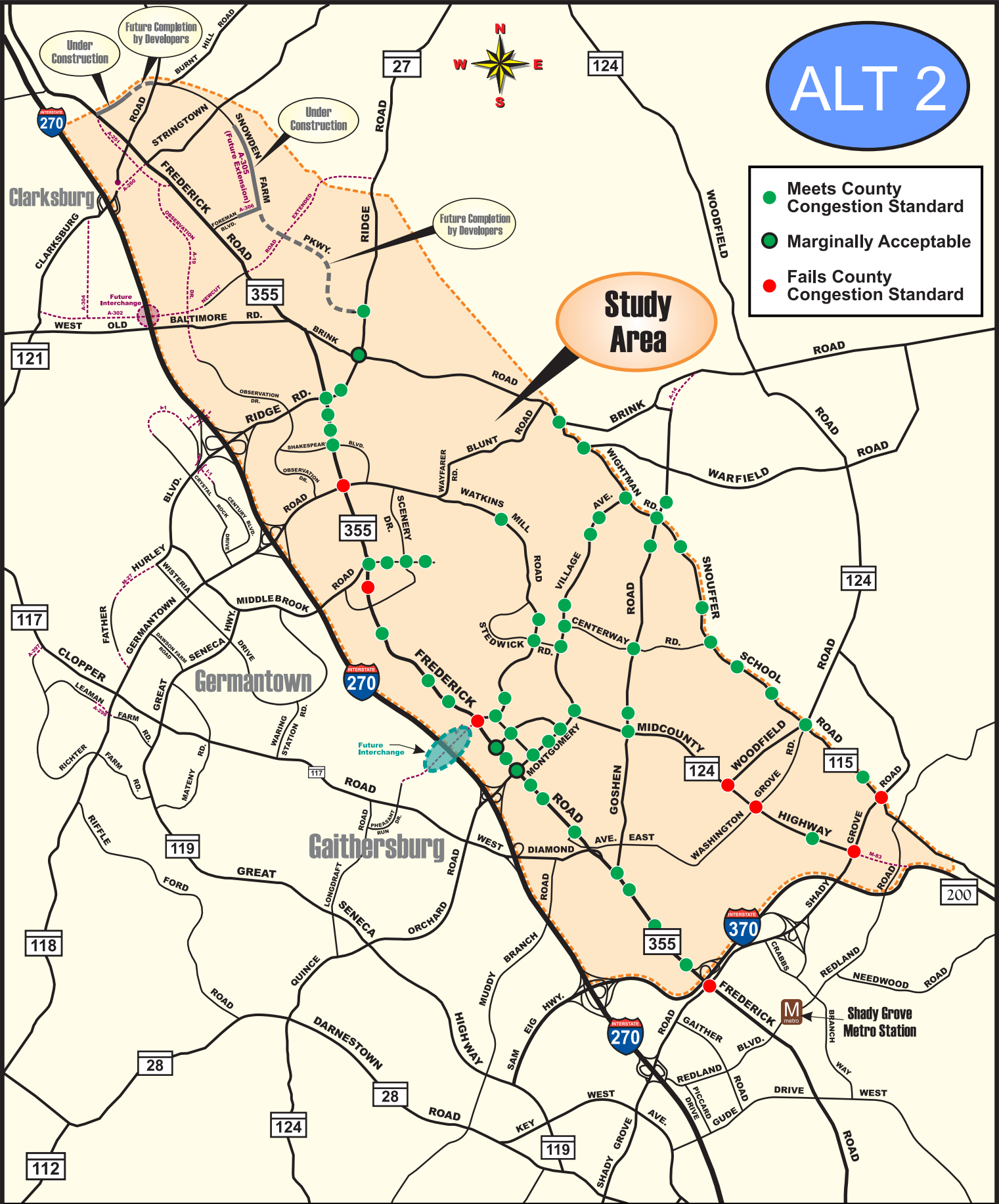
**Intersection Operation (2030)**

**Figure 3-2**

# ALT 2

- Meets County Congestion Standard
- Marginally Acceptable
- Fails County Congestion Standard

**Study Area**



**Intersection Operation (2030)**

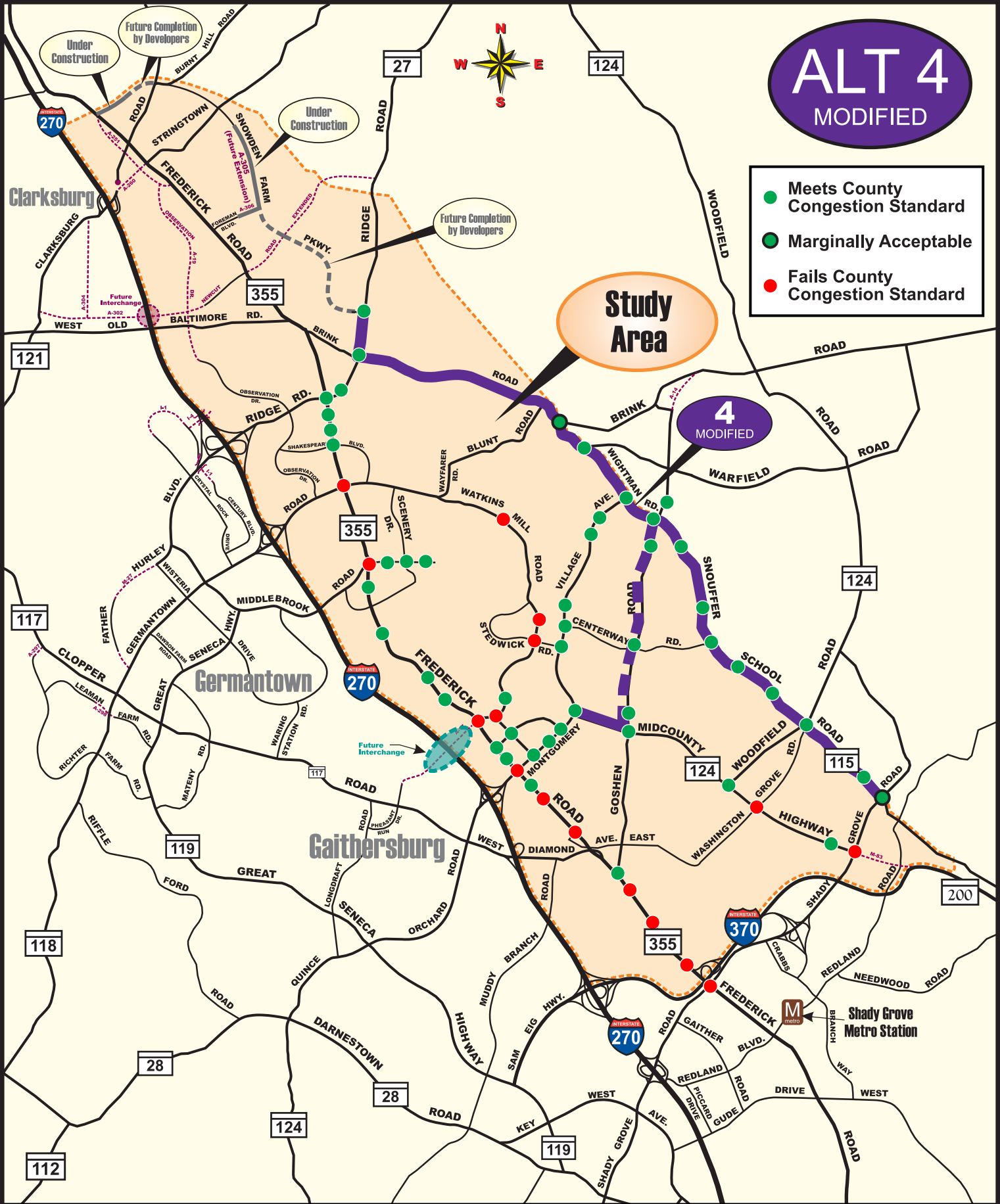
**Figure 3-3**

# ALT 4 MODIFIED

- Meets County Congestion Standard
- Marginally Acceptable
- Fails County Congestion Standard

**Study Area**

**4 MODIFIED**



**Intersection Operation (2030)**

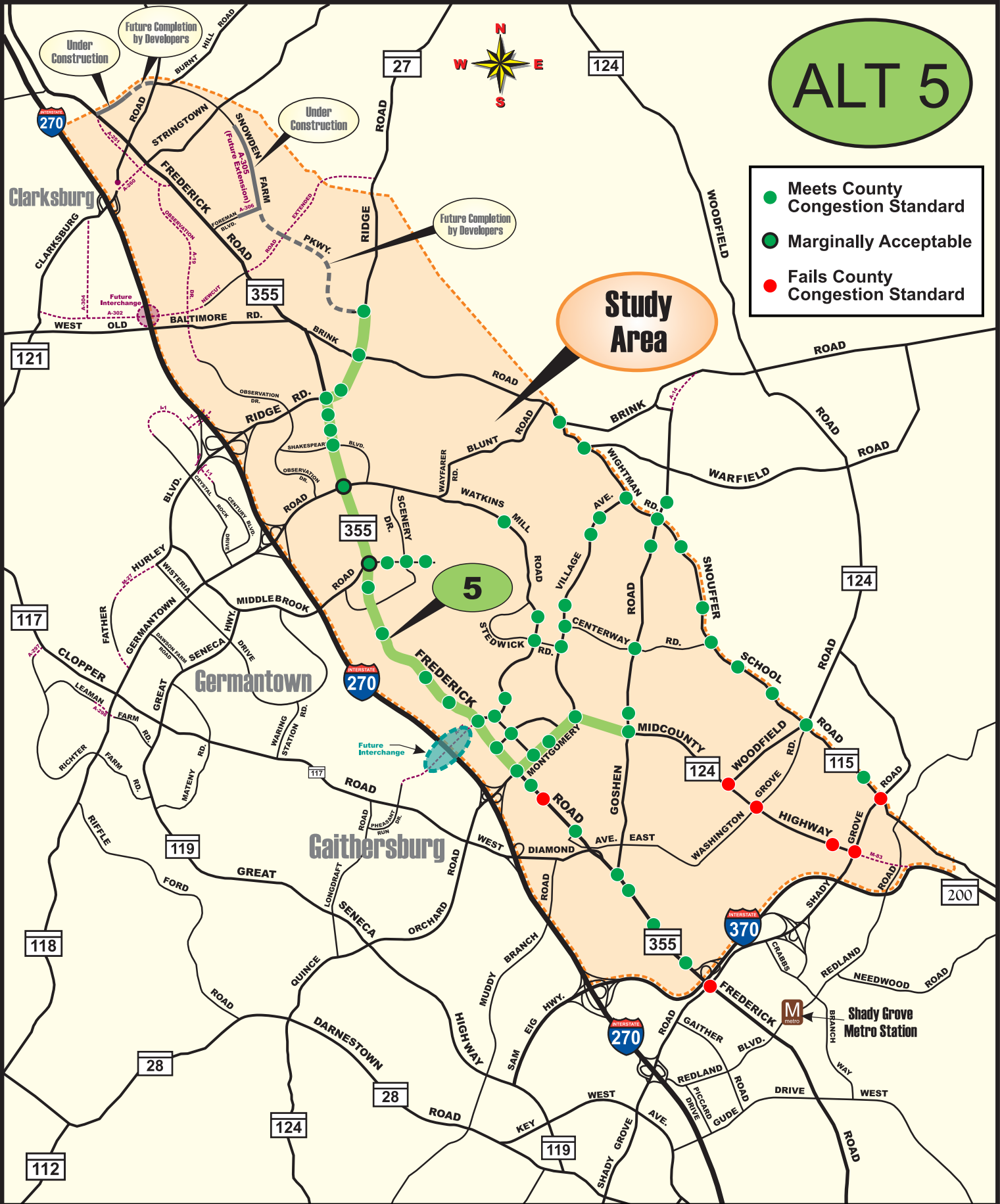
**Figure 3-4**

# ALT 5

- Meets County Congestion Standard
- Marginally Acceptable
- Fails County Congestion Standard

