The Faux Group, Inc.

Forest Drive Traffic Studies: Summary and Analysis of Four Recent Studies

Introduction

During the issue identification stage of the Forest Drive/Eastport Sector Study project, the planning team was asked about the relevancy and findings of four recent traffic studies. We were asked whether these studies might help the community understand both existing and future traffic issues in the Forest Drive Corridor, the larger Sector Study area and the Annapolis Neck Peninsula traffic-shed as a whole. The studies are:

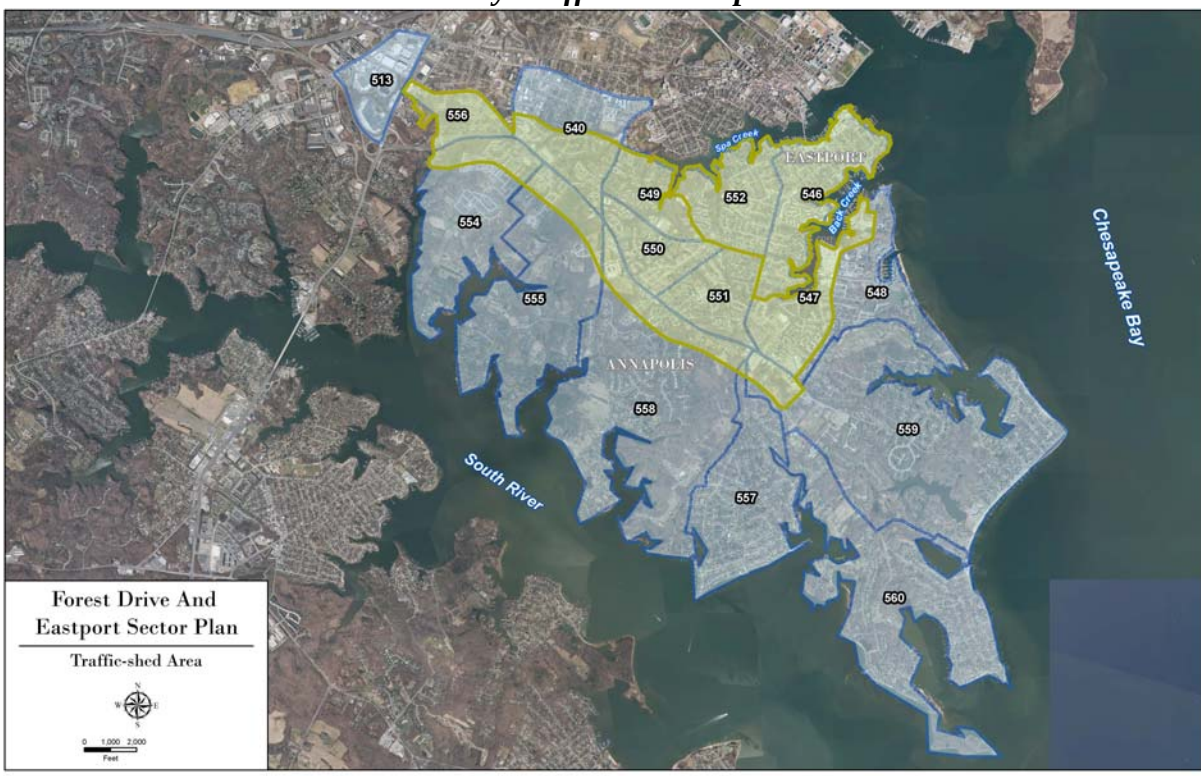
1) **Forest Drive Corridor Study,** 2015, published by the City of Annapolis (Referred to here as the FDCS. It is sometimes referred to as the Traffic Concepts, Inc. study)
2) **Major Intersections and Important Facilities Study** (MIIF), 2016, published by Anne Arundel County.
3) **The Eastport Transportation Study**, 2016, published by the City of Annapolis
4) **PALS Land Use/Transportation Evaluation for the Forest Drive Corridor**, 2016, published by a student with the University of Maryland/ Partnership for Action Learning in Sustainability

A brief review of each of these reports is provided and while each of these older studies provided useful insights, they served different, more focused purposes than the Sector Study. They looked only at portions of the Sector Study area. They utilized older traffic counts, studied fewer intersections, and looked at shorter time periods than the Sector Study. They used standard traffic analysis methodologies (HCM, intersection delay, etc.) to measure and report levels of congestion and road adequacy based on overall intersection function and overall road capacity.

