Transportation Facility Planning – Mountain Road (MD 177)

Commercial Corridor Study (Solley Road/Waterford Road to Edwin Raynor Boulevard)

Project No. H539600
Contract No. H539604

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Prepared for

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1 Introduction

1.1 Project Purpose

The Mountain Road Commercial Corridor Study was conducted to determine traffic operations and safety improvements for all travel modes, improve access and control and increase mobility options for pedestrians and cyclists along Mountain Road (MD 177) located in Pasadena, Maryland. Recommendations were also developed to improve the aesthetics and functionality of the commercial corridor. An urban design framework was created with potential strategies to create distinctive, identifiable places along Mountain Road that could enhance the use of the corridor for all users.

This report documents the results for each of the assigned tasks associated with the corridor study.

1.2 Study Area

Mountain Road, between the study limits of Solley Road/Waterford Road and Edwin Raynor Boulevard, is an east-west arterial roadway that provides access to residential and commercial properties in this area of Anne Arundel County. The western end of the corridor is generally more residential while the eastern end is more commercial. There is one school (George Fox Middle School) centrally located that is on the north side of the corridor. As part of this school, there is a designated school zone marked along Mountain Road. There is no current public transportation in the corridor.

The corridor is generally one lane in each direction with turn lanes at major intersections. There are no specific bicycle facilities, but signs are posted indicating shared use conditions with vehicular traffic. Recent improvements have been made to construct sidewalk and sidewalk ramps in certain areas of the corridor. However, much of these pedestrian facilities (sidewalk, crosswalks and ramps) are discontinuous which limits mobility options within and through the corridor. The posted speed limit throughout the corridor is 40 mph. Shown in **Figure 1**, the study area consists of six signalized intersections, one push button activated signal at the Anne Arundel County Fire House No. 30, and 12 unsignalized intersections in addition to numerous driveways accessing commercial properties along the roadway.

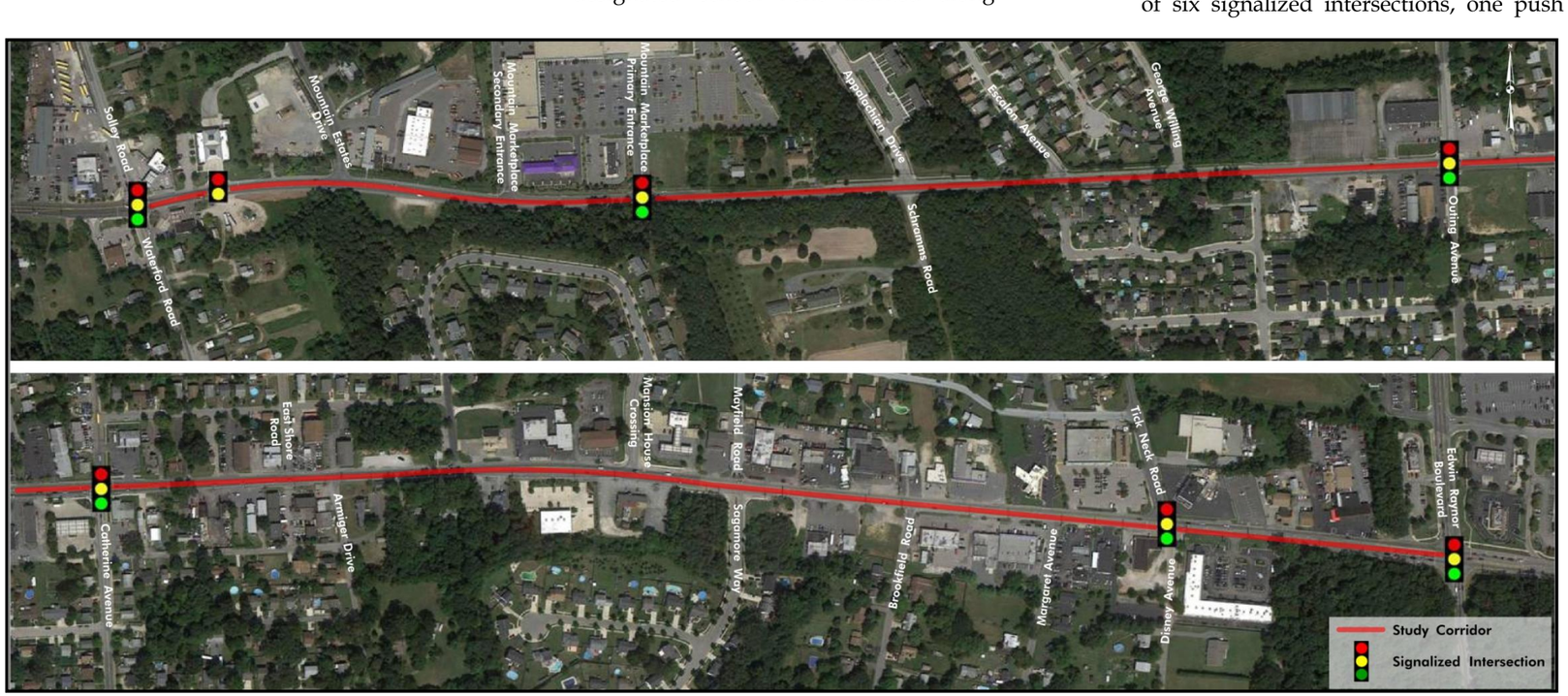


Figure 1: Study Area (Not to Scale, NTS)

1.3 Study Intersections

The study intersections along Mountain Road include:

- Solley Road/Waterford Road
- Mountain Estates Drive
- Mountain Marketplace Secondary Entrance
- Mountain Marketplace Primary Entrance
- Appalachian Drive/Schramms Road
- Escalon Avenue
- George Willing Avenue
- Catherine Avenue
- East Shore Road/Armiger Drive
- Mansion House Crossing
- Mayfield Road/Sagamore Way
- Brookfield Road
- Margaret Avenue
- Tick Neck Road/Disney Avenue
- Edwin Raynor Boulevard

1.4 Project Management Team

A Project Management Team (PMT) consisting of representatives from the Anne Arundel County Economic Development Corporation (EDC), the County Office of Planning and Zoning (OPZ), the County Department of Public Works (DPW), the Maryland State Highway Administration (SHA) and STV Incorporated was established to oversee the project and gain concurrence from the

relevant stakeholders regarding project deliverables. The PMT met periodically to review and discuss each of the project tasks as well as met with the public to inform local residents and business owners of the project's findings.

2 Existing Conditions Analysis

An existing conditions analysis was conducted to determine the current traffic operations and safety issues experienced throughout the corridor. The Existing Conditions Analysis Memorandum, dated June 2013, is included in **Appendix A**.

2.1 Traffic Data

Traffic data was also collected throughout the corridor including peak hour turning movement counts for vehicles and pedestrians and mechanical counts that collected volume, speed and classification information over a weeklong period. At intersections where traffic data was not collected, volumes were derived based on observations and volume balancing between adjacent intersections. The existing peak hour vehicle and pedestrian volumes can be found in **Appendix A**.

2.2 Field Observations

Field observations were conducted to determine operational characteristics on typical commuting weekdays as well as to confirm lane geometry, traffic control and storage for turn lanes. Key observations included:

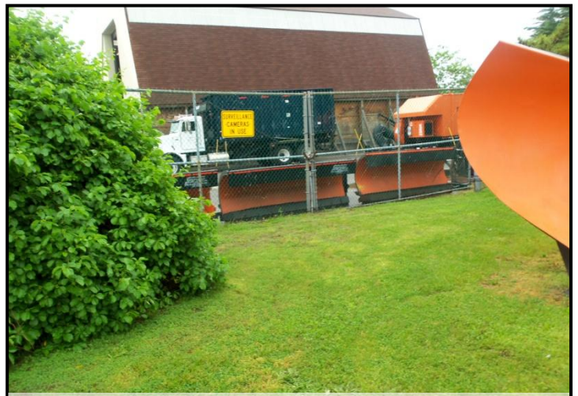
- Significant school bus traffic during the AM and PM peak hours
- Moderate pedestrian traffic, particularly school children, generated by George Fox Middle School on the north side of Mountain Road
- Significant queuing during the AM peak hour at the following intersections:
  - Edwin Raynor Boulevard (southbound through)
  - Catherine Avenue (westbound left turn)
- Significant queuing during the PM peak hour at the following intersections:
  - Edwin Raynor Boulevard (northbound through)
  - Catherine Avenue (northbound through)
- Eastbound traffic is metered by Catherine Avenue during the PM peak hour

2.3 Special Uses within Corridor

There are a number of unique land uses along Mountain Road that contribute to the mix of vehicular, pedestrian and cyclist traffic in the corridor. Various uses are shown in **Figure 2** and include:

- Anne Arundel County Fire Department No. 30
- County Maintenance Facility
- Drive Rite Driving School
- Mountain Marketplace Shopping Center
- BB&T Bank
- Exxon

Anne Arundel County Fire Department No. 30


Anne Arundel County Maintenance Facility


Drive Rite Driving School


Mountain Marketplace Shopping Center


BB&T Bank

Exxon

Figure 2: Notable Land Uses

2.4 Maintenance Concerns

Field observations noted a number of concerns that should be addressed with SHA maintenance forces or longer term improvements considered as part of this project. Various issues are shown in **Figure 3** and include:

Drainage Challenges
The corridor is generally flat, which compounded with the fact that the corridor feeds natural watersheds feeding the Chesapeake Bay, makes it challenging to drain the highway in certain areas. There are areas where roadway runoff immediately discharges into what appears to be unnamed creeks. There are also places along the corridor where curbing and low points trap runoff and water may pond for days. It also appears that some drainage features need to be cleaned of debris, particularly at the Solley Road intersection. Drainage concerns are more prevalent on the central and eastern ends of the corridor.

Fixed Objects in Traveled Way
There are considerable examples of utility poles, fire hydrants, signs and other features which are in the traveled way or clear zone. A particular example is at the Margaret Avenue intersection. Though a majority of fixed objects appear to be utilities, it also appears that some of the fixed objects, such as business signage, were placed in the traveled way by property owners.

Pedestrian Paths can be Hidden from Drivers
Pedestrians were observed all over the corridor walking where they desired including areas with limited visibility to oncoming motorists even when better mobility options were available on the other side of the road. This includes areas along the south side of the corridor (generally on the eastern end) where there is only a two to three foot shoulder. In certain areas, the vegetation is overgrown and motorists will swerve into the oncoming lane to avoid a pedestrian.

Signs and Other Traffic Control Devices can be Blocked
Similar to pedestrian paths noted above, some signs are blocked by the overgrown vegetation. Additionally, there are traffic control devices, particularly signs, that blend into the surrounding visual distractions.


Drainage concerns near Outing Avenue

Fixed objects in roadway near Margaret Avenue


Pedestrian path hidden from drivers


Drainage concerns east of Sagamore Way

Fixed objects in roadway near Catherine Avenue


Pedestrian path overgrown by vegetation

Signage that blends into surroundings

Figure 3: Maintenance Concerns

2.5 Crash Analysis

Intersection crash data was obtained from SHA for the six signalized intersections within the corridor for the period of 2009 through 2011. **Table 1** summarizes the results of the intersection data.

Table 1 indicates a moderate amount of crash activity at the signalized intersections. No fatalities were observed, and the predominant crash type included rear end and left turn collisions. Night crashes comprised one-third of the crashes at the intersections. Wet pavement was also a contributing factor in about one-quarter of the crashes at the intersections.

Data was also obtained showing crash history throughout the entire corridor for the period of 2002 through 2011. This data was used to understand crash activity at some of the smaller intersections as well as in between the six signalized intersections. **Table 2** summarizes the 2002-2011 crash information for the corridor by year.

Based on the analysis of **Table 2**, some unique observations become evident. There were 139 crashes in the corridor between the years of 2009 and 2011 compared to 63 at the intersections. The number of crashes spiked in 2011 compared to the previous two years. However, the crashes reported during 2009 and 2010 are generally lower than the other years studied. **Additionally, the corridor has significantly higher crash rates documented by SHA for most of the categories evaluated.** Notable exceptions include fatalities as well as incidents involving trucks.