**Study Area**

**5**



**Intersection Operation (2030)**

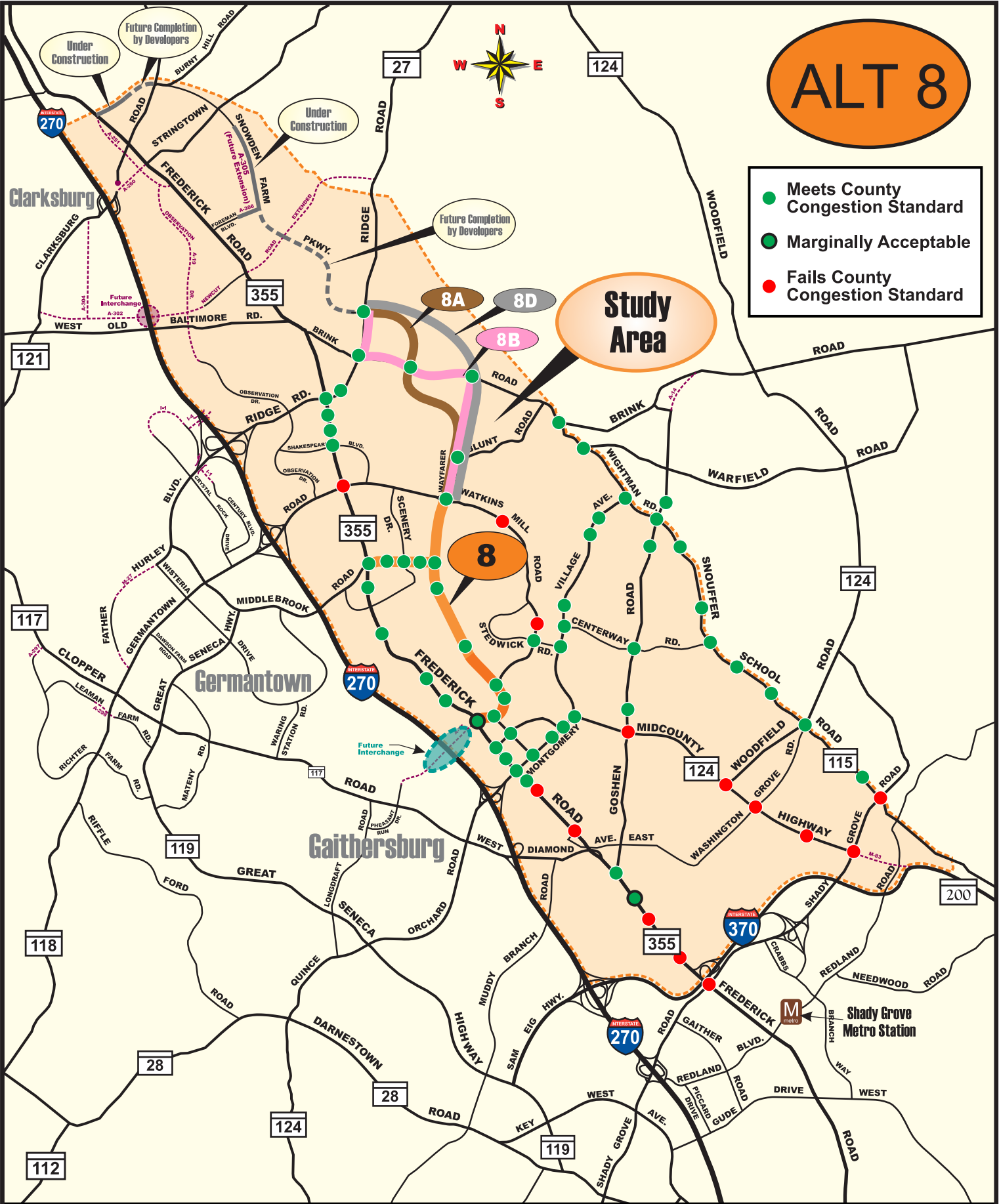
**Figure 3-5**

# ALT 8

- Meets County Congestion Standard
- Marginally Acceptable
- Fails County Congestion Standard

**Study Area**

**8**



**Intersection Operation (2030)**

**Figure 3-6**

# ALT 9

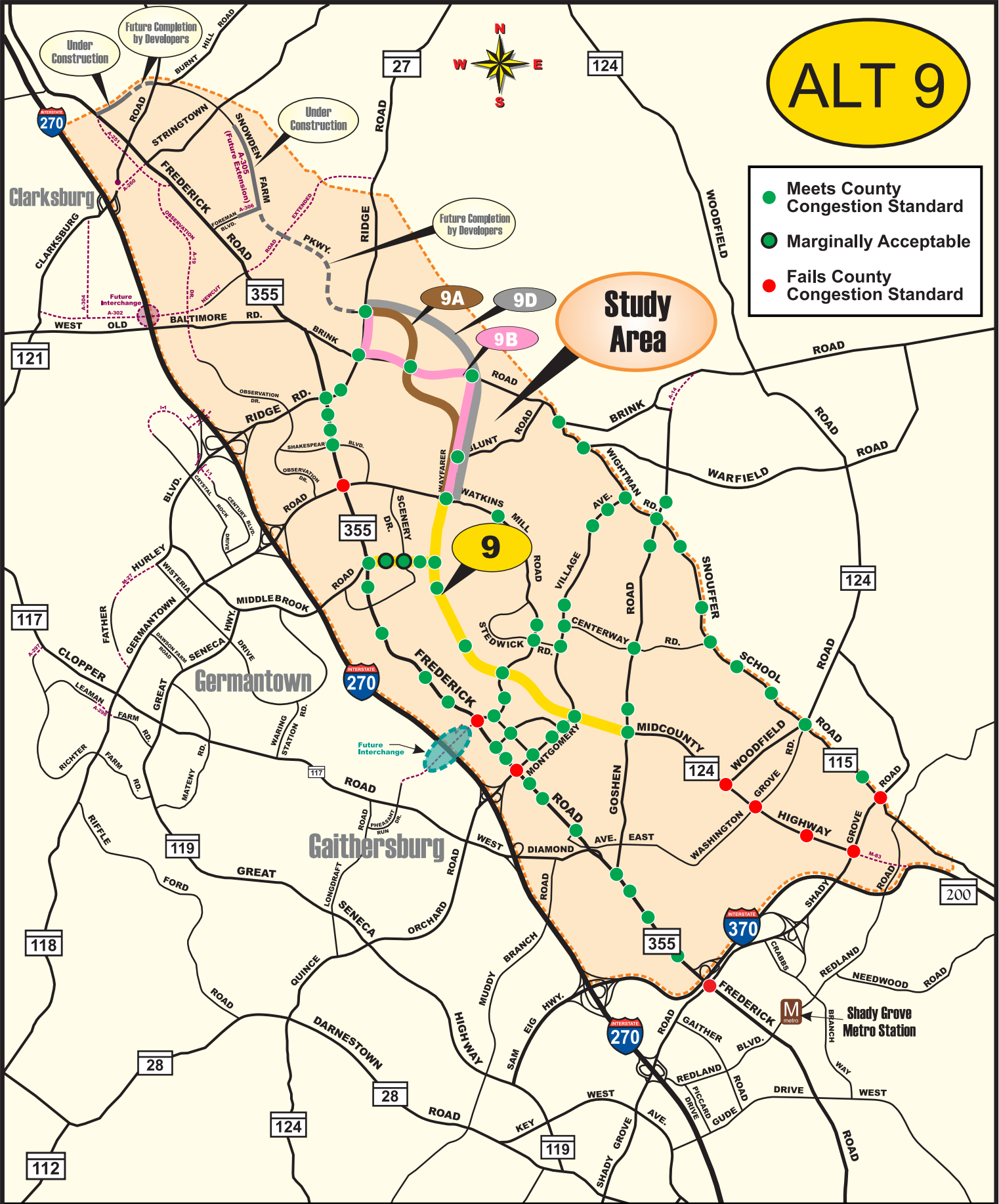
- Meets County Congestion Standard
- Marginally Acceptable
- Fails County Congestion Standard

**Study Area**

**9**

9A 9D

9B



**Intersection Operation (2030)**

**Figure 3-7**



AM peak hour, the PM peak hour, or both. A green dot with a black ring indicates the intersection CLV is slightly over the County’s congestion standard (between 1425 and 1450), but is so close as to not warrant additional intersection widening. The number of intersections that would remain at unacceptable levels of congestion in either the a.m. peak hour, the p.m. peak hour, or both, ranges from seven under Alternative 5 to sixteen under Alternative 4 Modified and the No-Build (see **Table 3-2**).

**Table 3-2: 2030-Build Condition Congestion Analysis**

	Alternative					
	1	2	4 Mod	5	8	9
Intersections Meeting Congestion Standard	46	53	46	54	56	61
Marginally Acceptable	2	3	2	2	2	2
Unacceptable Congestion	16	8	16	7	14	9
Total Number of Intersections	64 <sup>2</sup>	64 <sup>2</sup>	64 <sup>2</sup>	63 <sup>3</sup>	72 <sup>4</sup>	72 <sup>4</sup>
% of Total Intersections with Acceptable Level-of-Service	75	88	75	89	81	88

<sup>2</sup> During the course of the traffic study, the intersection at MD 355/Monument Office Park was closed.

<sup>3</sup> The improvements proposed under Alternative 5 would close the intersection at MD 355/Lockheed Martin South.

<sup>4</sup> Alternatives 8 and 9 and their options would result in eight new intersections.

Some of the intersections reported as having unacceptable congestion in **Table 3-2** are relatively minor in terms of the traffic volumes they would handle. It is recognized that congestion at minor intersections is not going to have as great an impact on traffic flow as congestion at major intersections. Therefore, to further compare effects of intersection congestion, MCDOT evaluated intersection congestion in the design year (2030) at the busiest intersections in the study area, since these serve the greatest volume of traffic and therefore have the greatest impact on traffic flow. These are locations where an arterial highway (such as Frederick Road) intersects another arterial highway (such as Montgomery Village Avenue) or a major collector road (such as Watkins Mill Road). Each major intersection that would be able to satisfy the County congestion standard in the AM peak hour or the PM peak hour is indicated with a check mark on **Table 3-3** below.

The following conclusions about year 2030 congestion can be drawn from **Figures 3-2** through **3-7** and **Tables 3-2** and **3-3**:

- Under Alternative 1, one-fourth (16) of the 65 intersections studied would result in unacceptable intersection operation in 2030, including 8 along MD 355.
- Alternative 2 does a good job of improving intersection operation throughout the study area with only 8 intersections having unacceptable level-of-service.

(Continued on **Page 3-16**)

**Table 3-3: Major Intersections Having Acceptable Operation during Peak Hours**

Major Intersection	Peak Hours with each Alternative											
	1		2		4 Mod		5		8		9	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Frederick Rd. at Mont. Village Ave.			✓	✓			✓	✓	✓	✓	✓	
Frederick Rd. at Watkins Mill Rd.							✓	✓	✓	✓		✓
Frederick Rd. at Middlebrook Rd.			✓	✓		✓	✓	✓	✓	✓	✓	✓
Frederick Rd. at Germantown Rd.							✓	✓				✓
Frederick Rd. at Ridge Rd.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Ridge Rd. at Brink Rd.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Ridge Rd. at Snowden Farm Pkwy.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Muncaster Mill Rd. at Shady Grove Rd			✓		✓	✓			✓			✓
Snouffer Sch. Rd.-Muncaster Rd at Woodfield Rd.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Wightman –Snouffer Sch.Rd. at Goshen Rd.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Wightman Rd. at Mont. Village Ave.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Midcounty Hwy. at Shady Grove Rd.												
Midcounty Hwy. at Goshen Rd.			✓	✓	✓	✓	✓	✓	✓		✓	✓
Midcounty Hwy. at Mont. Village Ave			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Midcounty Hwy. at Watkins Mill Rd.*									✓	✓	✓	✓
Midcounty Hwy. at Middlebrook Rd.*									✓	✓	✓	✓
Midcounty Hwy. at Germantown Rd.*									✓	✓	✓	✓
Midcounty Hwy. at Brink Rd.*									✓	✓	✓	✓
Total Number of Peak Hours of Acceptable Intersection Operation	12		21		19		24		30		30	

\* Proposed intersections.

- **Table 3-2** indicates that Alternative 4 Modified would result in 16 intersections with unacceptable level-of-service in the design year (2030). Ten of these unacceptable intersections are along MD 355.
- **Table 3-2** indicates that Alternative 5 would result in unacceptable intersection operation at only seven intersections throughout the study area, which is fewer unacceptable intersections than with any other build alternative.
- With Alternative 8, Midcounty Highway would terminate at Watkins Mill Road, requiring those who desire to continue along existing Midcounty Highway to use



local roads (Stedwick or Christopher). This truncation has the effect of reducing the diversion of traffic from MD 355 to Alternative 8, and would result in five intersections with unacceptable congestion along MD 355 south of Montgomery Village Avenue (see **Figure 3-6**).

- Alternative 9 is also effective at reducing congestion with only 9 intersections throughout the study area operating at an unacceptable LOS.
- When evaluating traffic operations at the major intersections, both **Table 3-2** and **Table 3-3** indicate that Alternative 4 Modified would be the least effective build alternative in terms of the number of intersections with acceptable operation during peak hours.
- Alternatives 8 and 9 would result in the greatest number of intersections with acceptable operation during peak hours. Furthermore, these two alternatives each add four new major intersections to the highway network that provide east-west connections between Midcounty Highway and I-270, thereby improving connectivity.

### ***Need No. 2: Improve Vehicular Safety***

#### Accident History along Study Area Roads

Crash data obtained from the Maryland State Highway Administration (SHA) for the years 2008-2010 was analyzed for existing highway segments comprising the build alternatives. The data indicates that nearly all of the existing roadway corridors along the build alternative alignments have accident rates higher than the statewide average in more than one category. Key factors contributing to the high rate of accidents are the heavy traffic congestion within the corridor, the lack of access controls (i.e., the high number of entrances, driveways, and intersecting roadways along the corridors), inadequate sight distance along portions of some roads, and conflicts with truck traffic. Research indicates that access controls offer significant benefits in terms of traffic safety and lower crash rates. This is also evident in the statewide average accident rates for the various types of highway facilities. For example, the category of Urban Divided Highways with Four or More Lanes and No Access Control has a statewide average accident rate of 206.9 crashes per 100-million vehicle miles traveled. The category of Urban Divided Highways with Four or More Lanes and Partial Access Control has a statewide average accident rate of 132.6 crashes per 100-million vehicle miles traveled.