The traffic modeling and analysis for the Forest Drive/Eastport Sector Study will build on aspects of these studies, but largely be a departure in terms of methodology and scope. The City is developing a new, refined traffic model that will be used to analyze different scenarios depending on future changes to land use and development patterns. This model will be based on the Baltimore Regional Transportation Board's (BRTB) model with local input. The BRTB is the federally designated Metropolitan Planning Organization for transportation planning in the Baltimore region. It is staffed by the Baltimore Metropolitan Council (BMC). The model will go beyond looking at intersection level of service, to look at performance measures for the entire sector area. Overall, the Sector Study will offer a more sophisticated analysis of overall traffic congestion and flow and be a more robust tool for modeling changes in the future. The Sector Study will include the following elements:

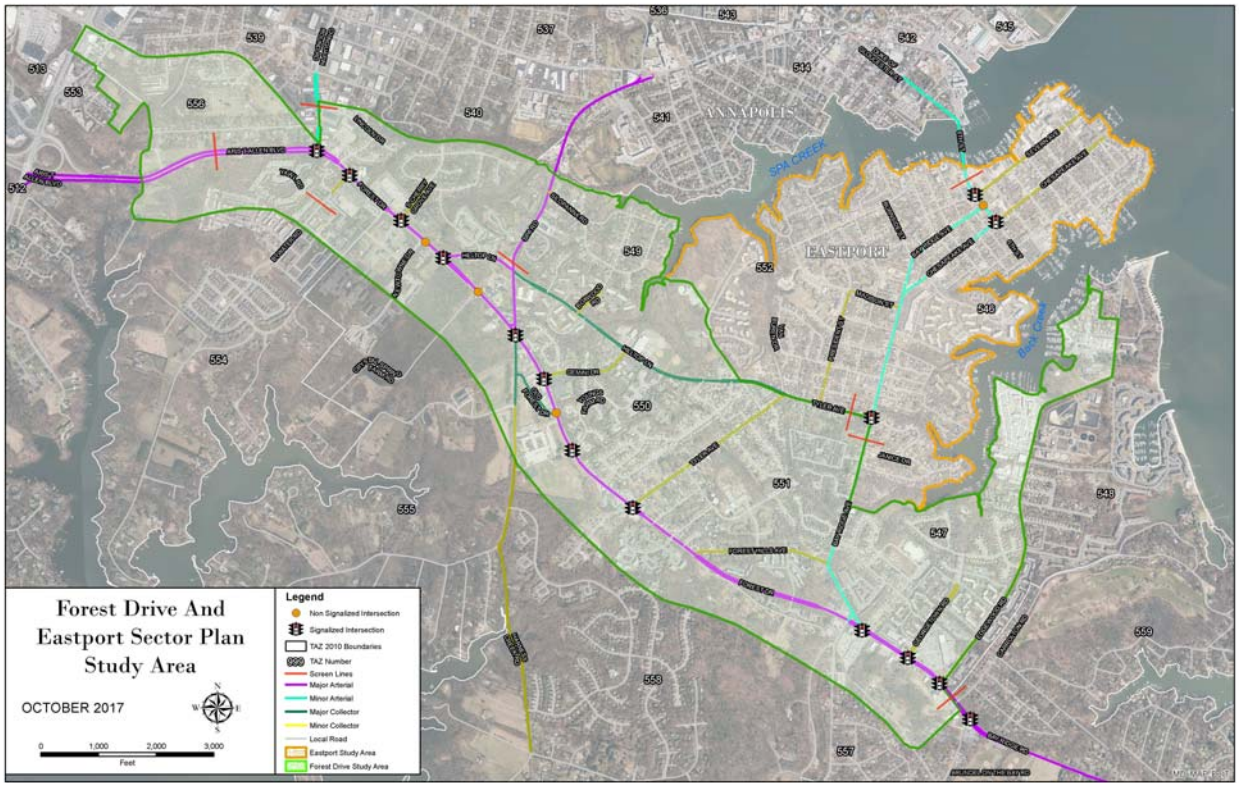
<u>Study Area</u>: A 3.5 mile section of Forest Drive along with the Eastport area and a larger regional traffic-shed will be studied. The study will take into account traffic flows and projections for the entire peninsula and City and the region based the BRTB/BMC's regional traffic model data.

Study Traffic Shed Map



<u>Intersections to be analyzed</u>: The Team will study and report on 19 intersections and a more detailed road network than analyzed in previous studies.

Roadway Network and Intersection Map



Date of Traffic Counts: The study will use base traffic signal and intersection design parameters and traffic volumes collected in 2017 during the school year.