Table 1: Existing Intersection Crash Data (2009-2011)

	Crashes by Intersection	Solley Road	Mountain Marketplace	Outing Avenue	Catherine Avenue	Tick Neck Road	Edwin Raynor Boulevard	*Total*
Severity	Injury	4	0	3	7	3	9	***26***
	Property Damage	7	2	5	7	5	9	***35***
Type	Opp. Dir.	0	0	0	1	0	0	***1***
	Rear End	5	1	6	4	4	5	***25***
	Sideswipe	1	1	0	1	1	0	***4***
	Left Turn	3	0	0	5	0	9	***17***
	Angle	1	0	1	2	0	3	***7***
	Ped/Bike	0	0	0	1	1	0	***2***
	Parked Vehicle	0	0	0	0	0	0	***0***
	Fixed Object	0	0	1	0	2	1	***4***
	Other	1	0	0	0	0	0	***1***
Extenuating Circumstances	Night Time	3	1	1	7	2	6	***20***
	Wet Surface	3	0	2	4	1	5	***15***
Total Crashes		***11***	***2***	***8***	***14***	***8***	***18***	***61***

Table 2: Existing Corridor Crash Data (2002-2011)

Year => Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total	Study Corridor Rates	Statewide Average Rates
Injury	27	24	20	13	23	15	24	17	15	24	202	126.7 **	70.7
Prop. Damage	42	38	31	33	28	28	30	28	25	30	313	196.4 **	96.6
Total Crashes	69	63	51	46	51	44	54	45	40	54	517	324.3**	169.2
Severity Index	150	137	91	82	108	94	118	81	63	107	Average 104		
Rate	410.6	370.8	296.0	273.3	306.1	264.1	370.9	309.9	273.7	371.7			
Opposite	1	1	0	0	0	2	2	2	0	3	11	6.9	7.4
Rear End	35	25	18	19	26	15	17	19	13	22	209	131.1 **	61.6
Sideswipe	4	2	4	1	2	3	4	1	3	4	28	17.6 **	10.5
Left Turn	6	6	9	4	2	5	7	8	4	6	57	35.8 **	13.5
Angle	17	20	10	12	13	11	11	9	8	9	120	75.3 **	33.8
Pedestrian/Bike	0	1	2	0	2	1	4	1	3	1	15	9.4 **	4.4
Parked Vehicle	0	0	0	1	1	0	0	0	0	3	5	3.1**	1.7
Fixed Object	4	6	7	7	5	5	4	4	9	4	55	34.5 **	25.2
Other	2	2	1	2	0	2	5	1	0	2	17	10.7 **	3.0
Night Time	22	15	17	14	11	15	17	10	13	17	151	29%	31%
Wet Surface	16	13	11	6	8	9	10	11	9	14	107	21%	21%
Intersection	32	36	20	13	22	25	25	18	17	28	236		

**** Significantly higher than the statewide average**

2.6 Capacity Analysis

Existing intersection capacity was analyzed using the Critical Lane Volume (CLV) approach as well as with Synchro 8 software at the six signalized intersections within the corridor. The CLV approach is a planning level tool to identify Level of Service (LOS).

LOS is defined as a qualitative measure of intersection operations with LOS A through LOS D generally considered acceptable, LOS E indicating capacity and LOS F indicating substandard conditions. Synchro uses the methodology from the ***Highway Capacity Manual*** which offers a more detailed examination of traffic operations.

The software records a variety of measures of effectiveness (MOEs). The MOEs utilized as part of this evaluation included delay, volume-to-capacity (v/c) and LOS. The Synchro evaluation considered the existing traffic signal timing as well as phasing at each intersection. Traffic signal timing was obtained from the existing controller cabinets.

Figure 4 summarizes the Synchro analysis LOS findings for each signalized intersection. The results of the HCM analysis indicate that the intersections of Mountain Road at Catherine Avenue as well as Edwin Raynor Boulevard operate at an unacceptable LOS.

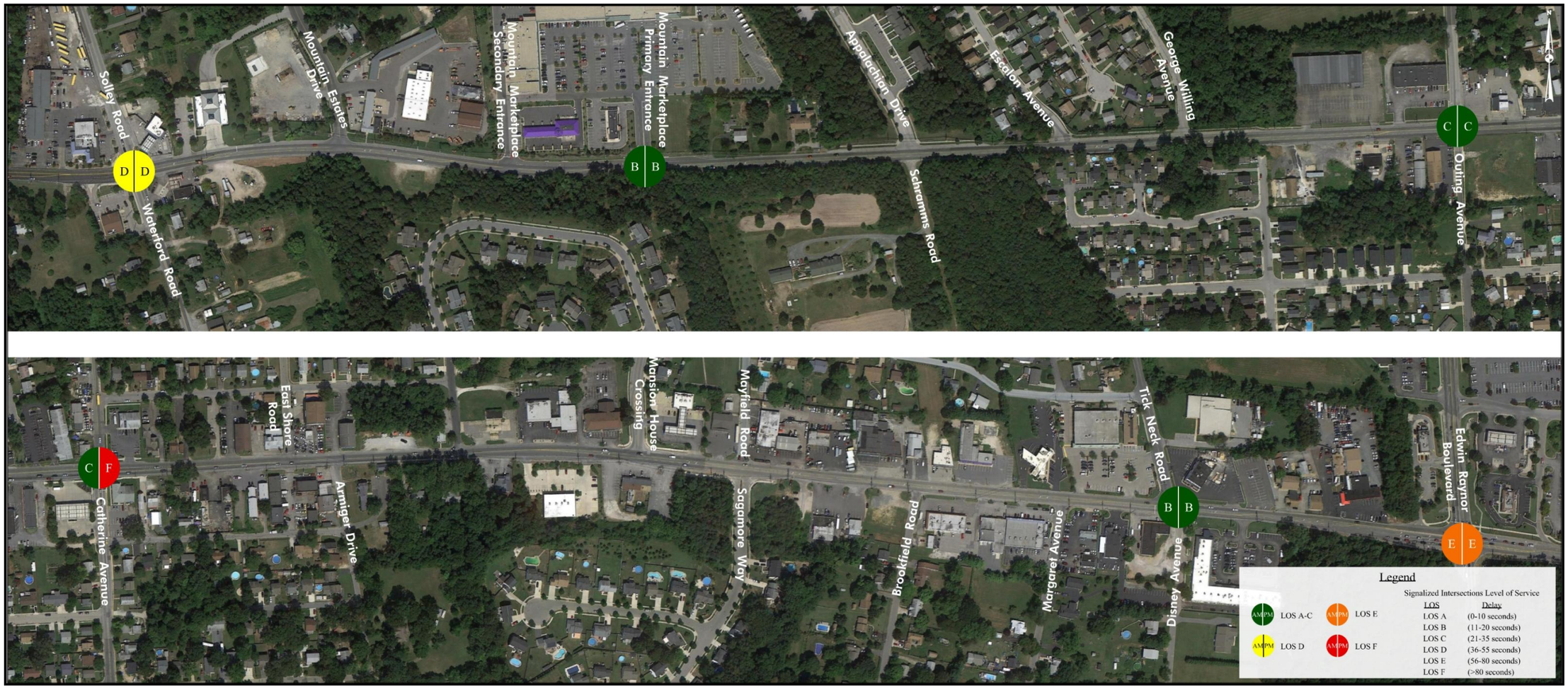


Figure 4: Existing Overall HCM Level of Service Summary (NTS)

2.7 Model Calibration

At the request of the PMT, the Synchro model created to evaluate the existing conditions was updated to reflect the field collected travel time data, or in other words, calibrated with SimTraffic software. The Synchro Calibration memorandum, dated December 2013, documents the process for calibrating the existing conditions Synchro model and is included in **Appendix B**.

Travel times were documented along Mountain Road between the study limits of Solley Road/Waterford Road and Edwin Raynor Boulevard.

The difference between the modeled and measured travel times for the westbound direction in the AM peak hour and the eastbound direction in the PM peak hour was high.

Therefore, calibration of the Synchro model was conducted to more accurately reflect the field conditions. Parameters in the model were adjusted, and the resultant SimTraffic travel times compared to the field collected travel times are shown in **Table 3**. The Synchro model was calibrated within 10% of the measured travel times. The calibrated model also provides an accurate representation of the queuing experienced by motorists traversing the corridor.

2.8 Public Involvement

A public meeting was held in October 2013 to present the existing conditions findings to local residents and business owners. Comment forms received at the meeting are included in **Appendix C**.

Table 3: Mountain Road Travel Times – Calibrated Model (mm:ss)

Condition	AM Peak Hour		PM Peak Hour	
	Eastbound	Westbound	Eastbound	Westbound
Measured	4:13	3:57	5:58	4:29
Modeled	3:56	4:19	5:26	4:29
% Difference	7.2%	9.3%	9.8%	0.0%

3 Travel Demand Forecasting

The future volumes for the year 2035 were developed using the following process:

- Evaluate the Regional Travel Demand Model to establish Projected growth
- Determine impacts associated with planned development activity
- Develop the 2035 No Build Volumes

These steps are detailed in the Travel Demand Forecasting Memorandum dated August 2013, included in **Appendix D**, and are summarized below.

3.1 Regional Travel Demand Model

Regional Travel Demand Model outputs were obtained from the Baltimore Metropolitan Council (BMC) for the years 2010 and 2035. The outputs contained projected daily, AM and PM peak period volumes throughout the study area including the major side streets of Solley Road/Waterford Road, Catherine Avenue, Tick Neck Road and Edwin Raynor Boulevard.

The daily, AM and PM peak period forecasts from 2010 and 2035 were evaluated to establish the projected growth along Mountain Road and major intersecting side streets. Though portions of the corridor and neighboring side streets showed zero or negative growth, the following annual growth rates were (conservatively) considered:

- Mountain Road: 1.0%
- Solley Road/Waterford Road: 0.5%
- Catherine Avenue: 0.5%
- Tick Neck Road: 0.5%
- Edwin Raynor Boulevard: 0.5%

The 1.0% growth rate was applied to the Existing Condition volumes for the east- and westbound through movements along Mountain Road. The 0.5% growth rate was applied to the Existing Condition volumes for all north- and southbound movements along the aforementioned major side streets as well as the east- and westbound turning movements from Mountain Road onto each of the major side streets. Since the turning movement counts were collected in 2013, the growth rates were compounded annually for 22 years to determine the projected 2035 AM and PM peak hour turning movement volumes.

3.2 Development Activity

Planned development activity within the study limits included the Pasadena Community Center, the Farmington Village at Schramm subdivision and the fast-food restaurant at Mountain Marketplace. The planned developments are shown in **Figure 5**.

Pasadena Community Center

Farmington Village at Schramm subdivision

Final pad site for fast-food restaurant

Figure 5: Planned Development

Projected turning movement volumes were calculated using the 8th Edition of the Institute of Transportation Engineers ***Trip Generation***. Trip distribution and assignment were based on existing traffic patterns, and mode split was not considered for this study. Trips generated from these planned developments were added to the 2035 AM and PM peak hour vehicle volumes, creating the 2035 No Build volumes

3.3 2035 Volumes

The summation of the Existing Conditions peak hour volumes, projected growth and planned development activity was used to establish the 2035 No Build Condition. An increase in pedestrian activity is not expected between 2010 to 2035; therefore, the pedestrian volumes remained the same between Existing and No Build Conditions.

4 Purpose and Need Statement

A purpose and need statement was created to use when establishing alternatives as well as to be used to justify advancing the project into the State's Consolidated Transportation Plan or the County's Capital Improvement Program. **Appendix E** includes the Purpose and Need Statement memorandum, dated August 2013.

4.1 Project Purpose

The purpose of the Mountain Road (MD 177) Commercial Corridor Study is to:

- Account for planned and future growth along the corridor in order to mitigate congestion and maintain an acceptable Level of Service
- Address strategies and designs to reduce the number of crashes throughout the corridor, as well as enhance corridor aesthetics
- Provide multi-modal options throughout the corridor and allow safe and continuous access for pedestrians and cyclists
- Improve accessibility to the corridor as a means of promoting economic revitalization

4.2 Project Need

The Mountain Road (MD 177) Commercial Corridor Study is needed to address current and proposed operational and capacity deficiencies that will occur as a result of planned and future development. The corridor currently operates at an unacceptable Level of Service at multiple locations within the study limits, and it is expected that congestion will continue to increase due to planned and future development.

Crash rates along the corridor were significantly higher than most statewide averages for each category studied. Redesigns can be implemented to consolidate areas of open pavement to reduce areas of conflict while minimizing impacts to adjacent parcels. Unsafe conditions also exist for pedestrians and bicyclists, as designated facilities are not continuous along Mountain Road. This leads pedestrians and bicyclists to traverse the corridor along the shoulder, through areas with inadequate lighting or overgrown vegetation, making it difficult to be seen by motorists.

5 Typical Roadway Sections

Coordination efforts with the PMT have led to the development of the No Build Alternative (Alternative 1) in addition to two build alternatives (Alternatives 2 and 3) that support the project's purpose and need. These build alternatives focus on maintaining acceptable traffic operations in the year 2035, pedestrian and bicycle connectivity, safety, access control and the promotion of economic revitalization. The process of establishing the roadway typical sections is detailed in the Roadway Typical Sections Memorandum, dated April 2014, which is included in **Appendix F**.

5.1 No Build (Alternative 1) Capacity Analysis

A summary of the 2035 No Build Synchro analysis findings for the corridor's six signalized intersections is shown in **Figure 6**. The intersections of Mountain Road and Solley Road/Waterford Road, Catherine Avenue and Edwin Raynor Boulevard were projected to operate at a LOS E or F during either the AM or PM peak hour in the year 2035 and were therefore identified as the corridor's critical intersections.