#### *MD 355, from Ridge Road (MD 27) to Montgomery Village Avenue (MD 124)*

MD 355 is a four-lane divided highway with auxiliary lanes and turning lanes from MD 27 to Middlebrook Road where the posted speed is 45 MPH. From Middlebrook Road to Montgomery Village Avenue, MD 355 is a six-lane divided highway, with a posted speed of 40 MPH.

The most common type of crash in this highway segment was rear-end (accounting for ~40% of the accidents), followed by angle crashes (15%), left-turn crashes (~10%), sideswipes (~10%), and fixed-object (~10%). Injury and head-on crashes occurred at a rate significantly higher than the statewide average rate for similar type highways. The portion of MD 355 between Watkins Mill Road and Montgomery Village Avenue, which is part of Alternative 5 and Alternative 8, has accident rates that are twice the statewide average for head-on, rear-end, sideswipe, left-turn, and injury-related accidents. Angle crashes, property damage crashes, and total crashes were also significantly higher than the statewide average rates for similar types of highway.

There are currently more than 90 access points (signalized intersections, unsignalized intersections, and driveways) along MD 355 between MD 27 (Ridge Road) and MD 124 (Montgomery Village Avenue). Each driveway and intersection represents a potential conflict point between through-vehicles and turning vehicles. Approximately 70% of the accidents along MD 355 occur at intersections. Although a raised median was previously constructed on MD 355 to limit the number of mid-block locations where left turns can be made, there are currently 17 unsignalized intersections where one or more left turn movements can be made against opposing through-traffic on MD 355 without the aid of a traffic signal to stop the opposing traffic flow.

*MD 115(Muncaster Mill Road), from Shady Grove/Airpark Road to Woodfield Road (MD 124)*

There were a total of 65 crashes on this segment of MD 115 during the three-year analysis period. This segment of highway is two lanes wide, with auxiliary lanes and turning lanes at some intersections. The posted speed limit is 35 MPH. The rate of injury-related, property damage, and total crashes were significantly higher (40%, 60%, and 50%, respectively) than the statewide average for two-lane arterials with no access control. The rate of sideswipe crashes was over 7 times the statewide average. The rate of truck-related crashes was more than 4 times the statewide average.

*Snouffer School Road, from Woodfield Road (MD 124) to Centerway Road*

Snouffer School Road has a five-lane cross section between MD 124 and Bonanza Way (which is the northernmost entrance to the Montgomery Airpark Industrial Park), and a three-lane cross section north to Centerway Road. The posted speed limit is 40 MPH. The most common type of crashes were rear-end and side-swipe, the latter being nearly 3 times the statewide average. Left-turn crashes were about twice the statewide average, and head-on crashes were nearly 4 times the statewide average. Truck-related crashes occurred at nearly 3 times the statewide average.

*Snouffer School Road, from Centerway Road to Goshen Road*

This portion of Snouffer School Road is a two-lane minor arterial with turn lanes at signalized intersections. The speed limit is 40 MPH and there is no control of access. The most common type of crash was rear-end. The rates of head-on crashes and left-turn crashes were approximately twice the statewide average for similar type roadways, and the rate of sideswipe crashes was approximately 3 times the statewide average.

*Wightman Road, from Goshen Road to Brink Road*

Wightman Road is a rural two-lane minor arterial with a posted speed of 35 MPH. Between Aspenwood Lane and Brink Road, a combination of horizontal and vertical curves necessitates a speed limit of 30 MPH. There is no control of access. The most common type of crash was rear-end. Head-on, rear-end, sideswipe, and left-turn crashes all occurred at rates 2 to 5 times the statewide average rate for similar type roadways. Truck-related crashes were more than twice the statewide average.

*Brink Road, from Wightman Road to Ridge Road (MD 27)*

Brink Road is a rural two-lane minor arterial from Wightman Road to Wildcat Road, where it transitions to a four-lane divided roadway approaching MD 27. The posted speed is 35 MPH and there is no control of access. The number of injury-related crashes and total crashes were both significantly higher than the statewide average. The most common type of crash was fixed-object, which occurred at a rate more than twice the statewide average. The highest grouping of crashes occurred along the section within the Seneca Creek Stream Valley Park.

Along the entire length of Alternative 4 Modified, there are currently 128 access points (13 signalized intersections, 25 unsignalized intersections, and 90 driveways). Each driveway and intersection represents a conflict point. The predominant types of crashes were rear-end, left-turn, sideswipe, and fixed-object, and involved trucks at rates significantly above the statewide average for truck-related accidents on similar type roadways.

Comparison of Build Alternatives

There are too many variables affecting the causes of accidents to accurately forecast future numbers of accidents along an alternative. However, based on the statewide average crash rates maintained by Maryland State Highway Administration (SHA) for various highway types, it is possible to estimate future trends in highway accidents along an alternative, based solely on the highway type. For example, Alternative 4 Modified would have a cross section that is typical of the highways that SHA has grouped into the category of Urban Divided Highways with Four or More Lanes and No Access Control. This category of highways has a statewide average crash rate of 206.9 crashes per 100 million vehicle miles traveled. The portion of Alternative 8 and Alternative 9 on new location would have a cross section and access control typical of the highways SHA classifies as Urban Divided Highways with Four

or More Lanes and Partial Access Control. This category of highways has a statewide average crash rate of 132.6 crashes per 100 million vehicle miles traveled. While it is not possible to predict that the build alternatives would experience crash rates identical to today's statewide average crash rates for similar type highways, it is accurate to state that alternatives with partial controls of access (like Alternatives 8 and 9) would result in substantially lower accident rates than alternatives which have no access controls (such as Alternatives 2 and 4 Modified).

As stated in the preceding section, service roads were included in Alternative 5 to consolidate the number of driveways, thereby reducing the number of potential conflict points along the route. With the addition of service roads, the number of driveways along MD 355 from Ridge Road to Montgomery Village Avenue were reduced from 62 to 17. SHA does not maintain accident statistics for multi-lane highways with service roads. However, the AASHTO Highway Safety Manual (HSM) provides Crash Modification Factors (CMFs) for a variety of design, traffic control, and operational treatments on roadway segments, including several CMFs for Access Management measures. Table 13-58 in the HSM shows the extent to which accidents can be reduced through the use of service roads. Reducing the driveway density along urban/suburban arterial roadways from 10-24 per mile to less than 10 per mile has a CMF of 0.75, which equates to a 25 percent reduction in crashes. The existing driveway density along MD 355 from Ridge Road to Montgomery Village Avenue is 21 driveways per mile. The proposed service roads would reduce the driveway density to 4 per mile. Therefore, a CMF of 0.75 would be appropriate for the portion of Alternative 5 along MD 355.

Applying the appropriate SHA statewide average crash rate to each build alternative (or to each segment of a build alternative for those alternatives that have more than one type of access control), **Table 3-4** shows the relative differences in the accident potential of each alternative.

### ***Need No. 3: Enhance Network Efficiency and Connections Between Economic Centers***

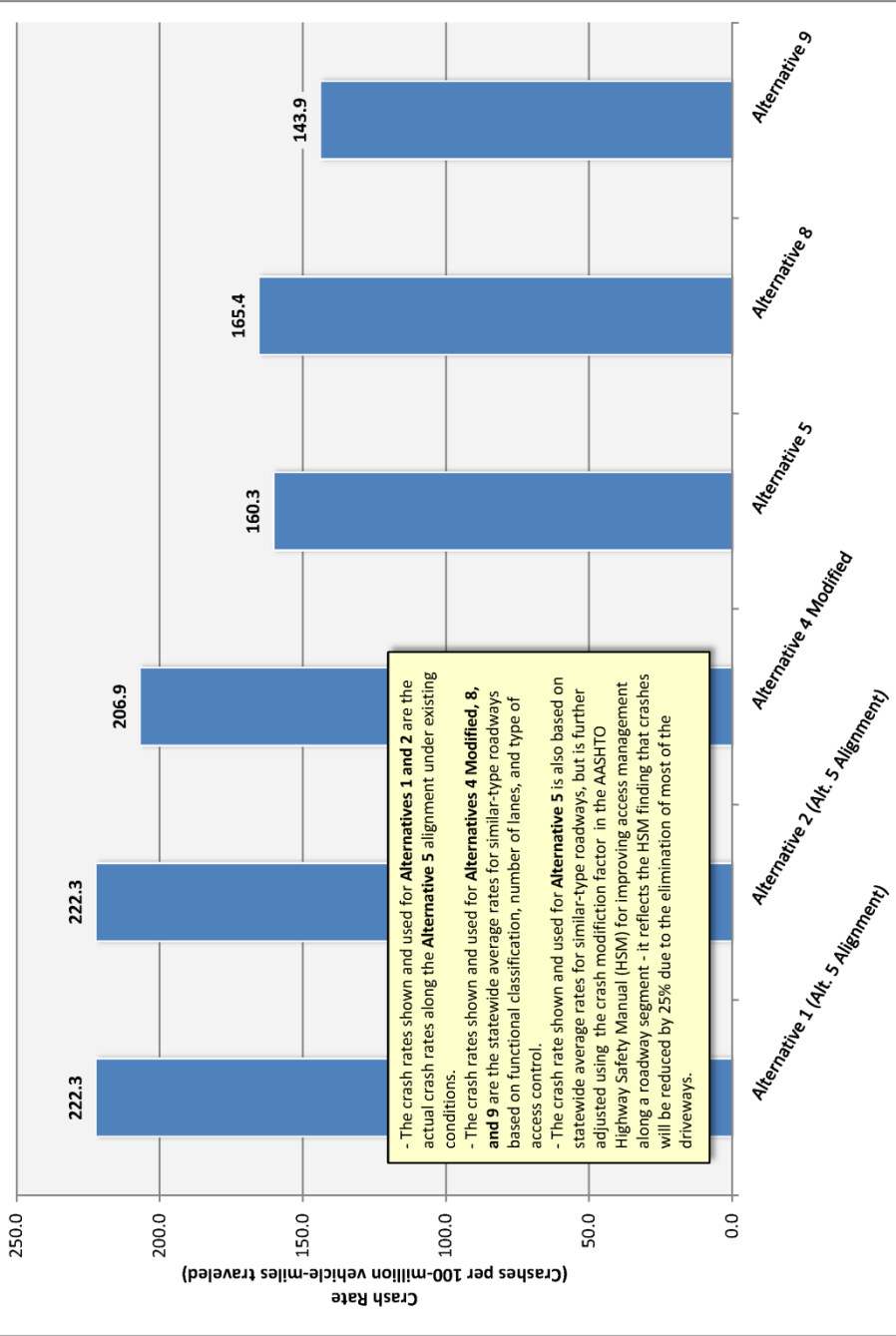
As discussed at the beginning of this chapter, the County's vision for MD 355 includes improved mobility between the technology centers, federal research facilities, and institutions of higher education. The three sectors are interdependent parts of the biotechnology community, and improved mobility between these sectors is vital to maintaining Montgomery County's competitive edge. Therefore, in addressing the need to enhance connections between economic centers, we focused on improvements in mobility.

Mobility is a commonly used term that, simply stated, means "ease of travel." Mobility can be increased in a number of ways: by reducing congestion (which was previously discussed), by providing facility types that are missing from the highway network to improve the network efficiency, by adding new links to the highway network, and by increasing capacity.

RK&K Engineers  
 April 2013

Midcounty Corridor Study  
 Montgomery County DOT

**Table 3-4: Projected Crash Rates Along the Build Alignments in 2030**



An efficient network is one in which the full spectrum of highway classifications is represented. The highway “network” can be explained as follows. At the lowest level of the network are subdivision streets. Subdivision streets should enhance safety and cohesiveness of neighborhoods by minimizing cut-through traffic, discouraging high speeds, and enhancing pedestrian awareness through residential areas. The next level of classification is the “collector” road, so named because they collect traffic from neighborhoods and farms and route the traffic to a higher type “arterial” facility. Collectors are generally posted for higher speeds than subdivision streets, and typically have no controls of access. Collectors provide access to a variety of land uses, including residential, commercial, industrial, schools, churches, institutional facilities, and parks. Arterials typically provide increasingly higher design speed and posted speed than collector roads, and frequently contain a four-lane divided or five-lane cross section. Arterial roads are often part of the state highway system. Access is provided to such land uses as major shopping centers, auto dealerships, restaurants, factories, office parks, and other large generators of highway traffic. The next higher roadway classifications are characterized by controls of access which facilitate higher travel speeds, accommodate higher volumes of traffic, and enhance motorist safety. These higher roadway classifications include “major arterials” with partial control of access (i.e., no driveways) and “freeways” with full control of access (i.e., no driveways or at-grade intersections).

Motorists typically gravitate toward the quickest route. (The travel demand model is based on this phenomenon.) When these higher roadway classifications are part of the highway network, regional traffic (such as long-distance commuters, distributors of consumer goods and raw materials, traffic related to the construction sector and service sector, and others) will make their way to the higher type roadways where they are able to drive at higher speeds and make fewer stops. When higher type roadways are not part of the highway network, regional traffic has no choice but to travel on arterial and collector roads where more of the traffic stream has a local destination, is slower moving, and includes a higher number of turning vehicles at driveways/entrances. This mixing of regional and local traffic is not only inefficient, but results in a greater number of potential conflict points, a mixing of high-speed and low-speed traffic, and a corresponding increase in accident rates.