Study Time Frame: Eighteen Years—the study will look out 8 and 18 years into the future using to the BRTB regional planning years of 2025 and 2035.

Projected Development and Growth Assumptions: The study will utilize the most recent BRTB/BMC Round 8b growth data for 2017 refined to include recent construction progress on approved development projects in the study area. Looking forward it will consider further build-out of approved development, newer projects that have received sketch plan approval, as well as other likely development that might occur within the next 18 years (year 2035). A series of scenarios will be generated for analysis that consider different land uses, road improvements and travel mode assumptions.

Methodology: The study will report on existing traffic flows and congestion in 2017. It will use the BRTB/BMC model to project future traffic flows and use post-modeling analysis tools to analyze and report on suggested intersection congestion changes (based on factors such as intersection queue lengths, intersection delay, and volume/capacity ratios) which may include signal phasing adjustments, lane use changes, turning-lane length modifications, and system signal coordination. The team will use micro-simulation visualization tools to simulate real world operations and show study participants how individual vehicles in the traffic system can be traveled through the model and driver behavior characteristics can be assigned to vehicles.

Analysis of Previous Studies

Forest Drive Corridor Study (FDCS)
Purpose: The City hired Traffic Concepts Inc. to develop a comprehensive analysis tool for the corridor as an aid in City planning and review of individual traffic impact studies for proposed developments. The study was designed to help identify needed APF improvements and was coordinated with the County. Consistent with its purpose the study followed the same methods currently required by the City's traffic impact guidelines and sought to be define a worst case in assessing traffic increases. It focuses on vehicular traffic impacts and utilized standard ITE trip generation rates to estimate the amount of traffic new development would generate. It did not address possible future changes in travel mode choices or other travel behavior in the City and County areas, nor did it recommend ways to improve congestion by means other than road improvements.

Study Area: A 2.5 mile corridor section of Forest Drive from Chinquapin Round Road to Arundel on the Bay Road.

Intersections Analyzed: 14 intersections (12 existing signalized intersections and two future intersections).

Date of Traffic Counts: The base traffic signal and intersection design parameters and traffic volumes were collected in 2011 by the County. To establish 2015 numbers, the 2011 numbers were adjusted by increasing them by 1% per year.

Study Time Frame: Five Years—the study had a base year of 2015 and projected forward to 2020.

Methodology: The study used a similar methodology as a traffic impact study for individual development applications, but looked at a wider geographic area. It used Synchro and SimTraffic analysis tools. Synchro is a macroscopic analysis that uses Highway Capacity Manual (HCM) analysis methodology for capacity calculations. It analyzes factors including signal cycle lengths and phasing, split timing, signal coordination and lane use. Per a County request the 2000 Highway Capacity Manual was used. Synchro uses equations to determine delay and queue length. SimTraffic is a microscopic model. It was used to provide travel times along the corridor and queuing and blocking information at intersections. With these tools each vehicle in the traffic system is individually traveled through the model and driver behavior characteristics are assigned to each vehicle and the variation of each vehicle's behavior is simulated in a manner reflecting real world operation. The FDCS analyzed future corridor operating conditions by looking at three scenarios:

- Scenario A - Future Conditions with No Road Improvements;
- Scenario B - Future Conditions with Adequate Public Facilities (APF) Improvements; and
- Scenario C - Future Conditions with Possible Road Improvements.

The list of road improvements described in the study was not evaluated by Anne Arundel County to determine their effectiveness or acceptability.

Projected Development and Growth Assumptions: The study projected additional traffic in the corridor based on another five years of 1% annual growth plus the traffic generated from full build-out of the eight development projects that were either approved or under review in the City at that time. This projected development included 871 residential dwelling units and over 230,000 sf of various types of non-residential uses They are as follows:

1. Stop and Shop (8 vehicle fueling position gasoline station)
2. Quiet Waters Preserve (158 units—72 townhomes and 86 single-family homes)
3. Village Greens (89 townhome units)

4. Rocky Gorge (48 units—31 townhomes and 17 single-family homes)
5. Bay Village (25,000 sf for pharmacy, restaurant, and office space)
6. 1503 Forest Drive (22,680 sf for general office and specialty retail space)
7. Crystal Springs (170 townhomes, 361 senior residential units, a 52 bed assisted living facility. 184,649 sf of retail, 31,362 sf cultural arts center and a 120 room hotel/spa)
8. Rodgers Property (45 townhome units)

Analyzed Improvements: The study identifies ten recommended road improvements selected to mitigate the impacts of the added traffic from the projected growth. Five improvement projects were recommended in Scenario B as Adequate Public Facilities (APF) Improvements for specific development projects and five as other possible road improvements were recommended in Scenario C without identifying which project might be required to build them.