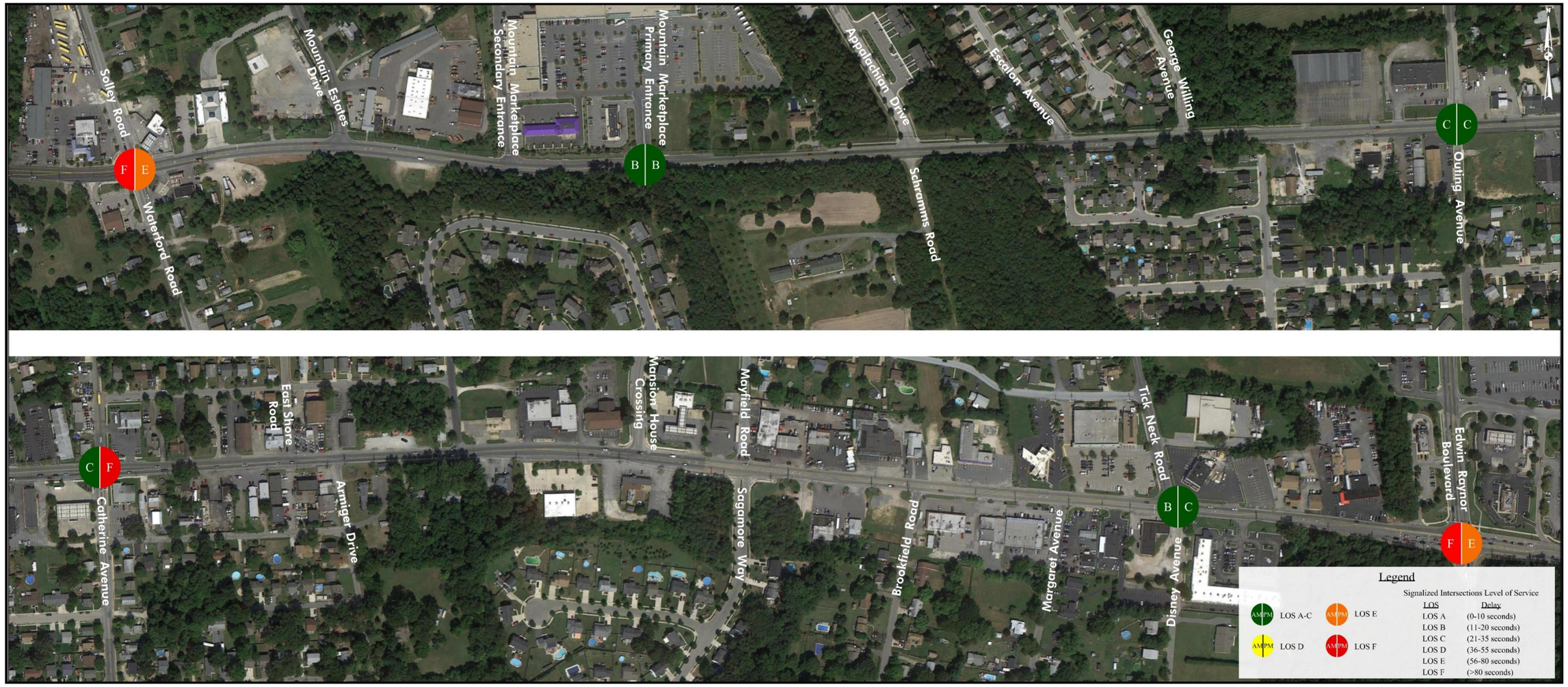


Figure 6: 2035 No Build HCM Level of Service Summary (NTS)

5.2 Development of Build Alternatives (Alternatives 2 and 3)

5.2.1 Intersection Improvements

In order to account for planned and future growth along the corridor, intersection improvements were recommended at the three failing intersections in order to maintain an acceptable LOS of D or better. Multiple traffic improvements were tested at the critical intersections and are defined in the Roadway Typical Sections Memorandum. After discussions with the PMT, the following intersection improvements, shown in **Figure 7**, were recommended:

Solley Road/Waterford Road:

- Add a northbound right-turn lane with 5-foot bike lanes in both directions on Waterford Road (MD 648)
- Add a southbound left-turn lane on Solley Road
- Implement exclusive/permissive phasing in the north- and southbound directions

Catherine Avenue:

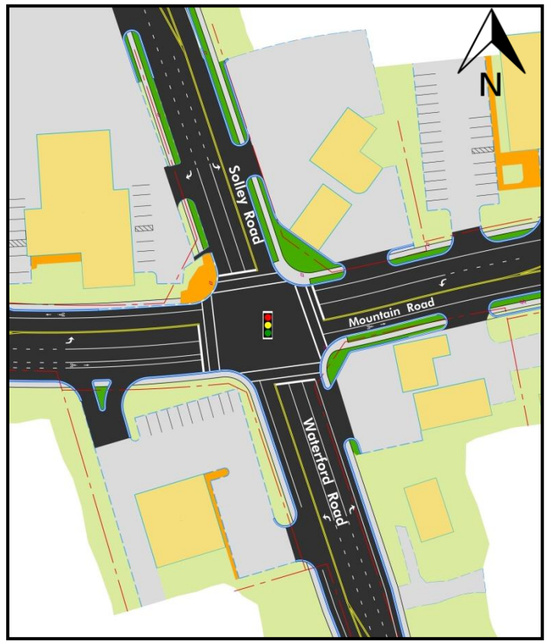
- Extend the westbound left-turn lane to 250 feet
- Add an eastbound through lane between Outing Avenue and Mansion House Crossing

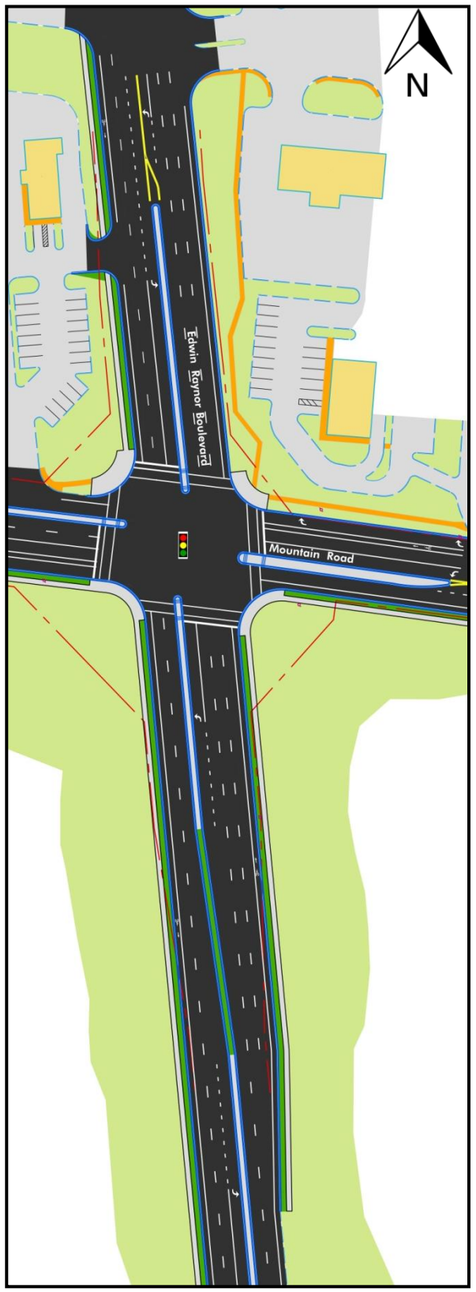
Edwin Raynor Boulevard:

- Add a northbound through lane between Deering Road and Old Crown Drive

In order to improve traffic signal progression and spacing throughout the corridor, traffic signals were recommended at the intersections of Mountain Road at Appalachian Drive/Schramms Road and Mountain Road at Mansion House Crossing. It should be noted, however, that while traffic signals were considered at these intersections, additional justification may be necessary to warrant traffic signals at these locations. Traffic signal parameters were also adjusted for all of the signalized intersections to improve operations throughout the corridor.

The findings of the Synchro analysis for the aforementioned traffic improvements at the six existing and two proposed signalized intersections are summarized in **Figure 8.**





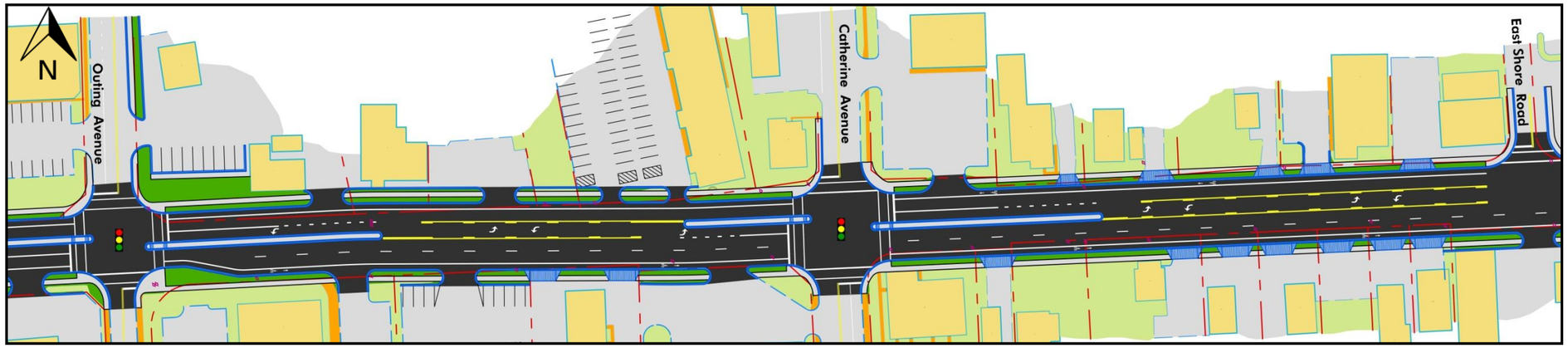


Figure 7: Proposed Intersection Improvements (NTS)

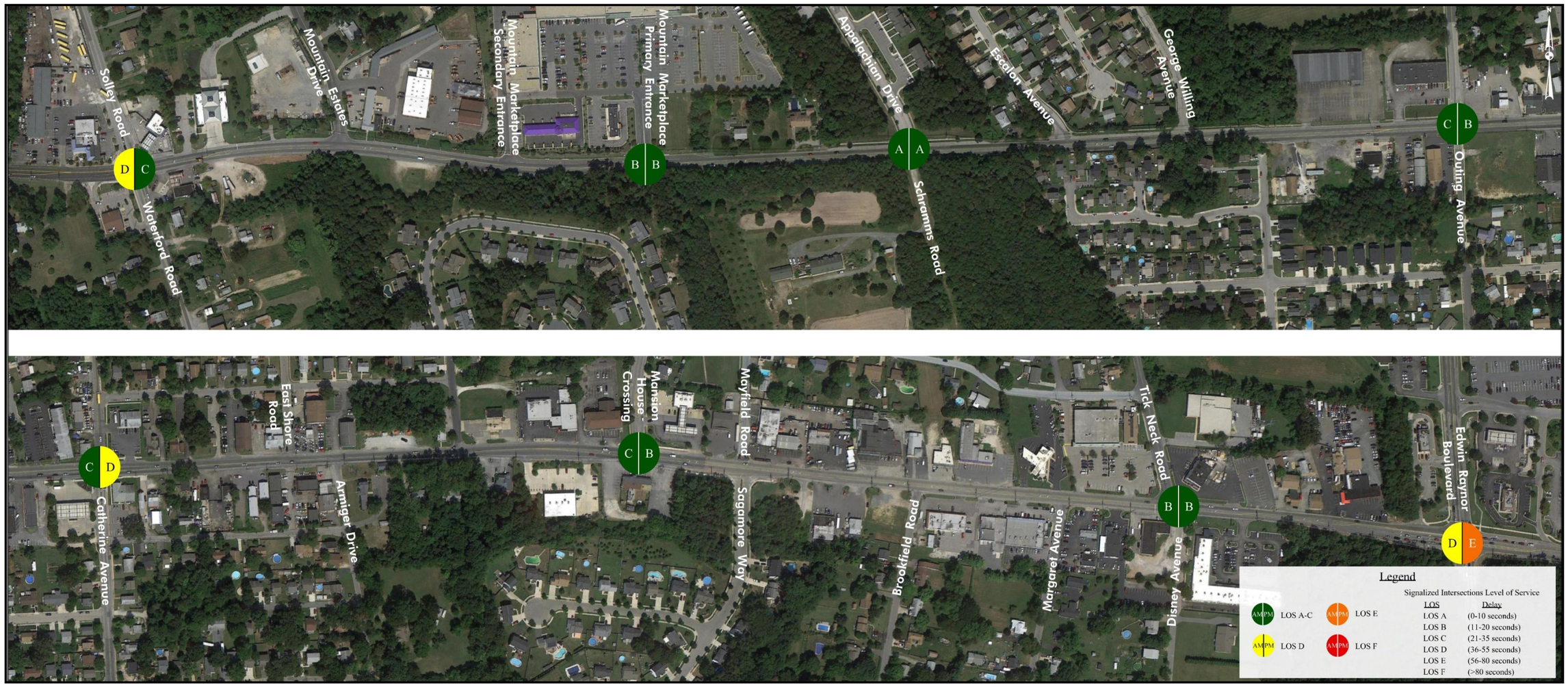


Figure 8: 2035 with Improvements HCM Level of Service Summary (NTS)

As shown in **Figure 8**, each of the signalized intersections is projected to operate at LOS D or better, except for Mountain Road at Edwin Raynor Boulevard, which is projected to operate at LOS E during the PM peak hour. This was deemed acceptable, however, by Anne Arundel County and the SHA because the intersection is projected to operate slightly better than the existing condition during both AM and PM peak hours.