Alternatives 8 and 9 would provide a major arterial highway with partial access control; a highway type that is missing from the existing highway network in the study area. This access-controlled facility would attract the regional traffic, leaving more capacity on the existing arterial roads for local traffic, thereby improving mobility as well as safety. Only Alternatives 8 and 9 provide a new highway with partial controls of access.

Another means of improving mobility is to provide new links in the highway network. New links provide alternative paths for traveling between two points, which can have the following beneficial effects with respect to mobility:

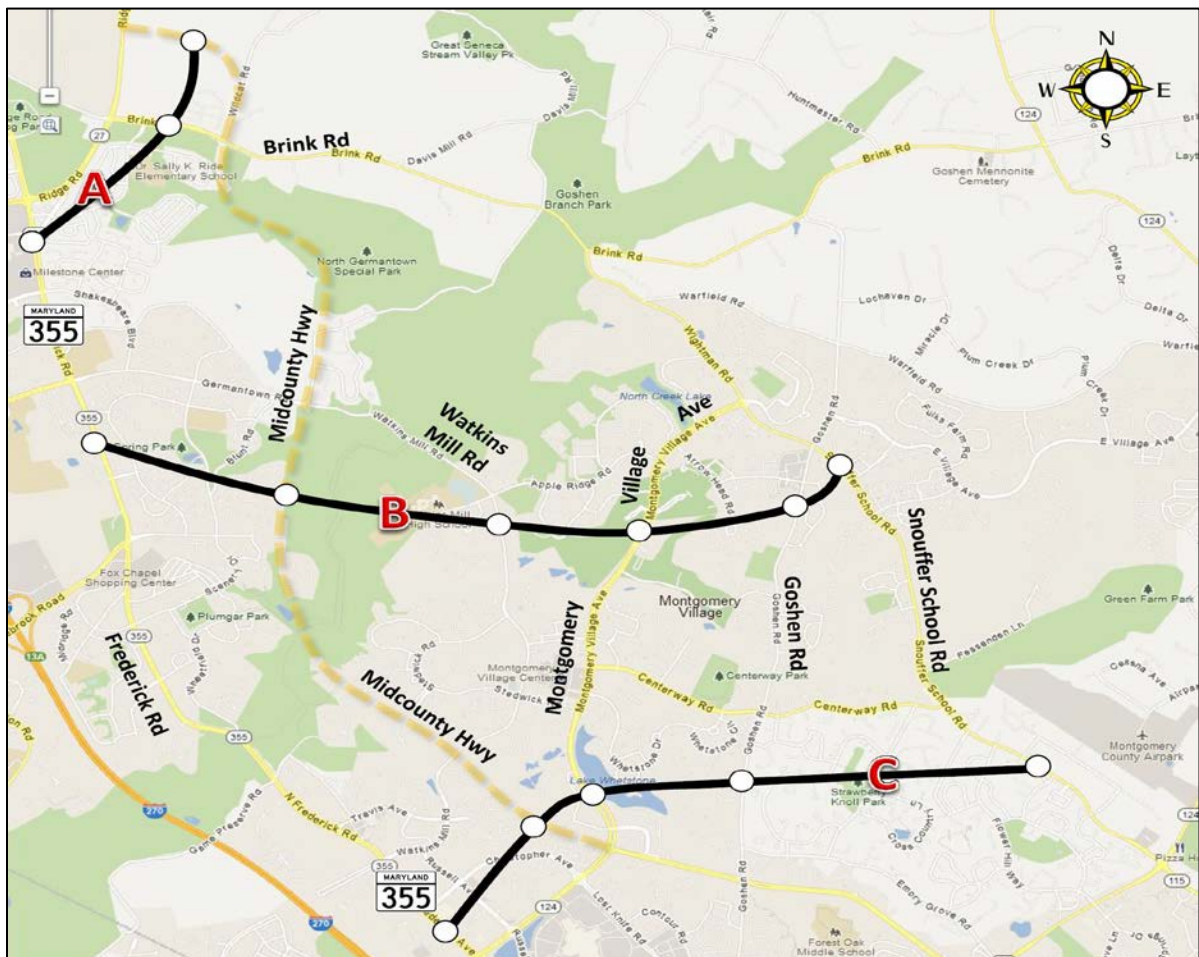
- increase connectivity;
- provide the opportunity to construct a higher-type highway facility that
  - reduces travel times;
  - attracts the higher-speed regional traffic from the lower-speed local roadways;
  - improves safety by limiting the number of access points;
- increase capacity;
- provide a more direct travel path; and
- provide an alternative travel path in the event that an incident has closed/slowed a highway.

Alternatives 8 and 9 would provide a new highway link parallel to MD 355 and I-270, resulting in three north-south highways that each have connections to five major east-west arterial roads – Ridge Road (MD 27), Germantown Road (MD 118), Middlebrook Road, Watkins Mill Road, and Montgomery Village Avenue (MD 124). These east-west roads would function like “ladder rungs” while the access-controlled Midcounty Highway and I-270 would function as the “ladder stringers.” The ladder rungs provide access to several major employment centers, such as the following: Ridge Road to the Seneca Meadows Corporate Center, Germantown Road to the Germantown Employment Center, Middlebrook Road to the US Department of Energy and Holy Cross Germantown Hospital (currently under construction), Watkins Mill Road to the Watkins Mill Town Center (currently under construction), and Montgomery Village Avenue to the National Institute of Standards and Technology. The advantage of the ladder configuration is that Midcounty Highway would provide access to the same five east-west arterial highways that are accessible from the interchanges along I-270. Therefore, motorists will know that if they exit I-270 (to avoid congestion or an incident) prior to reaching their normal exit ramp, the ladder configuration will provide an alternative route back to the east-west arterial where they would normally exit. Therefore, the ladder configuration would facilitate the use of Midcounty Highway as an alternative to a congested I-270.

An even greater advantage of the ladder configuration is that residents of the study area would incorporate Alternative 8 or 9 into their commute because they know it would provide access to the same east-west arterials as I-270, while providing a faster commute than would be possible on I-270 during congested peak hours. As reported in the Technical Appendix of the June 1994 Clarksburg Master Plan, 42% of the trips originating in Clarksburg would have destinations in Germantown or Gaithersburg, while 40% of the trips with destinations in Clarksburg would originate in Germantown or Gaithersburg. Of the build alternatives evaluated, Alternative 8 or 9 would best accommodate these medium-range commuter trips due to the lower overall travel time, fewer intersections, fewer driveways, and quick access to I-270 and MD 355. Because traffic on I-270 is projected to increase by 46% between 2011 and 2030, the ability to avoid I-270 for a portion of the commute is a substantial benefit

of Alternatives 8 and 9. Alternative 9 would have the added advantage of a possible future connection to the ICC. (While this extension is not currently funded for planning or construction, and it is not included within the 2030 Constrained Long Range Plan, the extension is included in the County’s Master Plan.) Of all the build alternatives, Alternative 9 would result in the greatest number of intersections with acceptable operation during peak hours, and the greatest increase in lane-miles of capacity. All of these factors combine to enable Alternative 9 to provide a high level of improvement in traffic mobility and improved connectivity between economic centers.

A screenline analysis was used to determine how each alternative would affect the number of vehicles traveling north and south through the study area on both the existing road network and the proposed alternative. Three screenlines (A, B, and C) were established across the northern, middle, and southern portions of the study area, respectively, crossing each of the primary north-south roadways (**Figure 3-8**). The nodes represent the locations where traffic was projected.



**Figure 3-8: Screenline Locations**



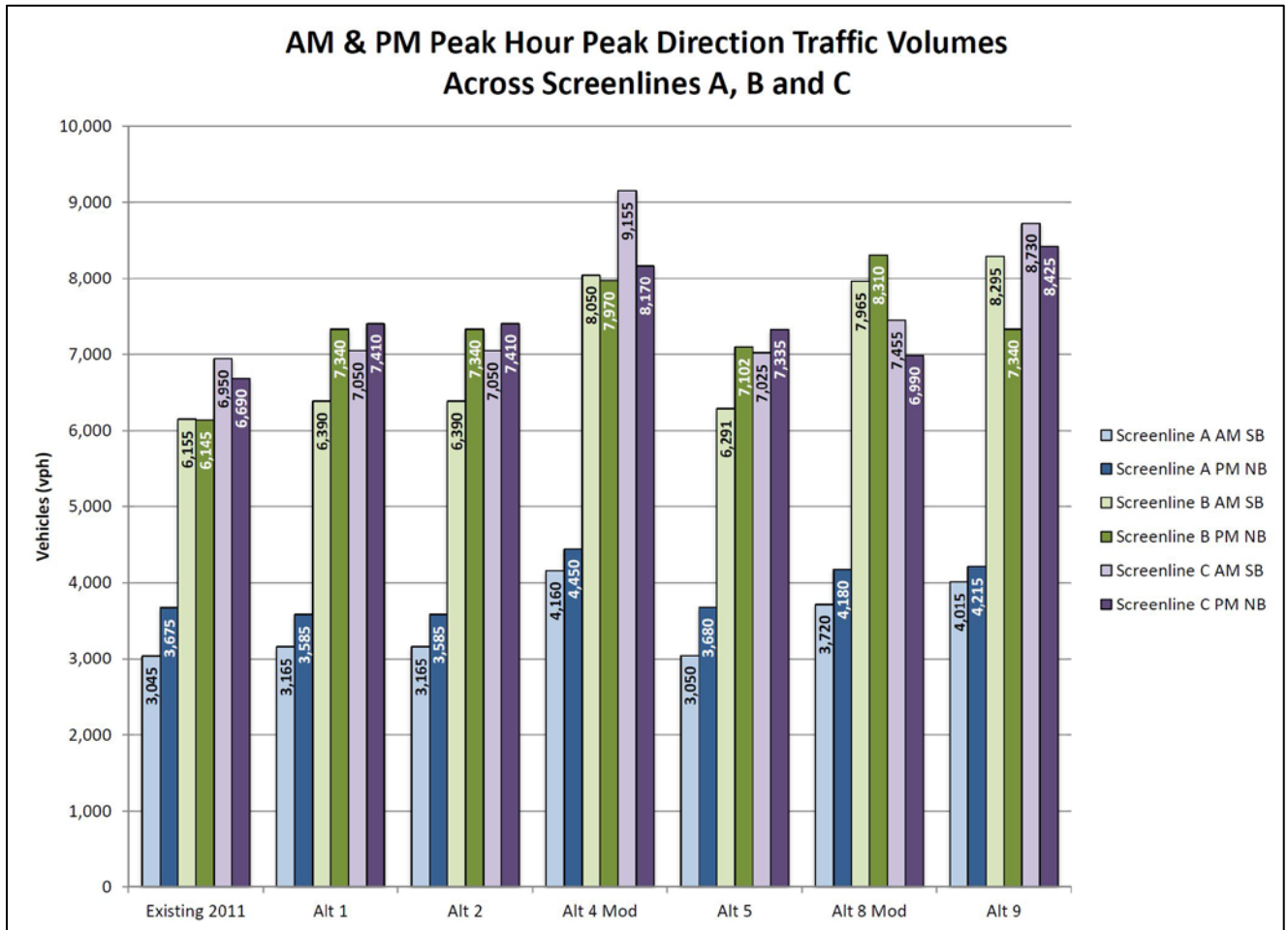
The results of the screenline analysis are shown in **Figure 3-9**. As depicted in the bar graph, Alternative 5 would result in the lowest projected north-south travel through the study area of any build alternative. This is because Alternative 5, despite reducing congestion and travel time along MD 355, would not substantially increase capacity or connectivity. While this finding may be viewed as beneficial by those who want to maintain the status quo, it would not support the master plan levels of growth of industry, office parks, R&D facilities, and other land uses in the MD 355/I-270 Technology Corridor.

Alternative 4 Modified would more than double the existing lane capacity along the Brink, Wightman, Snouffer School, and Muncaster Mill Roads by adding two additional lanes north of Montgomery Village Avenue, and by adding from two to four additional lanes south of Montgomery Village Avenue. Alternative 4 Modified is projected to result in the highest volume of north-south travel demand throughout the study area (see **Figure 3-9**). However, as noted on **Figure 3-4**, the 16 unacceptable intersections produced with Alternative 4 Modified indicate that Alternative 4 Modified is not very effective at accommodating the increased travel demand. Of all the build alternatives, Alternative 4 Modified would also be furthest from MD 355 and the economic centers. The traffic analysis shows that much of the increased travel demand is drawn from roads located east of the study area. As a result, Alternative 4 Modified would result in 10 unacceptable intersections on MD 355, which would make operations along MD 355 worse than under the No Build scenario.

Alternative 2 would reduce the number of congested intersections and reduce travel time along MD 355 compared to the No-Build scenario, but the limited scope of improvements proposed under Alternative 2 would not increase capacity or connectivity sufficiently to increase travel demand in the study area.