Study Findings and Conclusions: The FDCS reported that the corridor's overall level of service would remain acceptable but that corridor travel time would increase in all its future Scenarios. It reported and projected travel times in the corridor from Chinquapin Round Road to Arundel on the Bay Road as follows:

	EXISTING CONDITIONS		FUTURE CONDITION NO IMPRS		FUTURE CONDITION APF IMPRS		FUTURE CONDITION ALL IMPRS	
	AM	PM	AM	PM	AM	PM	AM	PM
Travel Time for Corridor (Average of 5 Runs)	204.0	206.9	249.1	320.8	253.9	293.5	227.8	277.9

Since the FDCS was completed, the County has installed an adaptive control system on Forest Drive. As of 2015, all 12 County and State traffic signals on Forest Dr. and Bay Ridge Rd. corridor are now coordinated and adjust in real time to traffic conditions. This is estimated to have resulted in a 10% to 15% reduction in travel time for the corridor. This timing operation cannot be fully simulated by the Syncro program. (The County reported in 2017 that with this change traffic in the corridor travels at the speed limit.)

The FDCS reported that the overall level of service for the studied intersections was acceptable in 2015 and would remain acceptable after the analyzed full development build-out even in the No Road Improvements Scenario. The FDCS also analyzed the congestion levels at each of the individual intersection movements of each of its studied intersections. It reported that certain turning lanes on most of the intersections had unacceptable levels of congestion during the AM and PM peak hours both in its 2015 baseline year and all three of its future scenarios. It demonstrated that the recommended improvements mitigated only some of this congestion on these movements.

Comments: The City APF standards define unacceptable levels of congestion to be as those at Level D. The 1998 Highway Capacity Manual describes Level D as: "Operations with control delay of greater than 55 and up to 80 seconds per vehicle. This level is considered by many agencies to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures are frequent occurrences." It is important to note that an overall intersection service analysis reflects the average delay for all cars passing through all movements of an intersection. Intersections considered acceptable by this measure may have one more movements that experience unacceptable delays but because the number of cars using that movement is comparatively low the overall intersection function remains acceptable.

City residents who enter and exit the Forest Drive corridor from various side roads and have experienced these longer delays have expressed some frustration with the overall intersection measurement reporting method.

The FDCS highlights two common conundrums of traffic planning along arterial corridors. First, improvements to the arterial corridor's level of service and travel time are typically given priority over side-street approaches. Correcting side delays often come at the expense of impacting the main line progression. Choices often must be made to find the best solutions to balance competing travel demands. Second, the Highway Capacity Manual method of grading congestion is less helpful on arterials. Once the overall signal cycle length at an arterial corridor intersection reaches a total of 140 seconds, the delays experienced on individual movements especially the of the side road approaches often exceed the 25 second delay benchmark for level D. This can occur without triggering the other failure features referred to in the definition of level D congestion. For instance, all the cars will regularly clear the signal cycle. A different measure of congestion may be more useful for these arterial corridor intersections.

The assumptions used in the FDCS were selected to show a worst-case scenario for the future that is unlikely to occur. For example, the assumption that traffic would grow at 1% each year means that the 2015 existing conditions baseline numbers used were higher than actual conditions. Actual SHA traffic counts for the nine years between 2007 and 2016 show a decline in corridor traffic volumes. In that time period the average daily traffic volume for the section of Forest Dr. between the intersection of Chinquapin Round Rd and the intersection at Bywater Rd. peaked in 2010 and was still more than 10% below that peak in 2016. This period of decline may reflect a temporary reduction in traffic during the recession years combined with a slower actual growth in the City at a rate less than was projected by the current City Comprehensive Plan. It may also reflect ongoing changes in travel behavior and destination choices for commuting and shopping.

Another example of the worst-case scenario outlook is the assumption made that all of the listed projected new developments would both start construction and be fully built-out within 5 years. That is unlikely. As of September 2017, only a small amount of the listed projected development have been approved or started construction. Some of these projects were listed as pipeline projects in the 2009 City Comprehensive Plan but have still not started construction. The Forest Drive/Eastport Sector Study will utilize updated data as the list of City and County development projects that have been approved and are under review has changed.