5.2.2 Pedestrian and Bicycle Considerations

In order to provide safe and continuous access for pedestrians and cyclists, sidewalks and bike lanes were considered throughout the corridor. With input from the PMT, it was determined that based on SHA requirements, each alternative would include 5-foot bicycle lanes and 5-foot sidewalks with 5-foot grass buffers in each direction along the study's limits of Mountain Road.

5.2.3 Access Management Considerations

Access management, particularly along the eastern half of the corridor, was reviewed to potentially improve safety for both vehicles and pedestrians. As stated previously, corridor crash data was reviewed for the years 2002-2011, and the corridor crash rates were found to be significantly higher than the statewide averages for most of the categories evaluated. This can likely be attributed to the number of unsignalized side streets and numerous access points along the corridor. In order to limit the amount of open pavement along the corridor, access points to adjacent businesses were consolidated along Mountain Road to one per property. This would not only improve safety by limiting the number of conflict points for potential collisions associated with entering and exiting the commercial properties, but would also provide a more aesthetically inviting corridor. Business entrances directly adjacent to intersections were closed, and access was provided on the side streets. Further, driveways were considered at select business locations in order to maintain sidewalk continuity.

5.2.4 County Improvements along Edwin Raynor Boulevard

In addition to this project's traffic recommendation to add a northbound travel lane along Edwin Raynor Boulevard from north of Deering Road to Old Crown Drive, the County identified previously planned improvements along Edwin Raynor Boulevard to provide 5-foot bike lanes in each direction from MD 100 to MD 173.

5.3 Alternative 2

The typical section for Alternative 2 is shown in **Figure 9** and includes 12-foot travel lanes, 5-foot bike lanes, 5-foot grass buffers, 5-foot sidewalks in each direction and a 16-foot two-way left-turn lane. The suggested alignment is included in **Appendix F**. The traffic improvements at the intersections of Mountain Road and Solley Road/Waterford Road, Catherine Avenue and Edwin Raynor Boulevard were included in Alternative 2, as well as the access management considerations previously discussed and the County's previously developed plan to provide bike lanes along Edwin Raynor Boulevard.

Five-foot medians with 11-foot left-turn lanes, also shown in **Figure 9**, were implemented at the following intersections with Mountain Road:

- Appalachian Drive/Schramms Road
- Outing Avenue
- Catherine Avenue
- Mansion House Crossing
- Tick Neck Road
- Edwin Raynor Boulevard

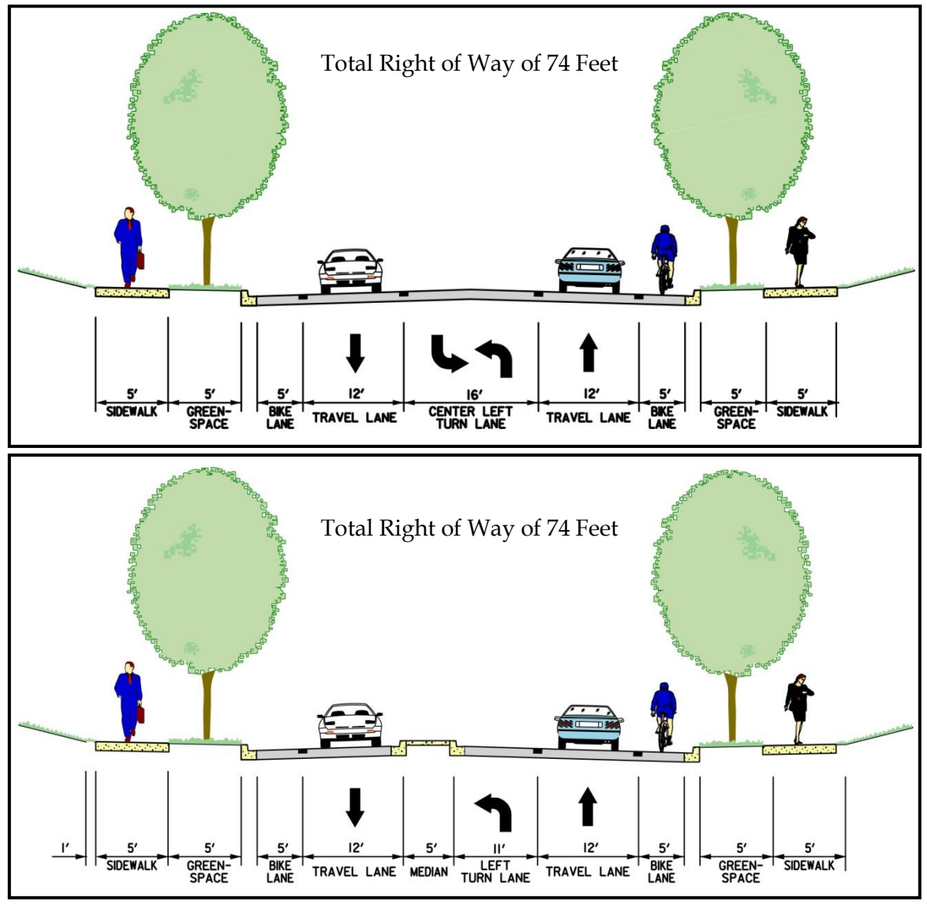


Figure 9: Alternative 2 Typical Section (NTS)

5.4 Alternative 3

The typical section for Alternative 3 is similar to Alternative 2, with 12-foot travel lanes, 5-foot bike lanes, 5-foot grass buffers and 5-foot sidewalks in each direction. However, Alternative 3 includes a 12-foot two-way left-turn lane, compared to the 16-foot two-way left-turn lane in Alternative 2. The typical section for Alternative 3 is shown in **Figure 10,** and the suggested alignment is included in **Appendix F**.

The traffic improvements at the intersection of Mountain Road at Solley Road/Waterford Road and Edwin Raynor Boulevard were included in Alternative 3, as well as the access management considerations previously discussed and the County's plan to provide bike lanes along Edwin Raynor Boulevard. However, to reduce right-of-way impacts, the additional eastbound through lane from east of Outing Avenue to Mansion House Crossing was not included.

Under Alternative 3, the intersection of MD 177 at Catherine Avenue is projected to operate at LOS C during the AM peak hour and F during the PM peak hour. Although the intersection is projected to fail during the PM peak hour, the projected delay of 83.0 seconds is an improvement over the existing delay of 93.6 seconds. The LOS for the remaining seven signalized intersections does not change between the two build alternatives.

6 Right-of-Way by Use

Based on the typical sections developed for each alternative, the right-of-way needs were identified, quantified and documented in the Right-of-Way by Use Memorandum dated April 2014.

To determine the existing right-of-way along Mountain Road, multiple sources were used including County provided GIS mapping, development plans for Mountain Marketplace, traffic signal plans throughout the corridor and the locations of fencing and utility poles observed in the field. For further verification, SHA plats were also used to spot check against the established right-of-way.

The proposed right-of-way was established for each alternative based on the typical sections developed. Areas of right-of-way impacts were computed and categorized by adjacent land uses. The zoning categories along Mountain Road were determined using the "My Anne Arundel Zoning Viewer", available on the County's Office of Planning and Zoning website. The right-of-way impacts of each alternative are included in **Appendix G**, and are summarized in **Table 4**.

Table 4: Right-of-Way Impacts

Zoning Category	Right-of Way Impacts (acres)	
	Alternative 2	Alternative 3
R1	0.13	0.12
R2	0.12	0.05
R5	0.36	0.31
Total Residential Impact:	**0.61**	**0.48**
C1	0.13	0.12
C2	0.01	0.01
C3	2.05	1.39
C4	0.45	0.26
Total Commercial Impact:	**2.64**	**1.78**
Total Right-of-Way Impact:	**3.25**	**2.26**

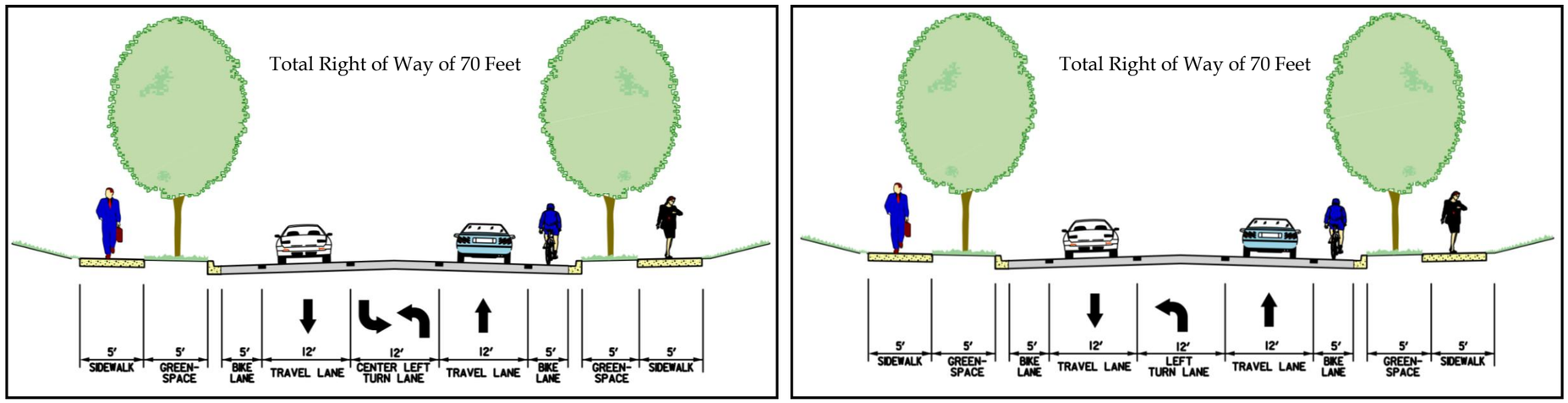


Figure 10: Alternative 3 Typical Section (NTS)

7 Planning Level Cost Estimates

Planning Level Cost Estimates were calculated to identify the projected costs associated with each build alternative. The process for calculating the cost estimates is documented in the Planning Level Cost Estimates Memorandum, dated April 2014, included in **Appendix H.**

7.1 Breakdown of Corridor

In order to quantify the estimated construction costs, the corridor was broken into the following five subprojects:

Project 1 – Mountain Road at Solley Road/Waterford Road Improvements:

- Mountain Road improvements from the study limits of approximately 400 feet west of Solley/Waterford Road to 500 feet east of Solley Road/Waterford Road
- Approximately 400 feet of Solley Road improvements
- Approximately 500 feet of Waterford Road improvements

Project 2 – Mountain Road Corridor Improvements

- Mountain Road improvements from 500 feet east of Solley Road/Waterford Road to 500 feet west of Outing Avenue

Project 3 – Mountain Road at Catherine Avenue Improvements

- Mountain Road improvements from 500 feet west of Outing Avenue to 500 feet east of Mansion House Crossing

Project 4 – Mountain Road Corridor Improvements

- Mountain Road improvements from 500 feet east of Mansion House Crossing to 500 feet west of Edwin Raynor Boulevard

Project 5 – Mountain Road at Edwin Raynor Boulevard Improvements

- Mountain Road improvements from 500 feet west of Edwin Raynor Boulevard to the study limits of approximately 550 feet east of Edwin Raynor Boulevard
- Edwin Raynor Boulevard improvements from north of Deering Road to Old Crown Drive

In addition to the traffic recommendation to add a northbound travel lane along Edwin Raynor Boulevard, the County identified previously planned improvements to provide 5-foot bike lanes in each direction along Edwin Raynor Boulevard from MD 100 to MD 173. The cost estimate for the County's improvement was adjusted for inflation using Consumer Price Index annual rates and has been added to this study.

7.2 Construction Costs

A major quantities estimate was performed based on unit rates identified in the SHA ***2012 Highway Construction Cost Estimating Manual***. Quantities for full depth pavement, grind and resurfacing, curb and gutter, pavement markings and sidewalks were calculated for each of the proposed alternatives. New traffic signals were added to each of the eight signalized intersections, and new signing was included based on the length of the corridor. Preliminary, drainage and landscape contingencies of 70%, 40% and 5%, respectively, were used based on the manual's recommendations for typical SHA projects.