**Figure 3-9** shows that Alternative 8 would provide a moderate increase in travel demand, and Alternative 9 an even greater increase. Both alternatives would significantly increase connectivity between economic centers. However, the truncation of Alternative 8 would reduce the volume of traffic that would divert to Alternative 8 from MD 355 and other north-south roadways. In fact, the traffic analysis shows, between Middlebrook Road and Watkins Mill Road, Alternative 8 would have 42% fewer vehicles than the same section of Alternative 9, leaving Alternative 8 under-utilized.

Of the three Northern Terminus Options, Options A and D would be superior to Option B in terms of improving mobility. Option B would require the north-south through-traffic movement to negotiate three turns, resulting in long queues, substantial delays, and poor weaving conditions between Brink Road and Snowden Farm Parkway. Option B would also merge the local Brink Road traffic and the regional Midcounty Highway traffic onto the same highway facility. Options A and D would keep local and regional traffic on separate facilities, and would not result in the operational deficiencies associated with Option B.



**Figure 3-9: 2030 Traffic Projected to Cross Screenlines A, B, C in Peak Hour/Peak Direction**

***Need No. 4: Accommodate Planned Land Use and Future Growth***

The No Build alternative would not facilitate planned land use and growth. The build alternatives would vary in their ability to facilitate development both in the Technology Corridor and along MD 355.

Growth in the Technology Corridor

As previously discussed, when establishing the amount of development that is appropriate for a planning area, the M-NCPPC must balance land use with the capacity of the existing and proposed transportation network. The Clarksburg, Germantown, and Gaithersburg area Master Plans were developed under the assumption that the Midcounty Highway would be constructed as a four-lane divided highway, connecting the existing Midcounty Highway to the planned Snowden Farm Parkway, forming a 12.2-mile continuous highway with partial



control of access. M-NCPPC’s Transportation Policy Area Review (TPAR) Report from 2010 projects 95,000 new jobs in these three planning areas and Montgomery Village between 2010 and 2040. Because Alternative 9 is the Master Plan alternative, the projected land use was balanced with the transportation capacity that would be afforded by Alternative 9 and other master planned transportation improvements. The other build alternatives would provide a lesser amount of transportation capacity and, therefore, would require either a reduction in the growth projections or alternative transportation improvements to offset the loss of capacity. A reduction in growth projections would be expected to have the consequential effect of slowing economic growth by deterring land development, lowering property values, reducing tax revenues, and eliminating jobs.

The following table shows the amount of new highway capacity that would be provided by each alternative.

**Table 3-5: Lane-Miles of New Highway Capacity Provided by Each Alternative**

No Build Alternative	Alternative 2	Alternative 4 Modified	Alternative 5	Alternative 8	Alternative 9
0	0	18.8	4.9	17.9	22.3

If land use and transportation are to remain in balance, it is apparent from the above table that Alternative 5 would necessitate the greatest down-sizing of growth projections, or would require a proportionally greater number of off-setting capacity improvements than the other alternatives. Of course, each off-setting capacity improvement would have its own associated impacts and costs. While Alternative 4 Modified would provide a large increase in capacity, the capacity would be furthest from the location of the planned growth. In addition, there would be a limited number of east-west connections between Alternative 4 Modified and the MD 355/I-270 Technology Corridor.

Economic development of the Technology Corridor is also affected in other ways. When corporations are considering whether to locate in Montgomery County’s Technology Corridor versus in Frederick County or Northern Virginia, the area transportation network is one of many factors evaluated. The rush hour congestion on I-270 is a significant concern to existing and prospective businesses. In fact, this congestion was cited as a major factor in the decision by at least one major employer to leave Montgomery County for Frederick County. Prospective businesses want to be assured that transportation improvements are programmed that will address the current congestion. The fact that Alternative 9 is part of a Master Planned improvement that would result in a 12-mile divided highway with partial access control would provide assurance to prospective businesses that Montgomery County is committed to providing an effective transportation network that will support business.

Impact on Businesses in the MD 355 Corridor

A screenline analysis was performed to determine the amount of traffic reduction that would occur on MD 355 under each build alternative (**Table 3-6** below). The analysis indicates that Alternative 2 would result in no reduction in traffic volumes on MD 355, and Alternative 5 would result in minor changes in traffic volumes on MD 355 compared to the No Build Alternative, because neither of these alternatives provides a new highway corridor to which traffic could divert. On the other hand, Alternative 5 would result in acceptable level-of-service at all but two intersections on MD 355, and would reduce travel time along MD 355, due to the alternative’s proposed intersection improvements and widening (**Figure 3-5**). Alternative 4 Modified would provide a moderate reduction in traffic volumes on MD 355, but would result in 10 intersections on MD 355 operating at an unacceptable level-of-service. (see **Figure 3-4**). Alternative 8 would also provide a moderate reduction in traffic volumes on MD 355, but would leave 6 intersections on MD 355 operating at an unacceptable level-of-service (see **Figure 3-6**). Alternative 9 would cause the largest reduction in traffic volumes on MD 355. This reduction in traffic volume would reduce congestion to an acceptable level-of-service at all but four intersections on MD 355 (**Figure 3-7**), and would reduce travel times on MD 355 as effectively as Alternative 5, without any construction along MD 355. Therefore, Alternative 9 would result in a substantial improvement in traffic operations on MD 355 without incurring the property impacts associated with Alternative 5.

**Table 3-6: Amount of Traffic Reduction on MD 355**

Build Alternative	Change in Daily Traffic on MD 355 vs. No Build Scenario		
	Screenline A*	Screenline B	Screenline C
Alternative 2	No Change	No Change	No Change
Alternative 4 Mod	9% Reduction	15% Reduction	10% Reduction
Alternative 5	1% Increase	5% Increase	1% Reduction
Alternative 8	17% Reduction	7% Reduction	8% Reduction
Alternative 9	33% Reduction	24% Reduction	34% Reduction

\* Screenline locations are depicted in **Figure 3-8**.

With reduced traffic and congestion on MD 355, commutes would be improved to the major employment centers located along MD 355 within the study area (IBM, Lockheed Martin, Kaiser Permanente, and the Holy Cross Germantown Hospital), and shipments of products and raw materials would be accelerated to and from the existing technology companies (such as Digital Receiver Technology, Hughes Communications, and the businesses in the Gateway 270 Office Park and Seneca Meadows Corporate Center). With Alternative 9, and to a lesser extent with Alternatives 8 and 4 Modified, retail businesses would experience a reduction in the volume of drive-by traffic. However, the extent to which the reduction in

drive-by traffic would affect the number of customers would vary depending on whether the business is an “opportunity” business or a “destination” business (see **Page 4-43** for further discussion). **Table 3-7** is provided to contrast the changes in drive-by traffic in year 2030 under Alternative 5 (which would result in a small increase compared to the No Build) and under Alternative 9 (which would result in the largest decrease compared to the No Build). To provide a baseline, the table also includes the year 2030 projected average daily traffic volumes for the No Build Scenario.

**Table 3-7: Range of Projected Changes in 2030 Traffic Volumes on MD 355**

Segment of MD 355	Traffic Vol on MD 355 with No Build	Traffic Vol on MD 355 with Alt 5	Change between Alt 5 and No Build	Traffic Vol on MD 355 with Alt 9	Change between Alt 9 and No Build
Ridge Road to Henderson Corner Road	33,550	35,275	+5%	20,725	-38 %
Henderson Corner Road to Milestone Center (South)	40,400	40,325	0%	24,475	-39%
Milestone Center (South) to Shakespeare Blvd	42,275	42,300	0%	27,400	-35%
Shakespeare Blvd to Germantown Road	47,750	48,050	+1%	32,900	-31%
Germantown Road to Middlebrook Road	45,975	47,175	+3%	30,300	-34%
Middlebrook Road to Gunners Branch Road	50,425	53,700	+7%	34,925	-31%
Gunners Branch Road to Plummer Drive	46,900	52,525	+12%	34,050	-27%
Plummer Drive to Professional Drive	47,950	53,325	+11%	34,900	-27%
Professional Drive to Travis Avenue	48,400	51,675	+7%	35,900	-26%
Travis Avenue to Watkins Mill Road	45,200	47,675	+5%	33,900	-25%
Watkins Mill Road to Christopher Avenue	48,775	50,225	+3%	37,750	-23%
Christopher Avenue to Lockheed Martin	45,500	49,950	+10%	34,100	-25%
Lockheed Martin to Montgomery Vill. Ave.	49,475	45,750	-8%	37,325	-25%

***Need No. 5: Facilitate and Provide Bicycle and Pedestrian Travel Connections***











The March 2005 *Countywide Bikeways Functional Master Plan* is the County's blueprint for providing bikeways for longer distance routes that provide connectivity to major destinations such as transit, employment, and activity centers. The Master Plan focuses on bicycling for both recreation and utilitarian purposes, within transportation rights-of-way. In addition, it addresses connections to the *Countywide Park Trails Plan* which is an interconnected system of hard surface and natural surface park trails. The Master Plan discusses three forms of bicycle accommodation: on-street bike lanes which are separated from vehicular lanes, shared roadways which accommodate bicyclists by adding two to three feet of additional pavement width to the outside vehicular lane, and shared use paths which are off the highway and are intended to accommodate pedestrians, joggers, strollers, skaters, and bicyclists. The Master Plan discusses appropriate applications for each type of bikeway, and recommends more than one type of bicycle facility on some roadways.

MCDOT envisions the Midcounty Corridor Study as an opportunity to provide a significant missing link in the County's bicycle network. All the build alternatives, with the exception of Alternative 2, would include bicycle accommodations which would provide connections to park trails and existing paved trails (**Figure 3-10**), and to the Shady Grove Metro Station (via the on-street bike lanes proposed along Shady Grove Road). In addition, because state law allows bicyclists to travel on highways that have a posted speed less than 50 MPH, MCDOT's objective is provide the safest possible accommodation for bicyclists who choose to ride on the highway by providing on-street bike lanes rather than shared roadways, where feasible.

The 1994 Household Travel Survey, developed by the Metropolitan Washington Council of Governments (MwCOG), revealed that there were approximately 10,300 bicycle trips within, to, and from Montgomery County every weekday. A 1995 MwCOG survey at three trails and three Metro stations revealed the average bicycle trip to a Metro station was 2.6 miles. Because 76% of County residents live within a three-mile radius of a Metro station, the March 2005 *Countywide Bikeways Functional Master Plan* recognizes the "tremendous opportunity to increase the number of people who travel to transit by bicycle." In support of this objective, all Metro stations in the County include bicycle racks and lockers. All Metro buses and all of Montgomery County's Ride-On buses can transport bicycles on racks mounted to the outside of the bus. Additionally, bicycles are permitted on Metro trains during non-peak hours.

In addition, Montgomery County will be implementing its bikeshare program in 2013 by constructing 29 bike share stations throughout the downcounty region. The stations are anticipated to be located near Metro stations and other public areas to enhance transit usage and to provide an alternative means of transportation between transit stops and nearby

**LEGEND**

	PAVED TRAIL
	BIKE LANE OR SHOULDER
	SHARED ROADWAY
	NATURAL SURFACE
	STUDY AREA
	ALTERNATIVE 4 MODIFIED
	ALTERNATIVE 5
	ALTERNATIVE 8
	ALTERNATIVE 9
	NORTHERN TERMINUS OPTION B/D







destinations. Of course, the success of biking programs like bikeshare relies on the County providing a safe network of bicycle facilities. Consequently, improving the bicycle facilities within the study area is a key component of the Midcounty Corridor Study project.

MCDOT officially adopted a ***Complete Streets Policy*** on April 2, 2012 and has incorporated the concept of “complete streets” into their Road Code and Context Sensitive Road Design Standards. Complete streets are intended to provide safe, attractive, and comfortable access and travel for all users, including pedestrians, bicyclists, motorists, and transit users of all ages and abilities. The National Complete Streets Coalition was founded in 2005 by a coalition of advocacy and trade groups, including AARP, the American Planning Association, the American Society of Landscape Architects, and the American Heart Association. In 2010, the U.S. Department of Transportation issued a policy statement on bicycle and pedestrian accommodation, declaring its support for their inclusion in federal-aid transportation projects and encouraging transportation agencies to adopt the concept. As of 2011, complete streets policies have been endorsed or adopted by 224 U.S. jurisdictions, including 23 states. The proponents of complete streets tout the benefits of improved safety, lower transportation costs, reduced emissions, healthier lifestyle, a sense of place, increased social interaction, and increased property values.

Montgomery County’s policy is to accommodate all levels of bicycle skill, confidence, and preferences. Some bicyclists are very experienced and prefer riding on the roadway. However, according to the National Center for Bicycling and Walking, fewer than 5 percent of bicycle owners consider themselves experienced or highly skilled. Consequently, Montgomery County also provides a shared use path, separated from the roadway, on highways with posted speeds of 40 MPH or higher and traffic volumes greater than 15,000 ADT (all build alternatives fall into this category).

Sidewalks are kept separate from bikeways because “bicyclists travel at a much higher speed than pedestrians, which often leads to conflicts” (page 24 of the March 2005 *Plan*). In addition, sidewalks may feature street furniture such as benches, bus shelters, and trash receptacles, whereas these devices are typically not installed on shared use paths. Therefore, in keeping with the March 2005 *Plan*, MCDOT is providing accommodations for pedestrians that are separate from the accommodations for bicyclists.