Major Intersections and Important Facilities Study (MIIF)

Purpose: The MIIF Study is a component of the County's Transportation Functional Master Plan. The master plan itself is not completed to date. The study evaluates mobility and accessibility needs of residents, commuters, and businesses along specific facilities of the regional travel network in Anne Arundel County. The study looks at seven key corridors, County-wide, in order to prioritize County improvement projects and identify ways to improve services without major road improvements where possible.

Study Area: A 5.0 mile corridor—the study includes two sections: Forest Drive from Chinquapin Round Road to Bay Ridge Avenue (2.3 miles) and MD 665 (Aris T. Allen Boulevard) from US 50 to Chinquapin Round Road (2.7 miles).

Intersections Analyzed: Five existing signalized intersections and the road links between.

Date of Traffic Counts: 2012 adjusted forward to 2015

Study Time Frame: 23 years—the study looked at existing conditions in 2012 and projected forward to the year 2035.

Methodology: The travel demand model that was used for the MIIF Study was developed from the BRTB/BMC's regional travel demand model. Among other factors this model takes into consideration growth projections provided by the county and origins and destination travel patterns for the peninsula as reported in the 2010 US Census data. The MIIF Study did not do any in-depth SimTraffic simulation analysis and did not evaluate travel time as a measure of effectiveness.

Projected Development and Growth Assumptions: In addition to the background BRTB/BMC growth projections for both City and the Outer Neck by 2035, the MIIF study also assumed that 820 new households and 400,000 sf of non-residential uses would be added in the in the 12 traffic analysis zones (TAZs) that feed into the corridor from 8 development projects. Based on the combination of these two sources the MIIF Study projected the average traffic growth along the Forest Drive corridor segments to be less than 1% annually over the next 23 years.

Analyzed Improvements: No roadway capacity or major transit improvements were assumed to occur within the next 25 years.

Study Findings and Recommendations: The MIIF study finds that the Forest Drive Corridor is the least congested of all of the seven major county corridors studied. It therefore places it at a lower priority for added County improvement.

Like the FDCS, the MIIF Study also reports on the current overall level of service at corridor intersections and on corridor links to be acceptable as the chart below shows. It reports the future overall level of service at corridor intersections as acceptable without any roadway capacity or major transit improvements.

Study Intersections	Summary of Results						
	Existing		Existing Delay (seconds per vehicle)			Existing v/c	
	AM	PM	AM	PM			
Forest Drive at Chinquapin Round Road	B	C	19.9	23.7		0.79	0.84
Forest Drive at Bywater Road	B	B	14.1	13.2		0.79	0.76
Forest Drive at Hilltop Lane	C	C	20.4	26.1		0.68	0.71
Forest Drive at Spa Road	D	D	39.6	46.3		0.94	0.96
Forest Drive at Bay Ridge Avenue	D	D	53.7	42.9		0.92	0.79

In addition to overall level of service, the MIIF Study reports on delay and v/c. The v/c ratio represents the sufficiency of a road segment to accommodate the vehicular demand. A v/c ratio less than 0.85 generally indicates that adequate capacity is available and vehicles are not expected to experience significant queues and delays. As the v/c ratio approaches 1.0, traffic flow may become unstable, and delay and queuing conditions may occur. The two diagrams below show these findings. Forest Drive at Spa Road and Forest Drive at Bay Ridge Avenue are shown above with acceptable levels of service, but v/c ratios that are approaching 1.