Utility impacts were also included in the construction cost estimates. Utility poles were located in the field and categorizes as either large or small depending on the utilities carried on each pole. A comparison of large versus small utility poles is shown in **Figure 11**. The number of impacted utilities within each subproject is summarized in **Table 5.**

Figure 11: Comparison of Utility Pole Sizes

The cost of $10,000 was used for the relocation of small utility poles and $35,000 was used for the relocation of large utility poles. Although transformers were identified in the field, none would be impacted by the proposed alternatives. The utility impacts were included in the total construction costs, which are summarized in **Table 6**.

7.3 Right-of-Way Impacts

With concurrence from the County, it was determined that $50 per square foot would be used for commercial right-of-way impacts and $30 per square foot would be used to calculate residential right-of-way impacts. The costs associated with the right-of-way impacts are summarized in **Table 7**.

7.4 Total Project Costs

The total project costs, including construction costs and right-of-way impacts, are summarized in **Table 8**.

7.5 Public Involvement

A second public meeting was held in July 2014 to present the three alternatives to local stakeholders including residents and business owners. Notes from the public meeting are included in **Appendix I**.

Table 5: Summary of Utility Impacts (Large/Small)

Subproject	Alternative 2	Alternative 3
1 – Solley Road/Waterford Road	5/3	4/3
2 – Corridor	16/17	14/13
3 – Catherine Avenue	21/23	19/14
4 – Corridor	9/13	7/11
5 – Edwin Raynor Boulevard	4/4	4/4
Total:	**55/60**	**48/45**

Table 6: Summary of Construction Costs

Subproject	Alternative 2	Alternative 3
1 – Solley Road/Waterford Road	$2,885,000	$2,710,000
2 - Corridor	$6,546,000	$6,032,000
3 – Catherine Avenue	$8,419,000	$6,714,000
4 – Corridor	$3,869,000	$3,670,000
5 – Edwin Raynor Boulevard	$11,299,000	$11,125,000
Total:	**$33,018,000**	**$30,251,000**

Table 7: Summary of Right-of-Way Impacts (Commercial/Residential)

Subproject	Alternative 2		Alternative 3	
	Acres	Cost	Acres	Cost
1 – Solley Road/Waterford Road	0.16/0.13	$339,000/$174,000	0.14/0.12	$306,000/$159,000
2 – Corridor	0.06/0.48	$124,000/$629,000	0.04/0.36	$92,000/$471,000
3 – Catherine Avenue	1.55/0	$3,393,000/0	0.89/0	$1,946,000/0
4 – Corridor	0.80/0	$1,745,000/0	0.65/0	$1,413,000/0
5 – Edwin Raynor Boulevard	0.08/0	$164,000/0	0.05/0	$116,000/0
Total:	**2.65/0.61**	**$5,765,000/$803,000**	**1.77/0.48**	**$3,873,000/$630,000**

Table 8: Summary of Total Project Costs

Subproject No.	Alternative 2	Alternative 3
1 – Solley Road/Waterford Road	$3,398,000	$3,175,000
2 – Corridor	$7,299,000	$6,595,000
3 – Catherine Avenue	$11,812,000	$8,660,000
4 – Corridor	$5,614,000	$5,083,000
5 – Edwin Raynor Boulevard	$11,463,000	$11,241,000
Total:	**$39,586,000**	**$34,754,000**

8 Minimization Alternatives

At the July 2014 public meeting, local stakeholders addressed concern that Alternatives 2 and 3 impact a building on the south side of Mountain Road east of Armiger Drive, shown in **Figure 12**, believed to be an historic building. After the meeting, it was confirmed that the building is included on the County's Inventory of Historic Resources. Therefore, minimization alternatives were created to mitigate the impact along this property. In the event that impacts to the historical building cannot be mitigated, the County also allows historical resources to be relocated on the existing property. The option to relocate the building was considered in addition to the two minimization alternatives developed.

8.1 Alternative 2 Minimization

In order to mitigate the impact associated with Alternative 2, a minimization alternative was developed between the intersections of Catherine Avenue and Mansion House Crossing to keep the county-historic building in its current location. This required a 28-foot reduction in the typical section in the vicinity of the building.

Alternative 2 includes the traffic improvement of an additional through lane from just east of Outing Avenue to Mansion House Crossing. As part of the minimization alternative, the additional lane was dropped approximately 400 feet east of Catherine Avenue. In addition to the lane drop, the 5-foot grass buffers were removed and the travel lanes were reduced from 12-feet to 11-feet and the two-way left-turn lane was reduced to 12-feet wide between East Shore Road and Green Forest Drive.

The revised typical section for Alternative 2 Minimization is shown in **Figure 13**. Plan sheets showing the revised section between Catherine Avenue and Mansion House Crossing are included in **Appendix J**.

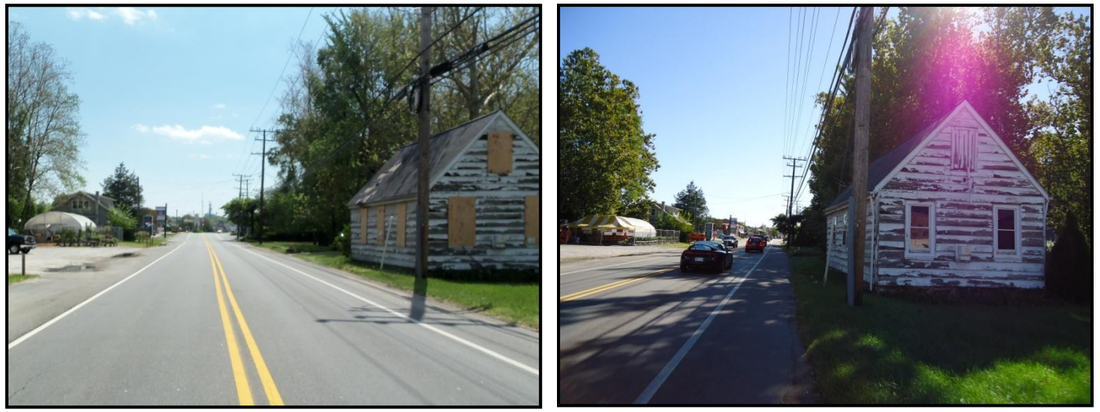


Figure 12: County-Historic Building

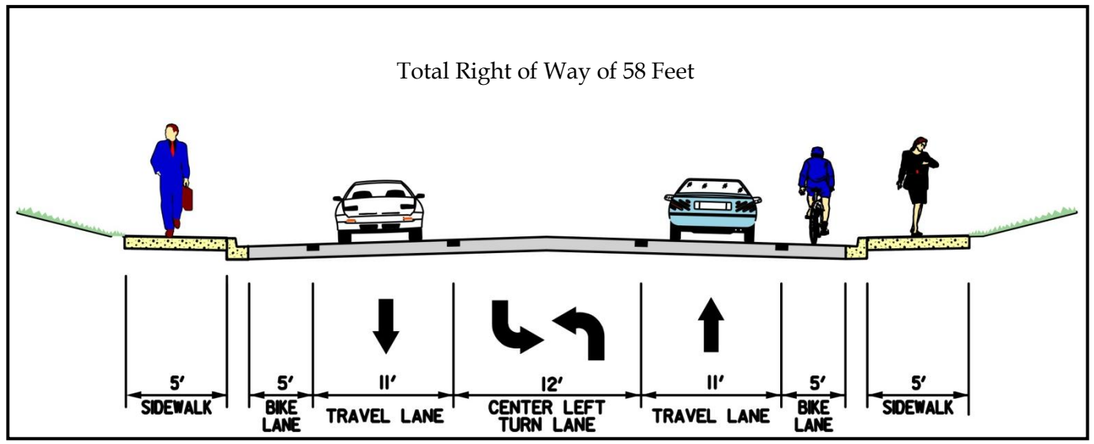


Figure 13: Alternative 2 Minimization Typical Section

8.2 Alternative 3 Minimization

In order to maintain the current location of the historic building, a 14-foot reduction of the section width between Armiger Drive and Green Forest Drive was required. Alternative 3 Minimization includes removing the 5-foot grass buffers, narrowing the travel lanes from 12-feet to 11-feet and narrowing the two-way left-turn lane to 10-feet. The typical section for Alternative 3 Minimization is shown in **Figure 14**. Plan sheets showing the revised section is included in **Appendix K**.

8.3 Minimization Alternatives Construction Costs

A major quantities estimate was performed for each of the minimization alternatives. The construction costs of the minimization alternatives, compared to the original build alternatives, are shown in **Table 9**. Calculation sheets are included in **Appendix L**.

The construction cost decreases by approximately $782,000 between Alternative 2 and Alternative 2 Minimization, and the construction cost between Alternative 3 and Alternative 3 Minimization decreases by approximately $162,000.

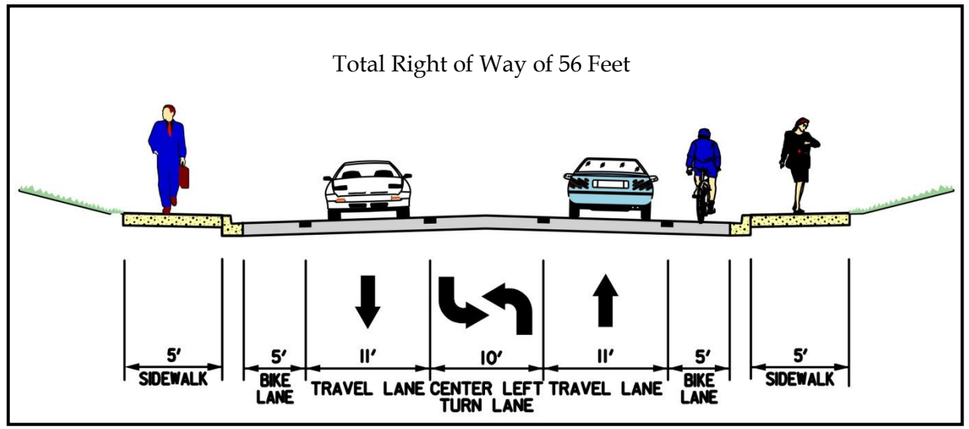


Figure 14: Alternative 3 Minimization Typical Section

Table 9: Summary of Construction Costs

Subproject	Alternative 2	Alternative 2 Minimization	Alternative 3	Alternative 3 Minimization
1 – Solley Road/Waterford Road	$2,885,000	$2,885,000	$2,710,000	$2,710,000
2 – Corridor	$6,546,000	$6,546,000	$6,032,000	$6,032,000
3 – Catherine Avenue	$8,419,000	$7,735,000	$6,714,000	$6,552,000
4 – Corridor	$3,869,000	$3,869,000	$3,670,000	$3,670,000
5 – Edwin Raynor Boulevard	$11,299,000	$11,299,000	$11,125,000	$11,125,000
Total:	**$33,018,000**	**$32,334,000**	**$30,251,000**	**$30,089,000**

8.4 Minimization Alternatives Right-of-Way Impacts

The right-of-way impacts of each of the minimization alternatives are included in **Appendix M**. The costs associated with the right-of-way impacts for each alternative are summarized in **Table 10**.

As shown in **Table 10**, Alternative 2 Minimization is projected to cost approximately $870,000 less than Alternative 2 because of the reduced 0.36 acre right-of-way impact. Alternative 3 Minimization is projected to cost approximately $465,000 less than Alternative 3 due to a reduced right-of-way impact of 0.21 acres.

8.5 Minimization Alternatives Total Project Costs

The total project costs, including construction costs and right-of-way impacts, are summarized in **Table 11.**

8.6 Minimization Alternatives Findings

In addition to the two minimization alternatives, there is an option with Anne Arundel County to relocate an historical resource on the existing property. Shifts in the roadway and narrowed lane widths affect the roadway continuity, and ultimately traffic operations. Because of this, it is recommended that the resource be relocated a distance back from the proposed right-of-way.