Following is a synopsis of the effectiveness of each alternative in facilitating bicycle and pedestrian connections:

- All build alternatives would provide sidewalks as part of the proposed improvements.
- All build alternatives except Alternative 2 would provide a shared use path. (The shared use path along Alternative 5 already exists).
- Alternative 4 Modified, 8, and 9 would accommodate on-street bicycle travel through

- the construction of bike lanes and bike-accessible shoulders.
- The bicycle accommodations along Alternative 4 Modified and Alternative 5 would be accessible at a larger number of locations due to the larger number of intersections along these alternatives. However, Alternatives 5 and 9 would intersect a greater number of existing bicycle paths.
  - Alternatives 4 Modified, 5, 8, and 9 would provide connections to the Seneca Creek Greenway Trail. However, Alternatives 4 Modified, 8, and 9 would displace the informal automobile parking areas which currently exist near the Trail. If any of these alternatives is subsequently identified as the Preferred Alternative, the M-NCPPC Parks Department will be consulted to determine their preferences regarding the construction of formal parking areas.
  - All the build alternatives are designed with a 40 MPH design speed and would have an anticipated posted speed limit of 40 MPH. Because motorist speed would be the same for all build alternatives, this is not a factor in comparing the safety of the bicyclist accommodations provided under the various alternatives. However, it should be noted that the high number of intersecting streets and driveways along Alternatives 2, 4 Modified, and 5 would present a greater number of conflict points between motorists and bicyclists.
  - Because the northern portion of Alternatives 8 and 9 (i.e., north of Middlebrook Road) has sufficient right-of-way to incorporate linear stormwater management and landscape trees along the outside of the roadway, the shared use path and sidewalk would be setback an additional 14.5 feet from the travelway compared to the other build alternatives (see **Figure 2-15**). The increased setback would improve bicyclist and pedestrian safety, while the landscaping would enhance the recreational experience.

#### ***Need No. 6: Enhance Homeland Security***

“Homeland Security” is a term that encompasses several factors, including response to hazmat spills, terrorism, severe weather, fires, wildfires, floods, gas leaks, and highway accidents. The Montgomery County Fire and Rescue Service (MCFRS) and the Montgomery County Office of Emergency Management and Homeland Security (OEMHS) provide such services for those who live and work in Montgomery County. The MCFRS handles over 100,000 emergency calls for service annually. The OEMHS focuses on preparedness, evacuation, and alerts.

The build alternatives for the Midcounty Highway would differ substantially in their ability to accommodate the emergency response to a highway “incident” (i.e., an accident, disabled vehicle, hazardous material spill). Improvements in intersection operation are not an important factor affecting emergency response time since emergency responders don’t

generally stop at traffic signals. Of greater importance would be the ability to pass motorists enroute to an incident. Alternatives 4 Modified, 8, and 9 would provide either an on-street bike lane or a shoulder which would allow motorists to pull over to let emergency responders pass. The bicycle lanes and shoulder could also be used as a refuge for disabled vehicles. Alternative 5 would not have on-street bike lanes or shoulders. Alternative 2 would offer no improvement in emergency response time.

The previously-discussed ladder configuration of the arterial road network that would be created with Alternatives 8 and 9 would form an expedient emergency detour route around an incident location if traffic had to be detoured. In addition, the ladder rungs would provide convenient connections between I-270, MD 355, and Alternative 8 or 9 if responders needed to access the incident location along an alternative route. Because traffic queues form quickly when a travel lane is blocked by an accident, emergency response is improved by having the choice of an alternative route that can avoid the queue. In addition, the partial control of access and the lower number of intersections along Alternatives 8 and 9 would enable high-speed emergency responders to access an incident with a lower potential for conflicts with turning vehicles and cross traffic.

Several fire departments would directly benefit by some of the alternatives. The additional capacity provided by Alternative 4 Modified would be expected to benefit emergency responders from the Gaithersburg-Washington Grove Fire Company 28, which is located at the intersection of Muncaster Mill Road and Shady Grove Road, at the south end of the alternative. Alternatives 8 and 9 could potentially be used by responders from Gaithersburg-Washington Grove Fire Company 8 (located on Russell Avenue at Montgomery Village Avenue) and Germantown Fire Company 29 (located just west of I-270 near MD 118). The minor capacity improvements along Alternative 5 north of Middlebrook Road would provide some benefit to these same two fire companies and the recently-commissioned Montgomery County Fire and Rescue Service – Station 34 (located on MD 355 at Boland Farm Road).

#### ***Need No 7: Improve Quality of Life***

Quality of life can include a large number of factors, such as commuting time, noise, aesthetics, availability of recreation/cultural activities, community cohesion, safety, etc. This discussion will focus on the manner in which transportation affects quality of life, expressed as travel time. The other factors affecting quality of life are discussed in subsequent sections of this document.

Inadequate transportation facilities can degrade a region's quality of life by increasing travel delay; reducing productivity; reducing time for personal, cultural, and recreational pursuits; increasing accident rates; stunting economic growth; and creating development pressure on agricultural properties. In 2011, the Urban Mobility Report, the Texas Transportation

Institute's annual ranking of congestion in U.S. cities, ranked the Washington D.C. metropolitan area as the most congested area (of cities with 3 million population) in the country, with a yearly delay of 74 hours per auto commuter. In the current economic environment, there is not enough public funding to keep pace with the growing number of motorists and increasing number of vehicle miles traveled (VMT). By 2026, the number of licensed Maryland drivers is expected to increase by more than 23%, and the number of registered vehicles is expected to increase by 40%, compared to 2006.<sup>5</sup> In 2006, Marylanders drove 57 billion vehicle miles, an average of 10,000 miles per person. This represents a 40% increase in VMT since 1990, a growth rate that significantly outpaced growth in both population (17%) and new lane miles (8%) during the same time period.<sup>6</sup> As a result, commuting times are constantly increasing and taking time away from more enjoyable and healthy pursuits.

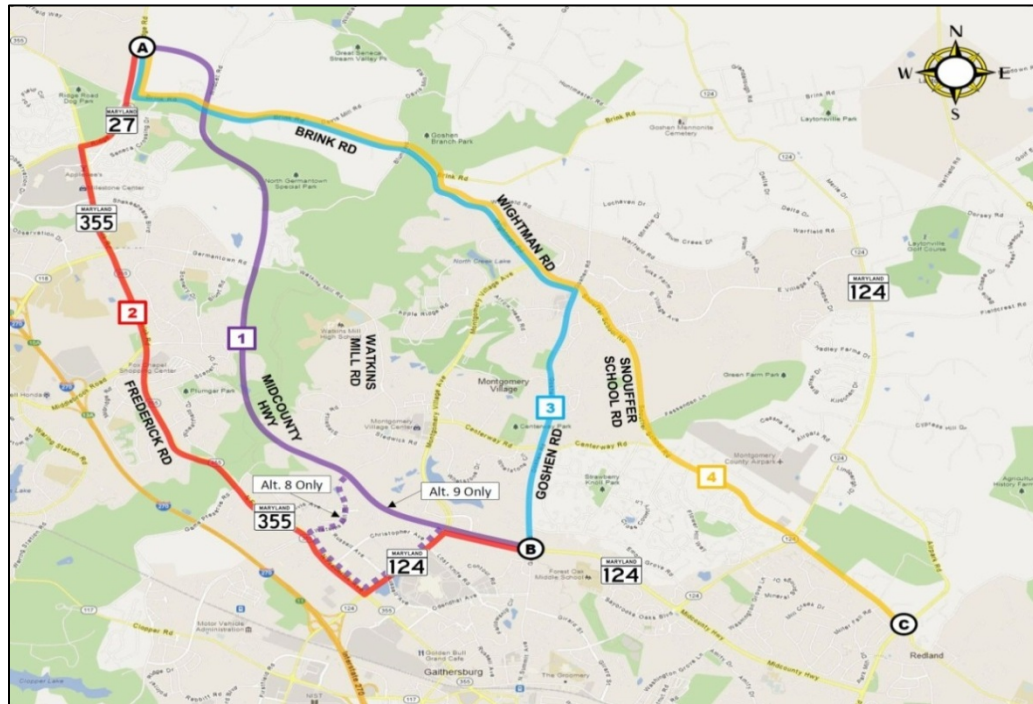
Travel time is a performance measure that is affected by congestion, roadway design speed, the number of access points (driveways and intersections), and "side friction" (a term that refers to the proximity of adjacent structures, trees, utility poles, etc). Because all build alternatives used the same design speed, similar typical sections, and similar clear zones, and would be posted for the same 40 MPH speed limit, the differences in travel time are primarily attributable to differences in the number of intersections/driveways, the distance between intersections, and intersection delay.

The measurement of travel time includes both the drive time and the time spent in a queue at intersections. As travel times increase along a route due to congestion, drivers will modify their travel patterns to seek a less-congested, faster, alternative route. (The travel demand model accounts for this phenomenon.) Therefore, an alternative with a shorter travel time would be expected to be more effective at diverting traffic from congested routes.

Travel times between common starting and ending points were computed for each of the Build Alternatives using Synchro software. Synchro analyzes intersection operation and determines the amount of delay for each movement and the queue lengths on each leg of the intersection, and factors this information into the projection of travel time. The travel time evaluation was based on a route from starting point A, located at the intersection of Ridge Road (MD 27) and future Snowden Farm Parkway, and ending at point B, located at the intersection of Goshen Road and Midcounty Highway (see **Figure 3-11**). Travel times were also computed along the yellow corridor between Point A and Point C located at the intersection of Muncaster Mill Road and Shady Grove Road. Analysis results are displayed in **Figure 3-12**, and portrayed in tabular form in **Table 3-8**. The travel time estimates are based on travel times in the peak direction of the peak hour (i.e., southbound in the AM peak hour and northbound in the PM peak hour).

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<sup>5,6</sup> Maryland Department of Transportation, Consolidated Transportation Program, 2010 State Report on Transportation



**Figure 3-11: Travel Time Corridors**

The following conclusions can be drawn from the Synchro travel time analysis (refer to **Figure 3-11** for the travel path and **Table 3-8** for the travel times):

- The travel time along Alternative 9 (#1-purple) would be the shortest possible travel time between Points A and B. This is attributable to the controls of access, the low number of intersections, the larger spacing between intersections, and the low intersection delay associated with Alternative 9.
- Travel time between Points A and B along the Alternative 8 alignment is increased by the circuitous travel path caused by the gap in Midcounty Highway. Vehicles that desire to continue along Midcounty Highway would be required to re-route along several local roads that serve residential and office land uses. Travel time along Alternative 8 (purple bar in **Figure 3-12**) would be substantially longer than the travel time along Alternative 9.
- All alternatives would result in substantial travel time reductions along the MD 355 (red) corridor, while Alternatives 5, 8, and 9 would result in the greatest reductions in travel time along MD 355.
- Regardless of the alternative, travel times during both the AM and PM peak hours would remain relatively constant along the Brink-Wightman-Goshen (#3-blue) corridor and the Brink-Wightman-Snouffer School-Muncaster Mill (#4-yellow) corridor.

(Continued on **Page 3-38**)

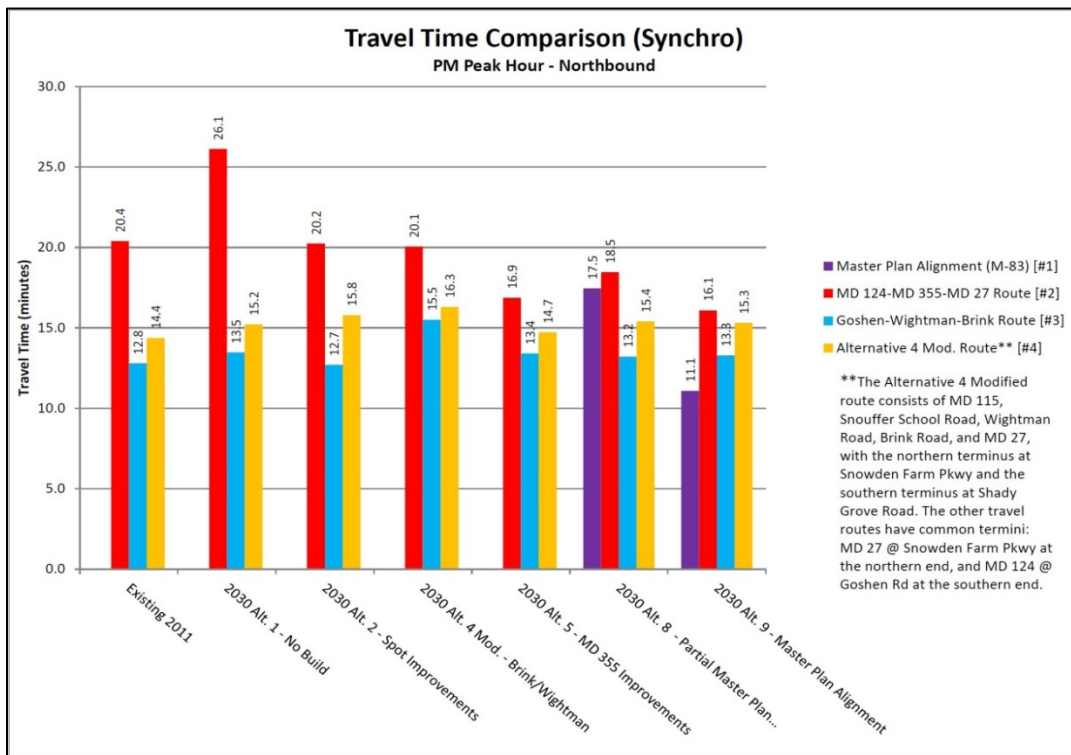
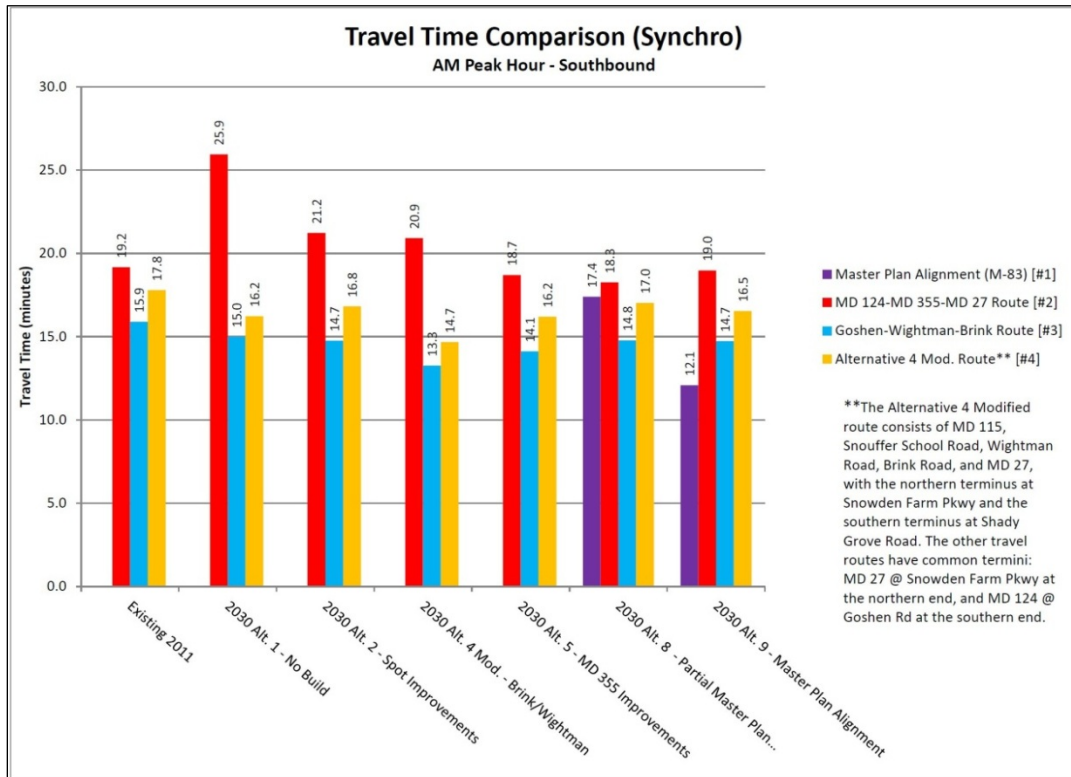


Figure 3-12: AM and PM Peak Hour Travel Times Along Four Different Corridors



**Table 3-8: Comparison of Travel Time**

Alternatives	Travel Time between Points A-B along Purple Path		Travel Time between Points A-B along Red Path		Travel Time between Points A-B along Blue Path		Travel Time between Points A-C along Yellow Path	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
1	-	-	25.9	26.1	15.0	13.5	16.2	15.2
2	-	-	21.1	20.2	14.7	12.7	16.8	15.8
4 Mod	-	-	20.9	20.1	13.8	15.5	14.7	16.3
5	-	-	18.7	16.9	14.1	13.4	16.3	14.7
8	17.4	17.5	18.3	18.5	14.8	13.2	17.0	15.4
9	12.1	11.1	19.0	16.1	14.7	13.3	16.5	15.3

- The travel time analysis for Alternative 4 Modified also identified an operational concern between the Ridge Road/Brink Road intersection and the Ridge Road/Snowden Farm Parkway intersection. The analysis indicates that the high volume of vehicles traveling from westbound Brink Road to Snowden Farm Parkway via Ridge Road would create a very difficult weaving movement between the two intersections. The large volume of turning traffic from westbound Brink Road (approximately 800 vehicles in the PM peak hour) would require two free-right turn lanes from westbound Brink Rd to Ridge Road and two left turn lanes from Ridge Road to northbound Snowden Farm Parkway. The short distance along Ridge Road between the Brink Road and Snowden Farm Parkway intersections (approximately 2200 feet) is not sufficient distance for the traffic from Brink Road to weave across three lanes of northbound Ridge Road traffic to get in the left turn lanes at the Snowden Farm Parkway intersection. The high volume of weaving traffic would result in poor operations and additional delays that the Synchro model is unable to account for. Therefore, the travel times would be expected to be even longer than are reflected in **Figure 3-12** and **Table 3-8**.
- The inoperable weaving movement noted above would also be a concern for Northern Terminus Option B under Alternatives 8 and 9.

***Need No. 8: Develop the Alternatives to be Environmentally Sensitive***

Sensitivity to the environment has been a major consideration during the development and refinement of the Alternatives Retained for Detailed Study. The cooperation of the environmental agencies throughout the development of the alternatives has contributed greatly to understanding the values of the social, historical, and environmental resources within the various alternatives, and has been the impetus for many of the efforts to avoid and minimize these resources. Following is a list of proposed features that reflect the project’s sensitivity to the natural environment:

### **Alternatives 2 and 5**

- Improvements proposed under Alternatives 2 and 5 would not be in close proximity to sensitive resources and would, therefore, have minimal impacts to natural resources.
- All Alternative 2 improvements would be restricted to the existing right-of-way and, therefore, would have minimal impacts to adjacent properties.

### **Alternative 4 Modified**

- The centerline of the proposed roadway improvements was shifted at numerous locations to minimize impacts to adjacent wetlands, forest, parks, and residential and commercial properties.
- Retaining walls were incorporated to minimize impacts to property and natural resources.
- At the intersection of Brink and Wightman Roads, the existing bridge over Seneca Creek becomes impassable during the 100-year storm event because the approach to the bridge is overtopped by floodwater. With Alternative 4 Modified, this bridge would be replaced with a longer bridge that would pass the 100-year flood with no overtopping of the bridge or approach roadway.
- Where feasible, the width of the proposed median has been reduced to minimize the impacts to adjacent resources and property.

### **Alternatives 8 and 9**

- The Master Plan portions of Alternatives 8 and 9 incorporate an alignment that has been reserved to preclude residential and commercial development within the alignment.
- The alignment was further modified to avoid and minimize impacts to adjacent wetlands, waterways, forests, parks, and properties.
- All new crossings of streams that have wetlands associated with them would be bridged to span both the stream and associated wetlands.
- All new bridges in parkland would have sufficient under-clearance to accommodate passage of wildlife and hikers.
- Retaining walls would be utilized to minimize impacts to property and natural resources.
- Northern Terminus Options B and D would avoid/minimize impacts to the portion of North Germantown Greenway Stream Valley Park located along Dayspring Creek that the M-NCPPC Parks Department values as a high-quality natural resource. Compared to Option A, Options B and D would:
  - a. Avoid impacts to high quality forest, County-rare plant species, and scenic Dayspring Creek headwaters;



- b. Result in no crossings of Wildcat Branch under Option B, or one crossing of Wildcat Branch under Option D, compared to two crossings with Option A;
- c. Reduce parkland impact in North Germantown Greenway Stream Valley Park by 15.6 acres (32% reduction);
- d. Reduce impacts to FIDS habitat within North Germantown Greenway Stream Valley Park by 8.3 acres (45% reduction);
- e. Be less visibly intrusive at the All Souls Cemetery; and
- f. Result in a smaller increase in impervious surface in the Clarksburg Special Protection Area (with Option B resulting in a minimal increase).

### 3.5 Summary

Each of the Build Alternatives has been evaluated in terms of its ability to satisfy the following elements of the project's Purpose and Need:

1. Reduce existing and future congestion
2. Improve vehicular safety
3. Enhance network efficiency and connections between economic centers
4. Accommodate planned land use and future growth
5. Facilitate and provide bicycle and pedestrian travel connections
6. Enhance homeland security
7. Improve quality of life (Travel Time)

Following is a descriptive summary of each alternative's ability to satisfy the purpose and need. A matrix summarizing the results of the evaluation is presented in **Table 3-9**.

#### Alternative 2

1. Reduce Congestion – High
  - Would result in a high percentage of intersections with acceptable level-of-service
  - Would result in a moderate number of peak hours of acceptable level-of-service at major intersections
2. Improve Vehicular Safety – Low
  - Would provide minor intersection improvements
  - Would maintain high number of intersecting driveways, entrances, and streets
  - Highest number of projected crashes, based on highway type
3. Enhance Network Efficiency and Connections Between Economic Centers – Low
  - Would not add additional lane capacity
  - Would not increase connectivity to other highways or enhance the highway network with a new highway link
4. Accommodate Planned Land Use and Future Growth – Low

- No additional lane capacity compared to No Build
  - Would not reduce traffic volumes on MD 355 compared to No Build
5. Improve Bicycle and Pedestrian Travel - Low
    - Would not provide new continuous sidewalk and bicycle facilities
    - Would maintain a high number of intersecting driveways, entrances, and streets; high potential for conflicts between bicyclists and vehicular traffic
  6. Enhance Homeland Security - Low
    - Would not enable emergency responders to pass motorists
    - Would not provide an alternate travel route for detours around blocked roadways
  7. Improve Quality of Life (Travel Time) – Moderate
    - Would moderately reduce travel times along north-south routes

#### **Alternative 4 Modified**

1. Reduce Congestion – Moderate
  - a. Would result in the lowest percentage of intersections with acceptable level-of-service (equal to the No Build), and the most congested intersections along MD 355
  - b. Would result in the lowest number of peak hours of acceptable level-of-service at major intersections, but an improvement compared to the No Build
2. Improve Vehicular Safety – Moderate
  - a. Would improve safety by providing a divided roadway with new median
  - b. Would maintain high number of intersecting driveways, entrances and streets
  - c. High number of projected crashes along alternative, based on highway type
3. Enhance Network Efficiency and Connections Between Economic Centers – Moderate
  - a. Would improve by adding additional lane capacity
  - b. Would not improve the transportation network with a new facility having partial control of access
  - c. Would not provide a new roadway link to the transportation network
  - d. Improvements would be furthest from economic centers
4. Accommodate Planned Land Use and Future Growth – Moderate
  - a. Would provide substantial increase in lane capacity compared to No Build
  - b. Would moderately reduce traffic volumes on MD 355, but have high number of intersections with unacceptable congestion on MD 355
  - c. Improvements would be furthest from growth centers
5. Improve Bicycle and Pedestrian Travel - Moderate
  - a. Would provide new continuous sidewalk and bicycle facilities

- b. Would maintain a high number of intersecting driveways, entrances, and streets; high potential for conflicts between bicyclists and vehicular traffic
- c. Bike Lanes would be accessible from the high number of intersecting streets
- 6. Enhance Homeland Security - High
  - a. Would provide additional lane capacity
  - b. Would allow motorists to pull over to let emergency responders pass
  - c. Would not provide an alternate travel route for detours around blocked roadways
- 7. Improve Quality of Life (Travel Time) – Low
  - a. Would have modest improvement to corridor travel times - but would result in operational problems at the intersections on Ridge Road which are not accounted for in the Synchro travel time analysis.