Table 10: Summary of Right-of-Way Impacts (Commercial/Residential)

Subproject	Alternative 2		Alternative 2 Minimization		Alternative 3		Alternative 3 Minimization	
	Acres	Cost	Acres	Cost	Acres	Cost	Acres	Cost
1 – Solley Road/Waterford Road	0.16/0.13	$339,000/$174,000	0.16/0.13	$339,000/$174,000	0.14/0.12	$306,000/$159,000	0.14/0.12	$306,000/$159,000
2 – Corridor	0.06/0.48	$124,000/$629,000	0.06/0.48	$124,000/$629,000	0.04/0.36	$92,000/$471,000	0.04/0.36	$92,000/$471,000
3 – Catherine Avenue	1.55/0	$3,393,000/0	1.16/0	$2,525,000/0	0.89/0	$1,946,000/0	0.68/0	$1,483,000/0
4 – Corridor	0.80/0	$1,745,000/0	0.80/0	$1,745,000/0	0.65/0	$1,413,000/0	0.65/0	$1,413,000/0
5 – Edwin Raynor Boulevard	0.08/0	$164,000/0	0.08/0	$164,000/0	0.05/0	$116,000/0	0.05/0	$116,000/0
Total:	**2.65/0.61**	**$5,765,000/$803,000**	**2.26/0.61**	**$4,897,000/$803,000**	**1.77/0.48**	**$3,873,000/$630,000**	**1.56/0.48**	**$3,410,000/$630,000**

Table 11: Summary of Total Project Costs

Subproject	Alternative 2	Alternative 2 Minimization	Alternative 3	Alternative 3 Minimization
1 – Solley Road/Waterford Road	$3,398,000	$3,398,000	$3,175,000	$3,175,000
2 – Corridor	$7,299,000	$7,299,000	$6,595,000	$6,595,000
3 – Catherine Avenue	$11,812,000	$10,260,000	$8,660,000	$8,036,000
4 – Corridor	$5,614,000	$5,614,000	$5,083,000	$5,083,000
5 – Edwin Raynor Boulevard	$11,463,000	$11,463,000	$11,241,000	$11,241,000
Total:	**$39,586,000**	**$38,034,000**	**$34,754,000**	**$34,130,000**

9 Conceptual Design Standards

9.1 Goal

Conceptual design standards are recommended for Mountain Road that will encourage economic development, commercial revitalization and create a sense of place through the establishment of general design concepts to visually and functionally improve the road corridor from Solley Road to Edwin Raynor Boulevard. The development and implementation of standards suggested here will complement the proposed improvements to the corridor, but implementation does not necessarily need to wait for those public improvements to occur. Many of these initiatives can move ahead independent of the corridor improvements, through the action of the local business association and the assistance of County agencies.

9.2 Immediate/Short Term Implementation: General Guidelines for Improving Appearances

Appearances matter. Commercial areas that appear clean, well-maintained, easy to understand and navigate, and offer a sense of place draw people to them. In the short-term, an improved appearance for the Mountain Road Commercial Corridor can be accomplished with a little clean-up work, improved ongoing maintenance of both public and private spaces, and a façade/signage improvement program.

9.2.1 *Clean It Up/Keep It Up: Creating and maintaining a clean appearance is an essential step*

- If possible, develop and implement a public space maintenance program for the public right-of way to enhance the visual perception of the corridor as a clean and attractive place.
- Honor /recognize merchants who clean up and maintain and enhance their own spaces.
- Remove out-of-date signs and banners, old, unused light poles and similar visual clutter
- Screen dumpsters and outdoor storage with fences, walls or planting.
- Design an 'adoption' plan for maintaining the cleanliness of public areas. Encourage business owners to pick up trash in public right-of-way adjacent to their property, sweep and promptly remove snow from walkways.

9.2.2 *Improve Store Windows & Existing Building Façades:*

- Encourage cleaning, painting and repair of storefronts.
- Encourage physical improvements such as planters, window boxes, benches and awnings.
- Identify and assist property owners to apply for government façade improvement rebates or low interest loan programs; if no suitable program exists, create one.
- Decorate and light windows of vacant buildings.
- Display photos or drawings in store windows illustrating local attractions or annual events.
- Consider using the sides of buildings for murals that represent the business or community as a whole.

9.2.3 *Improve On-Site Circulation:*

- Surface parking lots should be clearly striped and clean. Encourage creation of planted buffer between street ROW and parking.
- Front entrances should be clearly communicated through signage, lighting and perhaps seasonal planters.
- Offer rewards to encourage local businesses to improve signage.

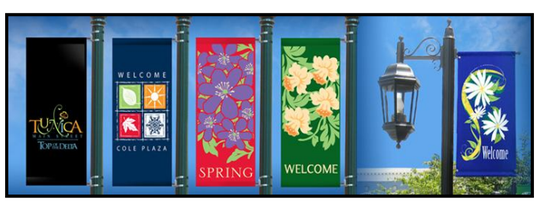
9.2.4 *Community Identification/Event Signage:*

- Design and hang banners that promote local events, such as festivals, exhibits and combined retail sales.
- Hang banners or flags from streetlights or utility poles to represent the season or history of the community.
- Install a historical marker for the property located at 2601 Mountain Road, a building that has been identified as a historic resource and is listed in the Maryland Historical Trust.

Awnings provide an opportunity to add architectural detail to the façade and enhance the visibility of a business with color and legible signage.

Bold graphics and murals painted on the façade or the side of the building can increase the visibility of businesses and create a sense of place.

Banners can help create a sense of place by promoting festivals, holiday celebrations and civic gatherings in the community.



Seasonal banners create a sense of place through colorful graphics and themed imagery, provide a human-scale element to the landscape and generate a sense of civic pride.

9.3 Conceptual Design Standards

Design standards for commercial development can enhance the physical appearance of an area, create a sense of place and encourage economic development. The following conceptual design standards will aide in developing formal Design Guidelines for the Mountain Road Commercial Corridor.

New development, substantial renovation or addition to existing buildings will need to meet County zoning, Landscape Manual and other applicable development requirements, which can be enhanced by area-specific design guidelines. For existing development, design standards should focus on actions that can be taken to improve function and appearances of individual businesses within the constraints of existing building location and site conditions. Incentives may be required to encourage existing businesses to implement enhanced standards where regulatory compliance is not mandated.

9.3.1 *Site Planning Standards:*

- Establish a "face-of-building zone" to identify the minimum and maximum setback line from the ROW to create a generally consistent building line along Mountain Road.
- Parking Lots should not be the dominant visual element of the street view. A landscaped front setback for front parking with additional parking located on the side and rear of the building is desirable. Such green buffer spaces are an opportunity to aesthetically incorporate required stormwater bioretention design.
- Existing businesses should be provided with incentives to implement the following:
  - Consolidated vehicular entry points by establishing cross easements between lots for continuous automobile and pedestrian circulation along the fronts of the stores
  - Screen parking adjacent to the public ROW with 30-inch to 42-inch high shrubs and other plant materials, planted in minimum 3-foot wide planting strips between the parking lot and Mountain Road
  - Where the minimum landscape strip is not feasible a stone wall or fence should be considered
- Pedestrian circulation and spaces provide attractive, safe and functional walkways to the main entrances. When possible the 'front door' to a building should be designed to provide outdoor space with seating to create a pedestrian-friendly environment.
- Service areas shall be designed and located to address the needs of the facility while minimizing traffic conflicts, visual impacts, noise and odors.
- Plantings, earth berms, fences, walls and grade changes can be used to effectively separate uses, enclose dumpsters and service areas and improve the appearance of a site.

9.3.2 *Building Design Standards (New Construction):*

- Objectives for commercial architecture should take into consideration the building's size, shape, windows, materials and details. Buildings should be designed to human-scale, meaning the form, massing, and openings should be proportional to the size of a human figure. All renovations and additions to existing structures should add visual interest to a building and enhance the original structure. Features that add visual interest include articulated façades, wall plane projections, wall recesses, fake windows, projecting windows, window boxes and planters and overhangs. Accessory structures should coordinate with the primary building through a repetition of form, materials, details and color.

A well-designed building integrates the architectural elements with the signage, lighting and landscape to create a site that is highly visible from the roadway and pedestrian-friendly.

- Façade design standards should provide for an attractive and human-scaled façade that faces the street with a main entrance that is easy to distinguish and clearly visible from the street. When possible, incorporate façade-mounted signs into the design of the building. Architectural details such as covered porches, arcades, gables and dormers, display windows and outdoor seating areas add visual interest to the main entrance. Coordinate the design of exterior components such as signs, lighting and landscaping to complement the architecture. Treat all mechanical and functional elements as an integral part of the architecture. Incorporate downspouts and vents into the façade design through detailing and color and exterior service elements behind walls or locate out of the view from the public.
- Standards for materials and details are significant in defining the appearance of buildings. They may address the types of materials, the exterior color of the building and trim, as well as the type of roof lines.

Good use of architectural elements, materials and colors create a highly visible and low-maintenance building.

- Linear commercial building standards define the elements that reduce the scale of building and add architectural interest such as the façade and roof line. Techniques such as varied roof lines, raised roof line at key entryways, and offsets can add visual interest to a linear building. The pedestrian entrances to business should be clearly articulated through architectural detailing, roof line breaks, lighting and clear signage.

Roof line variation combined with the strong use of vertical elements gives definition and interest to a linear commercial building.

- Standards for vehicular-focused buildings such as gas stations, convenience stores, car washes and drive-through services address the façade and roof line elements that reduce their scale and add architectural interest. Buildings should be oriented to the street and canopies should be visually compatible with the main structure through consistency in roof pitch, architectural detailing, materials and color. Vehicular doors for service bays or car washes should be integrated into the building design and, where feasible, not be directly visible from a public street, common area or adjacent residential area.

9.3.3 *Signage Standards:*

- Signage is an integral part of the overall commercial development plan. Clear standards ensure that signage is attractive and serves the needs of business while complementing the site and architecture.
- Commercial signage should provide basic, clear information about the business with attractive, highly legible signage. The signage plan delineates the design, size, placement and graphic format of each sign to ensure compatibility with the overall site design and will propose the minimum level of signage required for identification and wayfinding to lessen visual clutter.

Legible signage with well-designed lighting enhances the visual appearance of a business.

- General signage design standards provide a standard for all signs proposed in the Mountain Road Commercial Corridor and ensure the sign design is coordinated with the building and its surroundings through the use of similar detailing, form, color, lighting and material. Free standing signs should be located to maintain a motorists' line of sight and use the appropriate letter size to be easily read by the intended viewer.
- Content standards correlate the content of the sign to the viewer. The amount of information contained in a sign is dependent upon the distance and traveling speed of the intended viewer. The use of electronic signs with movable images and letters is not recommended as they distract from other signs and add to visual clutter.
- Free standing sign standards help to locate signs to increase visibility for the intended viewer. Two-sided signs placed perpendicular to the roadway provide the most visibility on a two-lane road. Signs should be placed near the entrance to the parking lot on the business owner's property and adjacent to the sidewalk/green buffer. Design of the supporting structure should complement the site and building. Internally illuminated signage, signs with electronic messaging and signs with flashing light are not recommended. For business clusters, use one consolidated sign, located at the parking lot entry point.

Free standing signs contribute to the overall sense of place and should reflect the surrounding area in use of materials and style.

- Façade mounted sign standards include information about the shape and materials of the sign and how the sign design complements the architectural features on the building. Façade mounted signs should be located to enhance the architectural details on the building and to aid in wayfinding and should be placed on the lower edge of the building canopy.
- Multi-tenant signage standards coordinate all signs of multi-tenant developments for a harmonious signage plan that is attractive and effective. Each sign should be designed within the context of the principle building color, materials, detailing and style to present a unified appearance for the development and establish a signage hierarchy to help with wayfinding and to eliminate visual clutter. Sign hierarchy includes a development identification sign, directional signs listing tenants, and individual tenant signs at the entrance to their businesses

Well-branded signage can enhance the visual appearance of linear commercial buildings.

- Multi-tenant development identification sign standards use one identifying sign in a highly visible location near the primary driveway entrance to convey an overall identity for the property and emphasize the name of the place. The sign lists the major individual tenants on the identification sign in a clear hierarchy in the display of information by using significantly smaller lettering in a coordinated graphic and color palette and incorporates the street address into the sign to facilitate wayfinding and 911 emergency response.

A multi-tenant sign clearly identifies the place and the tenants and should be the most prominent sign type in the signage hierarchy.

- Tenant-listing directional Sign Standards provide guidance on tenant-listing directional signs to aid visitor wayfinding. The design should be coordinated with the development identification sign and use a limited color and graphic palette to minimize the confusion and visual clutter of the sign.
- Individual tenant sign standards should follow the standards for free-standing signs, façade mounted or pendant signs and sign content.

A legible and well-designed sign with appropriate uplighting.

- Signage lighting standards are an integral part of the sign design standards. Vertical surface of externally–lit signs should be illuminated with sufficient light to provide a noticeable contrast with the surrounding building or landscape without causing undue glare or reflections. Light fixtures of externally-lit signs should be located to direct only onto the face of the sign and avoid light spillage beyond the sign. All light sources should be concealed with appropriate canopy, screening ground-mounted fixtures or partially buried to minimize the view of the light source. Light fixtures should be selected to complement the color and design of the sign, the architecture and for ease of maintenance. Limit the use of internally-lit signs to light lettering and/or symbols of no more than 40% if the sign surface, set against a dark background, to minimize the amount of light emanating from the sign.

9.3.4 *Lighting Standards:*

- Lighting should improve safety and security of the site in addition to improving the visual appearance.
- Outdoor lighting should be carefully designed with regard to placement, intensity, timing, duration and color.
- Avoid over-lighting which can cause unsafe glare and result in reducing the effect of the lighting which can contribute to accidents and hinder visibility. Lighting that is too bright interferes with the eyes' ability to adapt to dark areas.
- General lighting standards establish a hierarchy of site lighting to provide safety and security in addition to complementing the buildings, pedestrian amenities and site elements. Light poles and fixtures should be at an appropriate scale for the buildings and surrounding spaces, and the human scale. Lighting fixtures should complement the architecture, landscaping, and other elements in terms of form, color and style.
- Standards for lighting vehicular areas should provide the minimum lighting necessary for motorists and pedestrian comfort and safety, eliminate glare or spillover onto adjacent property and decrease skyglow. A hierarchy of fixtures can help to define major and minor roadways and drives. It should be noted, however, that continuous lighting on roadways is not SHA policy.
- Standards for lighting pedestrian areas should identify light fixtures for pedestrian spaces that are appropriate for the project that relate to the human scale with a maximum height of 15-feet.
- Standards for lighting façades and features should enhance the key architectural elements. Fixtures should be directed only onto the feature to avoid spillover onto adjacent areas. Façade-mounted fixtures should wash the face of the building with even light in a downward direction.
- Standards for lighting gas stations, convenience stores and drive-throughs should provide sufficient lighting for user safety without creating glare onto adjacent properties or roadway.