### **Alternative 5**

- 1. Reduce Congestion – High
  - a. Would result in the highest percentage of intersections with acceptable level-of-service
  - b. Would result in high number of peak hours of acceptable level-of-service at major intersections
- 2. Improve Vehicular Safety – Moderate
  - a. Would provide service roads along MD 355 to control access
  - b. Would maintain moderate number (53) of intersecting driveways, entrances and streets along the path of the entire alternative
  - c. Would result in low number of projected crashes along alternative, based on highway type
- 3. Enhance Network Efficiency and Connections Between Economic Centers – Moderate
  - a. Would reduce the number of access points along MD 355
  - b. Would not add a new roadway link to the transportation network or increase connectivity
  - c. Would result in lowest volume of north-south travel through the study area
- 4. Accommodate Planned Land Use and Future Growth – Low
  - a. Would provide the least increase in lane capacity, necessitating a down-sizing of growth projections and zoning
  - b. Would not reduce traffic volumes on MD 355, but would better accommodate the volumes in terms of level-of-service, travel time, and safety
- 5. Improve Bicycle and Pedestrian Travel - Moderate
  - a. Would provide continuous sidewalk and shared use path, but no on-street bicycle facilities

- b. Would maintain a moderate number of intersecting driveways, entrances, and streets; moderate potential for conflicts between bicyclists and vehicular traffic
- c. Commercial nature of corridor not conducive to a major bicycle corridor
- 6. Enhance Homeland Security - Low
  - a. Would not provide significant improvements for emergency responders or a shoulder for traffic to pull over to allow emergency responders to pass
  - b. Would not provide alternate travel route for detours around blocked roadways
- 7. Improve Quality of Life (Travel Time) – Moderate
  - a. High improvement in travel time along MD 355

### **Alternative 8**

- 1. Reduce Congestion – Moderate
  - a. Would result in moderate percentage of intersections with acceptable level-of-service
  - b. Would result in highest number of peak hours of acceptable level-of-service at major intersections
- 2. Improve Vehicular Safety – Moderate
  - a. Would provide new divided arterial with partial control of access for majority of alternative
  - b. Moderate (33) number of intersecting streets, driveways, and entrances along the path of the entire alternative
  - c. Low number of projected crashes along alternative, based on highway type
- 3. Enhance Network Efficiency and Connections Between Economic Centers – High
  - a. Would provide new facility with partial control of access that is missing from the existing transportation network
  - b. Close proximity to MD 355 and economic centers
  - c. Would provide quick access to I-270 and the Technology Corridor using east-west connections
  - d. Would leave gap in Midcounty Highway between Watkins Mill Rd and Montgomery Village Ave
- 4. Accommodate Planned Land Use and Future Growth – Moderate
  - a. Would provide a substantial increase in lane capacity compared to No Build
  - b. Would provide moderate reduction in traffic volume on MD 355
  - c. Close to MD 355, I-270, and Technology Corridor with several east-west connections to I-270
  - d. Would leave gap in Midcounty Highway between Watkins Mill Rd and Montgomery Village Ave
- 5. Improve Bicycle and Pedestrian Travel - High

- a. The new access-controlled portion of the alternative would have a low number of intersecting streets (mostly signalized) and no driveways / entrances, resulting in low potential for conflicts between bicyclists and vehicular traffic
  - b. Would provide new continuous sidewalk and bicycle facilities
  - c. Greater potential for conflicts between bicyclists and vehicular traffic where Alternative 8 departs from Master Plan
6. Enhance Homeland Security - High
- a. Would provide new access-controlled arterial with few conflict points
  - b. Would provide shoulders to allow motorists to pull over and let emergency responders pass
  - c. Would provide alternate travel route for detours around blocked roadways – except for missing link between Watkins Mill Road and Montgomery Village Ave.
7. Improve Quality of Life (Travel Time) – Moderate
- a. Moderate improvement in travel times along all north-south routes
  - b. High improvement in travel time along MD 355

### **Alternative 9**

1. Reduce Congestion – High
  - a. Would result in high percentage of intersections with acceptable level-of-service
  - b. Would result in highest number of peak hours of acceptable level-of-service at major intersections
2. Improve Vehicular Safety – High
  - a. Would provide new divided arterial with partial access controls
  - b. Lowest number of intersecting streets (13), and no driveways or entrances with Option A or Option D
  - c. Lowest number of projected crashes along alternative, based on highway type
3. Enhance Network Efficiency and Connections Between Economic Centers – High
  - a. Would complete 12-mile link between Clarksburg and Gaithersburg
  - b. Would provide new facility with partial control of access that is missing from the existing transportation network
  - c. Close proximity to MD 355 and economic centers
  - d. Would provide quick access to I-270 and Technology Corridor using east-west connections
  - e. Would allow for future connection of Midcounty Highway to ICC
4. Accommodate Planned Land Use and Future Growth – High
  - a. Would provide the most miles of new lane capacity
  - b. Highest reduction in traffic volume on MD 355

- c. Close proximity to MD 355, I-270, and Technology Corridor with several intersecting east-west corridors
- 5. Improve Bicycle and Pedestrian Travel - High
  - a. Would provide new continuous sidewalk and bicycle facilities
  - b. Lowest number of intersecting streets (mostly signalized) and no driveways / entrances, resulting in least potential for conflicts between bicyclists and vehicular traffic
- 6. Enhance Homeland Security - High
  - a. Would provide new access controlled arterial with lowest travel times and fewest conflict points
  - b. Would provide alternate travel route for detours around blocked roadways
  - c. Would provide shoulders to allow motorists to pull over and let emergency responders pass
- 7. Improve Quality of Life (Travel Time) – High
  - a. Shortest travel time of all the alternatives
  - b. High improvement in travel time along MD 355

**Table 3-9: Transportation Effectiveness of Each Alternative**

Alt.	Project Purpose and Need						
	1 Reduce Congestion	2 Improve Safety	3 Enhance Mobility	4 Planned Growth	5 Bike and Pedestrian	6 Homeland Security	7 Quality of Life
2	High	Low	Low	Low	Low	Low	Moderate
4 Mod	Moderate	Moderate	Moderate	Moderate	Moderate	High	Low
5	High	Moderate	Moderate	Low	Moderate	Low	Moderate
8	Moderate	Moderate	High	Moderate	High	High	Moderate
9	High	High	High	High	High	High	High

### 3.6 Conclusion

**Alternative 1 – No Build:** This alternative serves as the baseline for comparison for the other alternatives. This alternative would not meet the purpose and need since it does not improve congestion, safety, network efficiency, accommodation of planned growth, pedestrian and bicycle connectivity, emergency response, and travel time.

**Alternative 2 – Transportation System Management / Travel Demand Management:** This alternative would not adequately meet the purpose and need since it is limited to improving congestion at intersections. It would not adequately improve vehicle safety, network efficiency, accommodation of planned growth, pedestrian and bicycle connectivity, emergency response, and travel time.

**Alternative 4 Modified – Brink-Wightman-Snouffer School-Muncaster Mill:** This alternative would provide a major roadway improvement along the eastern limits of the study area and would moderately address most of the seven purpose and need items. The alternative would reduce congestion, and enhance safety and pedestrian/bicycle travel, by reconstructing the existing roadway as a divided four-lane arterial with new sidewalks and bicycle facilities. However, Alternative 4 Modified’s distance from the MD 355 corridor hampers its ability to effectively meet all the needs of the study area. For instance, the alternative would result in the highest number of congested intersections because it does not divert a large enough volume of traffic from MD 355 where the majority of the congested intersections are located. Its distance from MD 355, and the limited east-west connections between the Alternative 4 Modified corridor and the MD 355/I-270 corridor, would limit its ability to support planned growth in the Technology Corridor. Furthermore, the Alternative 4 Modified corridor has a very high level of intersecting streets (38, of which 25 are unsignalized) and driveways (90). Consequently, the roadway is anticipated to have a crash rate that is significantly higher than the access-controlled Alternatives 8 and 9. The numerous intersections along Alternative 4 Modified would pose a higher potential for conflicts between automobiles and bicyclists than Alternatives 8 and 9. Alternative 4 Modified would improve emergency access by providing a wider roadway; how. Travel time would be moderately improved through the provision of a safer roadway that would improve vehicular, transit, pedestrian, and bicycle travel through the corridor. Travel time reductions would be experienced along the corridor; however, the alternative would not reduce travel time along MD 355 as well as Alternatives 5, 8 and 9, and it would result in operational problems at the intersections on Ridge Road.

**Alternative 5 – MD 355 with Service Roads:** This alternative would complete MD 355 as a six-lane divided major arterial and would include intersection improvements, missing sidewalk and shared use path links, and the addition of new service roads. Alternative 5 varies in the degree that it would address the seven purpose and need items. The alternative would significantly improve congestion in the study area since its improvements are focused on the several intersections along MD 355 that would exceed the congestion threshold under the No-Build alternative. Travel safety would also be enhanced by the proposed service roads which would reduce the number of access points and reduce the potential for conflicts between vehicles, pedestrians, and bicyclists. However, because nearly all of the MD 355 corridor has already been constructed to its ultimate six-lane divided section, the alternative would not significantly improve mobility and network efficiency. And since the improvements would provide little additional lane capacity in the study area, the alternative would be limited in its ability to accommodate planned growth in the Technology Corridor. The portion of the alternative along MD 355 would still include 24 intersections and 17 driveways and is anticipated to have a higher crash rate than the access-controlled facility under Alternatives 8 and 9. Also, the number of intersections along the corridor, combined

with its six-lane width, would still pose challenges for bicyclists and pedestrians. Furthermore, the alternative would not provide separate on-road bicycle facilities like Alternatives 4 Modified, 8, and 9. Alternative 5 would not provide a significant improvement for emergency access and it would not provide a new alternative route to detour around blocked roadways. Quality of life would be moderately improved through the provision of a less congested and safer roadway with moderate travel time improvements.

**Alternative 9 – Master Plan Alignment:** This alternative would construct Midcounty Highway as a new four-lane divided arterial between MD 27 and Montgomery Village Avenue and would widen the existing Midcounty Highway to six lanes from Montgomery Village Avenue to Goshen Road. Alternative 9 would include new roadway, sidewalk, shared use path, and on-road bicycle facilities to accommodate vehicular, transit, pedestrian, and bicycle travel. Alternative 9 would most effectively address the purpose and need of the project. First, the alternative would result in a low number of congested intersections throughout the study area and would provide the highest number of peak hours of acceptable operation at major intersections in the study area. In addition, Alternative 9 would provide a facility with partial control of access, which is currently missing from the highway network in the study area. The roadway would also enhance network efficiency and mobility in the corridor since it would provide a new north/south link with several east-west connections to MD 355 and I-270. Under Northern Terminus Option A or Option D, Alternative 9 would have only 13 intersections, of which 5 would be unsignalized, and no driveways or entrances along the roadway. (Northern Terminus Option B would have 19 intersections, of which 10 would be unsignalized). Consequently, Alternative 9 (particularly with Option A or D) would be superior to the other alternatives in its ability to provide a safe roadway facility with the lowest projected crash rates, and less potential for conflicts between vehicular traffic and pedestrian/bicycle traffic. Alternative 9 would provide the most new highway lane capacity in the study area (22.3 lane miles), fully accommodating the projected growth that has been identified in the area master plans. In addition, Alternative 9 would be the most effective at reducing traffic volumes on MD 355, which would substantially reduce congestion and travel time without disrupting businesses through changes in access or loss of parking. Furthermore, the alternative would complete a 12-mile link between Clarksburg and Gaithersburg with the potential to have a future direct connection to the Intercounty Connector (ICC), thus providing an inducement for new business and industry to locate in the Technology Corridor. Because the alternative would provide a new north-south access-controlled link in the study area network of roads, it would also be most effective at improving network efficiency and the ladder configuration would improve mobility. The new roadway would also improve emergency access and would serve as an alternative route in the event I-270 or MD 355 is blocked during an incident. Quality of life would be substantially improved by providing the community with the maximum travel time savings,



the safest roadway facility, and new pedestrian and bicycle facilities that would accommodate safe, efficient travel between Clarksburg and Gaithersburg.

**Alternative 8 – Master Plan Alignment Truncated at Watkins Mill Road:** This alternative would construct Midcounty Highway as a new four-lane divided arterial between MD 27 and Watkins Mill Road and would widen the existing Midcounty Highway to six lanes from Montgomery Village Avenue to Goshen Road. However, Alternative 8 would eliminate the final 4200-foot segment between Watkins Mill Road and Montgomery Village Avenue to avoid impacts to Whetstone Run and its associated resources. Alternative 8 would include new roadway, sidewalk, shared use trail and on-road bicycle facilities to accommodate vehicular, transit, pedestrian, and bicycle travel. In general, the truncation of the Master Plan alignment as proposed under Alternative 8 would reduce the Master Plan alignment’s effectiveness at addressing purpose and need from a very high level under Alternative 9 to a moderate level under Alternative 8. For example, the alternative’s ability to reduce congestion would be substantially lower than Alternative 9 due to the increased traffic on MD 355 south of Watkins Mill Road, which would result in additional congestion and failing intersections on this southern segment of MD 355. On the other hand, the alternative would still match Alternative 9 with the highest number of peak hours of acceptable operation at major intersections in the study area. As with Alternative 9, Alternative 8 would provide a facility with partial control of access, which is currently missing from the highway network in the study area, and would have the same low number of intersections, and no driveways, along the access-controlled portion of the alternative. Consequently, Alternative 8 would provide a safer roadway facility with a lower volume of projected crash rates than all alternatives except Alternative 9. Alternative 8 would provide a high level of pedestrian and bicycle facilities north of Watkins Mill Road, however, the portion south of Watkins Mill Road would require circuitous travel along other roadways without access controls or bicycle lanes. Since Alternative 8 would provide a new facility, it would provide a high level of additional highway lane capacity (17.9 lane miles). However, its truncation would reduce the volume of traffic that would divert to the new roadway from MD 355 and other north-south roadways. In fact, the traffic analysis reveals that, between Middlebrook Road and Watkins Mill Road, Alternative 8 would have 42% fewer vehicles than the same section of Alternative 9. This is due to the gap in the 12-mile corridor, making it less effective than Alternative 9 at accommodating planned growth in the Technology Corridor. The new roadway would also improve emergency access and would serve as an alternative route in the event I-270 or MD 355 is blocked during an incident. Quality of life would be moderately improved by providing the community with a modest level of travel time savings, a safer access-controlled roadway facility, and new pedestrian and bicycle facilities that would enhance safer and more efficient travel between Clarksburg and Gaithersburg.

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