9.3.5 *Public Streetscape Elements:*

- Sidewalks shall meet or exceed the SHA standard of a minimum 5-foot wide sidewalk with upright curbs on both sides of Mountain Road. No utility poles, highways signs or business signs shall be located in the sidewalks.
- When possible, shift utility poles to allow for a continuous sidewalk and evergreen hedge along both sides of Mountain Road.
- Wherever not in conflict with utility lines, trees should be placed in the green space between the curb and sidewalk or in green space behind the sidewalk.

- Where overhead wires are present, choose tree species that will not exceed 20 feet in height.
- Tree species and heights should be consistent, where feasible, throughout the corridor.
- Street furniture should be installed at strategic locations throughout the corridor to provide a continuous, pedestrian-friendly environment.
- Utility wires connected to commercial structures and traversing parking and pedestrian areas should be undergrounded as these business centers are upgraded.
- Provide consistent and attractive highway lighting for the length of Mountain Road Commercial Corridor. Light poles should be placed on the business side of the sidewalk. Incorporate pedestrian scale lighting along sidewalks to provide a unifying design element and appropriate scale for pedestrians.
- Anne Arundel County and business associations should work with SHA to consolidate and coordinate directional signage to ensure adequate visibility and reduce visual clutter resulting from multiple sign posts.

9.4 Existing Areas of Implementation

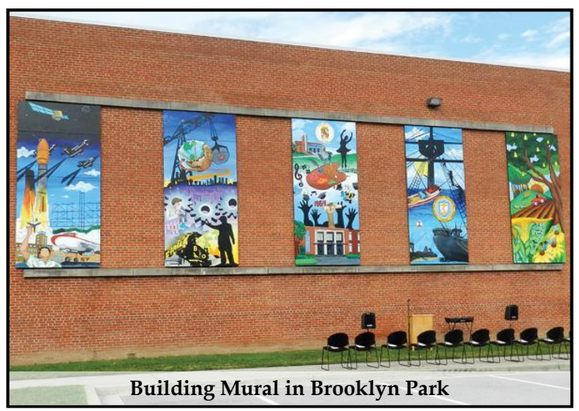
A number of the recommended improvements listed above have already been implemented throughout Anne Arundel County. Examples are shown in **Figure 15**.

Façade Design Standards in Gambrills

Linear Commercial Building Standards in Gambrills

Multi-tenant Signage in Gambrills

Event Banners in Annapolis



Building Mural in Brooklyn Park

Figure 15: Conceptual Design Standards

9.5 Support for Business Owners

The Anne Arundel County Economic Development Corporation (EDC) strives to support local businesses by promoting business growth in the County, increasing job opportunities, expanding the tax base and improving the quality of life. The EDC provides investment and technical assistance, fosters community revitalization initiatives and plays a vital role in enhancing commercial districts, improving county infrastructure and increasing agriculture-based business. The EDC also promotes high-value business sectors such as technology and national security.

The EDC provides zero percent interest loans to local business owners looking to expand or redevelop their property. The corporation also provides business owners with up to $1,500 of technical assistance from architects. Before and after photos of businesses that have participated in these EDC-sponsored programs are shown in **Figure 16**.

These programs, if used by business owners along Mountain Road, could greatly promote economic revitalization in Pasadena. Further information on how to apply for the EDC loan program can be found on the EDC website, www.aaedc.org.

Before: Honey Bee Diner, Glen Burnie


After: Honey Bee Diner, Glen Burnie


Before: Ward-Pratz Law Firm, Glen Burnie


After: Ward-Pratz Law Firm, Glen Burnie


Before: Tennis Shoe Warehouse, Glen Burnie

After: Tennis Shoe Warehouse, Glen Burnie

Figure 16: EDC Loan Recipients

9.6 Recommended Areas of Implementation

The recommended improvements previously discussed can be implemented throughout the Mountain Road corridor. Specific locations for the improvements are shown in **Figure 17**.

Figure 17: Proposed Areas of Implementation (NTS)

9.7 Conceptual Renderings

Conceptual renderings of the recommended aesthetic improvements at specific locations throughout the corridor are shown in **Figures 18** through **21**. These renderings of depict potential ideas for how the conceptual design standards could be implemented.

Multi-tenant development identification signage can be implemented at multiple locations throughout the corridor, such as the Mountain Road Plaza. As shown in **Figure 18**, the names of the shopping centers should be emphasized to convey an overall identity for the properties, and the signage should be cohesive with the design of the developments.

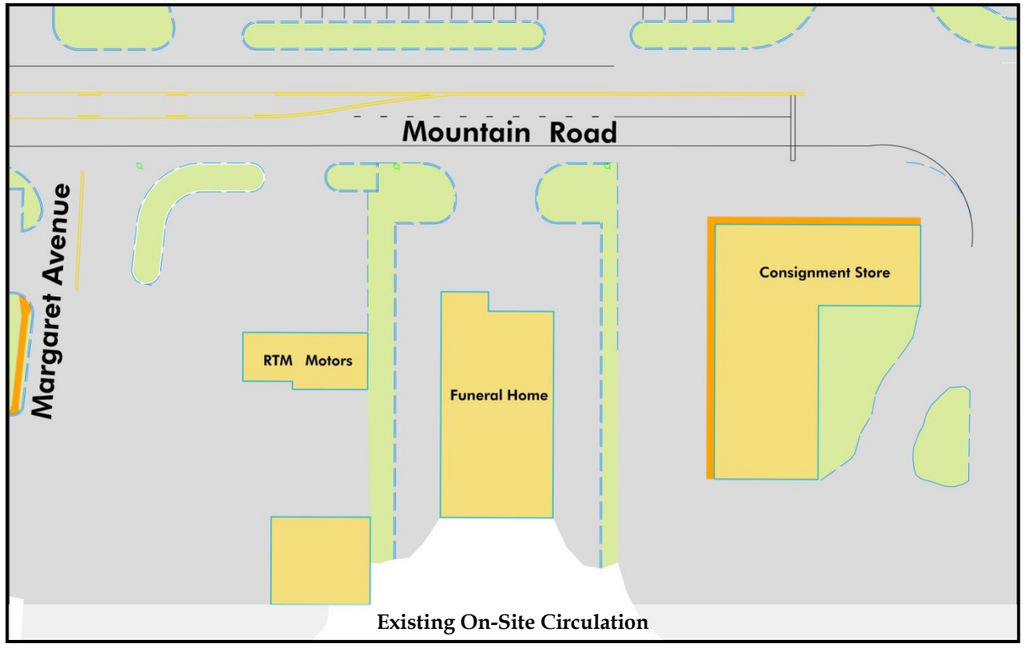
Opportunities to consolidate business driveways and improve on-site circulation are present throughout the corridor. These opportunities would not only provide a more aesthetically inviting corridor, but would also limit the number of conflict points for potential collisions associated with entering and exiting the commercial properties. **Figure 19** depicts how these access management considerations can be implemented along the south side of Mountain Road, between Margaret Avenue and Disney Avenue.

By consolidating the number of driveways and reducing the open pavement along Mountain Road, grass buffers and sidewalks can be installed, which would greatly improve the appearance of the corridor. Providing business access along side streets also decreases the number of vehicles accessing the properties via Mountain Road. The installation of medians at signalized intersections also encourages drivers to access land uses via side streets.

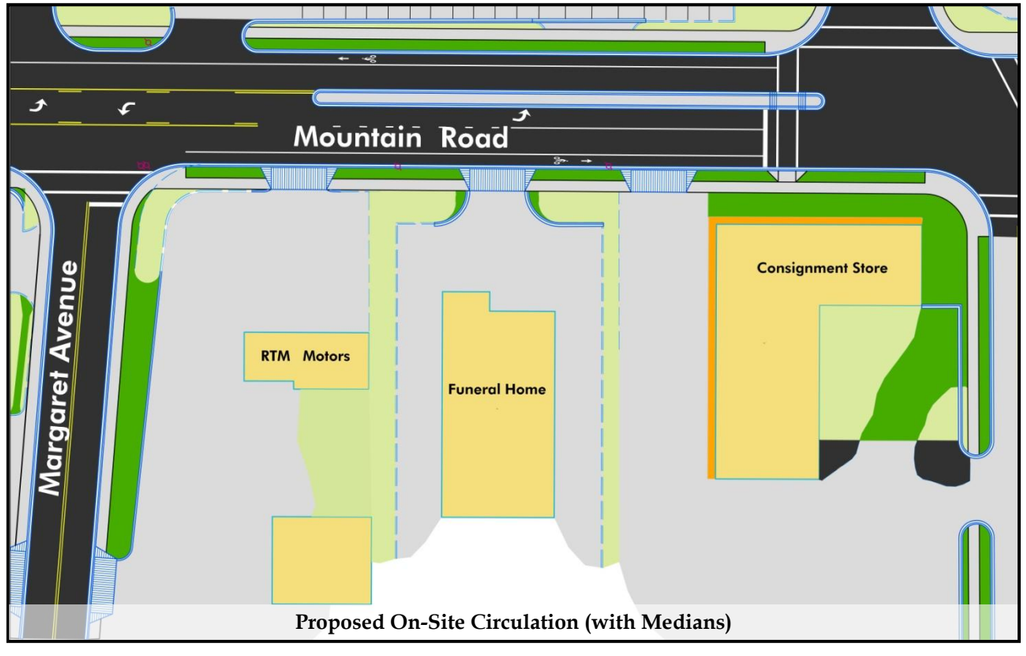
Figure 20 shows how existing building façades can be improved by removing clutter. Excess signage and unnecessary objects surrounding the buildings are a distraction to drivers and should be kept to a minimum.

Potential façade design standards and site planning standards could also be applied throughout the corridor. As shown in **Figure 21**, standards for materials and details can significantly define the appearance of buildings, such as the Thrift Store located at the corner of Mountain Road at Outing Avenue. By providing parking on the side and rear of buildings, "face-of-building zones" can be established. Green buffer spaces in addition to pedestrian circulation areas could provide attractive, safe and functional walkways to the main entrances.

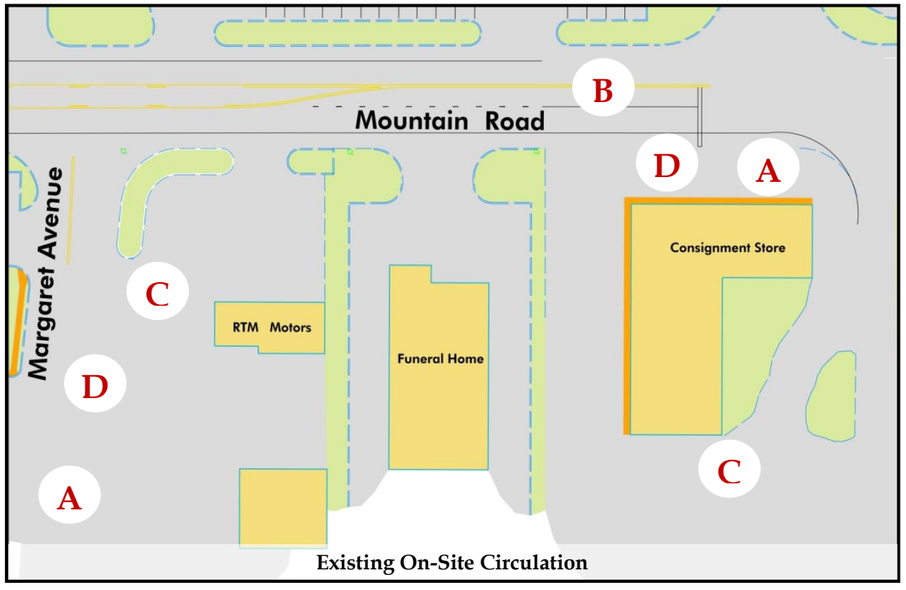
Figure 18: Signage Standards Conceptual Rendering (NTS)



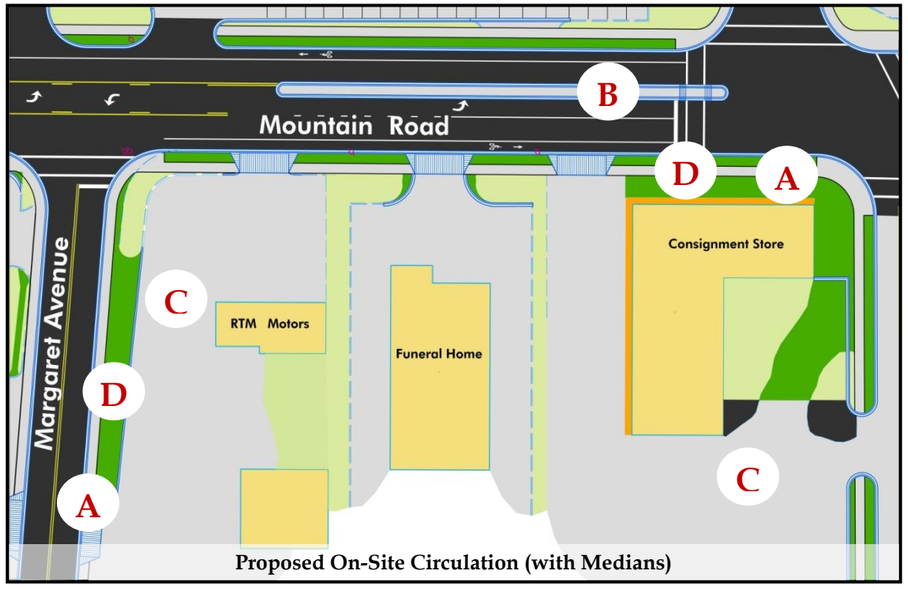
Existing On-Site Circulation



Proposed On-Site Circulation (with Medians)



Existing On-Site Circulation



Proposed On-Site Circulation (with Medians)

Recommended Improvements:

A – Consolidated access points limit conflict points and potential collisions

B – Medians (Alternative 2) limit potential conflicts by restricting left-turns out of driveways

C – Improved parking configuration improves vehicle parking and circulation patterns to adjacent side streets

D – Landscaping screens parking

Figure 19: On-Site Circulation Improvements Conceptual Rendering (NTS)

Existing Building Façade

Proposed Building Façade

Existing Building Façade

Proposed Building Façade

Recommended Improvements:

A – Consolidate signage to provide basic, clear information about the business

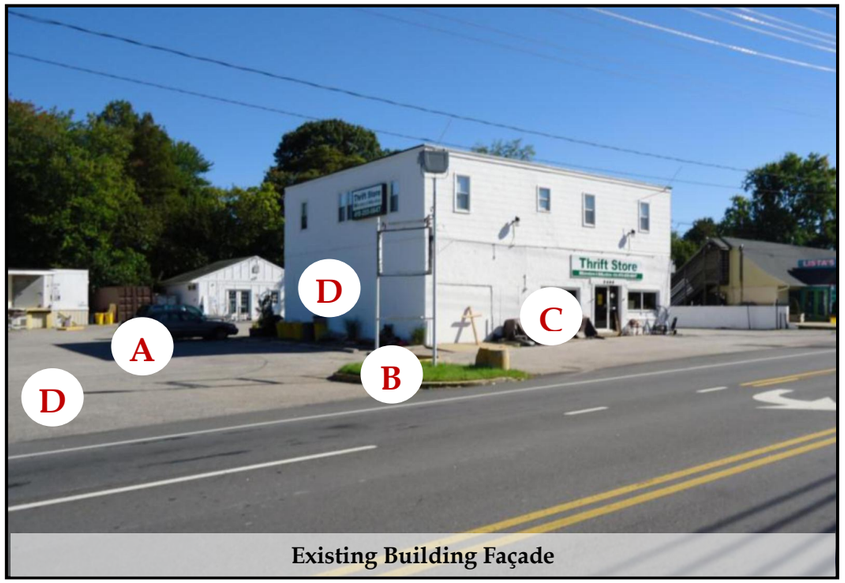
B – Remove unnecessary signage to emphasize land use

C – Remove unnecessary objects visible from the roadway

Figure 20: Removal of Clutter Conceptual Rendering (NTS)

Existing Building Façade

Proposed Building Façade



Existing Building Façade

Proposed Building Façade

Recommended Improvements:

A – Parking on the side and rear of buildings creates a "face-of-building zone"

B – Green buffer spaces in addition to pedestrian circulation areas provide attractive, safe and functional walkways to the main entrances

C – Architectural details add visual interest to the main entrance

D – Landscaping and planters effectively separate uses and improve the appearance of the site

Figure 21: Façade Improvements Conceptual Rendering (NTS)

10 Screening of Alternatives

The three alternatives in addition to the two minimization alternatives were screened to determine which option best accomplishes the project's purpose and need. The scoring was used to determine the preferred alternative.

10.1 Methodology

Similar to the construction cost estimates, the corridor was separated into five segments. These segments were rated for each alternative on a scale of one to ten, with ten being the best, based on the following categories:

- Level of Service
- Pedestrian/Bicycle Accessibility
- Safety Enhancements
- Total Project Costs
- Aesthetic Enhancements

Each of these categories was then weighted based on input received from relevant stakeholders.

It was noted in the project progress meeting held on November 6, 2014 that the primary concern for Anne Arundel County was to improve safety along the corridor; therefore, safety enhancements were weighted with the highest priority, at 30%. The total scores for each category were calculated by averaging the scores assigned to each segment of the corridor. The weighted total scores for each category were then summed to determine the overall score, out of 100, for each alternative. As shown in **Table 12**, Alternative 2 scores the highest, with 73 out of 100.

11 PMT Review

As part of the PMT coordination process, the SHA provided final review comments regarding the build alternatives. A memorandum documenting the final review comments and comment responses is included in **Appendix N**. It should be noted that a number of SHA's comments address design-level concepts. If this planning-level study leads into follow-up design phases, final details which incorporate the SHA comments will be evaluated at that time.

Table 12: Screening of Alternatives

Line Number	Intersection/Segment	Length of Segment (miles)	Level of Service (Average of AM & PM)						Pedestrian/Bicycle Accessibility						Safety Enhancements						Total Project Costs										Aesthetic Enhancements				
			Weight Applied by Intersection (LOS Category Only)	Alt 1	Alt 2	Alt 2 Min	Alt 3	Alt 3 Min	Alt 1	Alt 2	Alt 2 Min	Alt 3	Alt 3 Min	Alt 1	Alt 2	Alt 2 Min	Alt 3	Alt 3 Min	Alt 1		Alt 2		Alt 2 Min		Alt 3		Alt 3 Min		Alt 1	Alt 2	Alt 2 Min	Alt 3	Alt 3 Min
1	Solley Road/Waterford Road	0.2	33%	1	7.5	7.5	7.5	7.5	1	10	10	10	10	0	6	6	6	6	$0	10	$3,398,000	0	$3,398,000	0	$3,175,000	3	$3,175,000	3	0	10	10	10	10
2	Corridor	0.7							1	10	10	10	10	0	10	10	10	10	$0	10	$7,299,000	0	$7,299,000	0	$6,595,000	3	$6,595,000	3	0	10	10	10	10
3	Catherine Avenue	0.7	34%	5	7.5	7.5	5	5	5	10	10	10	10	1	10	8	6	4	$0	10	$11,812,000	0	$10,260,000	1	$8,660,000	3	$8,036,000	4	0	10	10	10	10
4	Corridor	0.3							1	10	10	10	10	0	10	10	10	10	$0	10	$5,614,000	0	$5,614,000	0	$5,083,000	3	$5,083,000	3	0	10	10	10	10
5	Edwin Raynor Boulevard	0.2	33%	1	3.5	3.5	3.5	3.5	3.33	10	10	10	10	1	10	10	6	6	$0	10	$11,463,000	0	$11,463,000	0	$11,241,000	3	$11,241,000	3	0	10	10	10	10

Weighted Total Scores (Out of 100)

	Level of Service					Pedestrian/Bicycle Accessibility					Safety Enhancements					Total Project Costs										Aesthetic Enhancements				
Score	24	62	62	53	53	23	100	100	100	100	4	92	88	76	72	100		0		2		30		32		0	100	100	100	100	
Weight of Category	25%					20%					30%					15%										10%					
Alternative 1	27																														
Alternative 2	73																														
Alternative 2 Minimization	72																														
Alternative 3	71																														
Alternative 3 Minimization	70																														

Relative Performance Scale

Worst — Average — Best

Legend

Level of Service	Score	Pedestrian/Bicycle Accessibility	Score	Safety Enhancements	Score	Total Project Costs	Score	Aesthetic Enhancements	Score
LOS A,B,C	10	Sidewalks and Bike Lanes Present on Both sides of MD 177	10	Crosswalks, Medians & Reduction of Commercial Access Points	7-10	None	10	Major Potential	6-10
LOS D	5	Sidewalks Present on Both sides of MD 177	6.66	Crosswalks on Some Legs, No Medians & Limited Reduction of Commerical	3-6	Minor	5	Minor Potential	5
LOS E	2	Sidewalks Present on one side of MD 177	3.33	No Change	0-2	Major	0	No Change	0-4
LOS F	0	No Sidewalks or Bike Lanes Present on MD	0						

12 Conclusion

The purpose of the Mountain Road Commercial Corridor Study was to determine traffic operations and safety improvements for all travel modes, improve access and control, and increase mobility options for pedestrians and cyclists along the Mountain Road. Three alternatives were developed, with input from the PMT, to improve pedestrian and motorist safety throughout the corridor as well as accommodate projected growth for the year 2035.

Recommendations were also considered to improve aesthetics and functionality of the commercial corridor. Local residents and business owners addressed concern that Alternatives 2 and 3 impact a building on the south side of the corridor, east of Armiger Drive, which was confirmed to be listed on the County's Inventory of Historic Resources. Therefore, two minimization alternatives were developed to mitigate the impact along this property. A summary of the five alternatives is shown in **Table 13**.

Table 13: Summary of Alternatives

Alternative No.	Projected LOS at Critical Intersections (AM/PM)	Typical Section	Right-of-Way Impacts (Acre) (Commercial/Residential)	Total Project Cost
Alternative 1	Solley Rd/Waterford Rd: **F/E** Catherine Ave: C/**F** Edwin Raynor Blvd: **F/E**	Same as existing	0/0	$0
Alternative 2	Solley Rd/Waterford Rd: D/C Catherine Ave: C/D Edwin Raynor Blvd: D/**E**	• 5-foot bike lanes • 5-foot grass buffers • 5-foot sidewalks • 12-foot travel lanes • 16-foot TWLTL with 6-foot medians • Section width of 74 feet	2.65/0.61	$39,586,000
Alternative 2 Minimization	Solley Rd/Waterford Rd: D/C Catherine Ave: C/D Edwin Raynor Blvd: D/**E**	• 5-foot bike lanes • 5-foot sidewalks • 11-foot travel lanes • 12-foot TWLTL • Section width of 58 feet	2.26/0.61	$38,034,000
Alternative 3	Solley Rd/Waterford Rd: D/C Catherine Ave: C/**F** Edwin Raynor Blvd: D/**E**	• 5-foot bike lanes • 5-foot grass buffers • 5-foot sidewalks • 12-foot travel lanes • 12-foot TWLTL with 6-foot medians • Section width of 70 feet	1.77/0.48	$34,754,000
Alternative 3 Minimization	Solley Rd/Waterford Rd: D/C Catherine Ave: C/**F** Edwin Raynor Blvd: D/**E**	• 5-foot bike lanes • 5-foot sidewalks • 11-foot travel lanes • 10-foot TWLTL • Section width of 56 feet	1.56/0.48	$34,130,000

Each of the alternatives was then scored based on how well it met the project's purpose and need. The categories of Safety Enhancements and Total Project Costs provided the greatest scoring discrepancies between the alternatives. Accessibility concerns and aesthetic enhancements were provided for each of the alternatives, with the exception of Alternative 1, and therefore resulted in equal scores. Based on discussions with the PMT, it was confirmed that safety should be weighted with the highest priority.

Alternative 2 generally ranked higher than Alternative 3 in safety because of proposed medians at select intersections. The minimization alternatives ranked lower than Alternatives 2 and 3 because of the reduced lane widths and roadway shifts required to bypass the historical resource. These shifts in the roadway and narrowed lane widths affect the roadway continuity, and ultimately traffic operations. Because of this, it is recommended that the historic resource be relocated a distance back from the proposed right-of-way.

Alternative 2 was deemed preferable based on the final scores of the alternatives screening. Not only does it provide the greatest safety enhancements, but Alternative 2 is also projected to operate at an acceptable LOS for each of the critical intersections during the AM and PM peak hours. Although Alternative 2 incurs the greatest total project costs, the PMT agreed that safety and future traffic operations should be considered more important than cost.

In addition to the traffic and safety improvements, recommendations were developed to improve the aesthetics and functionality of the commercial corridor. An urban design framework was created for the corridor with potential strategies to create distinctive, identifiable places along Mountain Road that could enhance the use of the corridor for all users, regardless of mode of travel.

Based on the screening of alternatives, the improvements suggested in Alternative 2, in conjunction with the recommended conceptual design standards, best accomplish the project's purpose and need. **Therefore, Alternative 2 is the preferred alternative for the Mountain Road Commercial Corridor.**