Figure 13: Forest Drive 2035 AADT and LOS

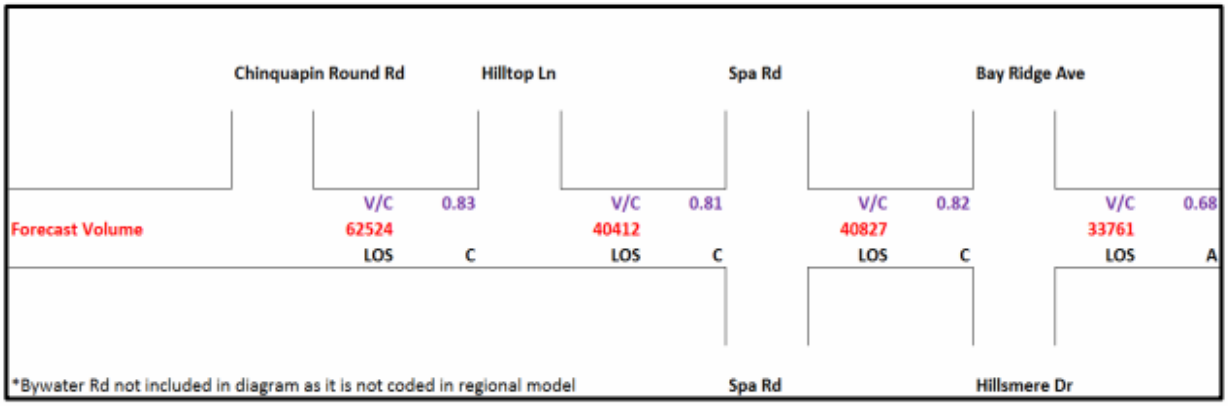
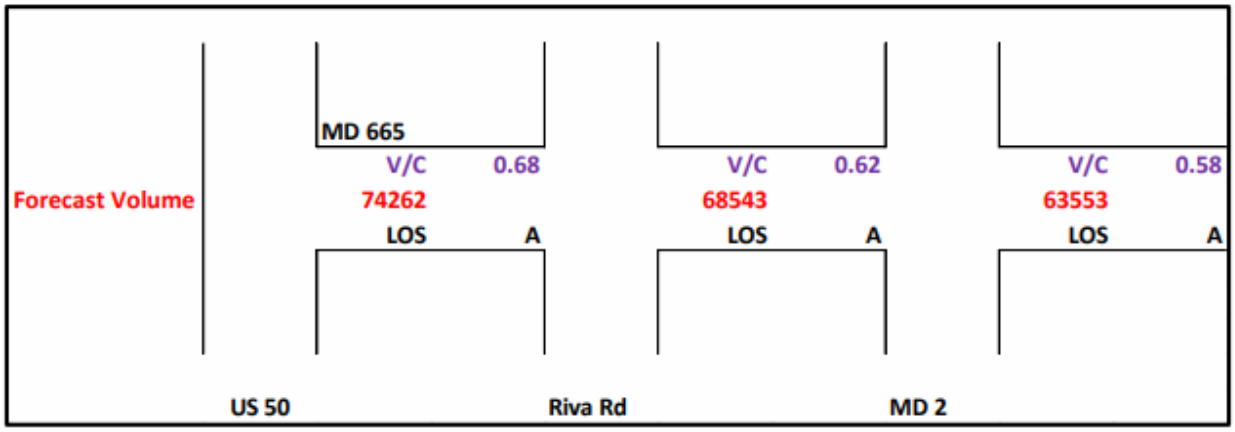


Figure 19: MD 665 2035 AADT and LOS



The MIIF study did not recommend any roadway capacity or major transit improvements for the Forest Drive corridor. It did recommend ways to improve congestion by means other than road improvements. Its recommendations include:

- Extension of MTA commuter bus service from Riva Rd. to Bay Ridge Ave.
- Explore Bus Rapid Transit or Light Rail Transit service from Annapolis Town Center
- Improve transit amenities including bus shelters and real time bus information
- Add bike lanes on Forest Dr. including segment from MD 2 to Chinquapin Round Rd.
- Construct missing sidewalk connections
- Allow for increased density and transit-oriented development in Town Center area
- Future development should occur in New Urbanism fashion with complete streets network
- Signal System coordination and optimization*
- Real Time Travel Time Information on Changeable Message Signs
- Special Event/Evacuation signal timing plan
- Access Management Plan

* Like the FDCS, the MIIF study's assessment of existing congestion predates the County's 2015 improvements to 12 traffic signals on Forest Dr. and Bay Ridge Rd. corridor that now provide coordinated and adjust in real time to traffic conditions.

Comments: Since the MIIF study was completed the County has made the development of an Inter-model Transit Center their highest priority in their annual requests to the State for transportation assistance. That project could impact travel behavior in the corridor and options for transit service.

This study, like the FDCS, utilizes older traffic counts from 2011 that have been adjusted forward. It uses older demographic data as a basis for existing conditions and uses lower growth projections than the FDCS does. The Forest Drive study will utilize traffic counts taken in 2017 and review the model's projections for the future. While the Forest Drive/Eastport Sector Study will also use the BRTB/BMC model; however, it will be refined to include more recent data, more detail in the road network and a more refined demographic analysis. Give the comparative congestion in the other 6 corridors analyzed in the MIIF Study; it is possible, but not likely that these higher projections might change the county's priorities for road improvements in this corridor.

The Forest Drove/Eastport Sector Study will analyze the MIIF recommendations in more detail as applicable to the City. It will also provide a more in-depth analysis of the corridor since it will rely on micro-simulation to assess additional measures of effectiveness.

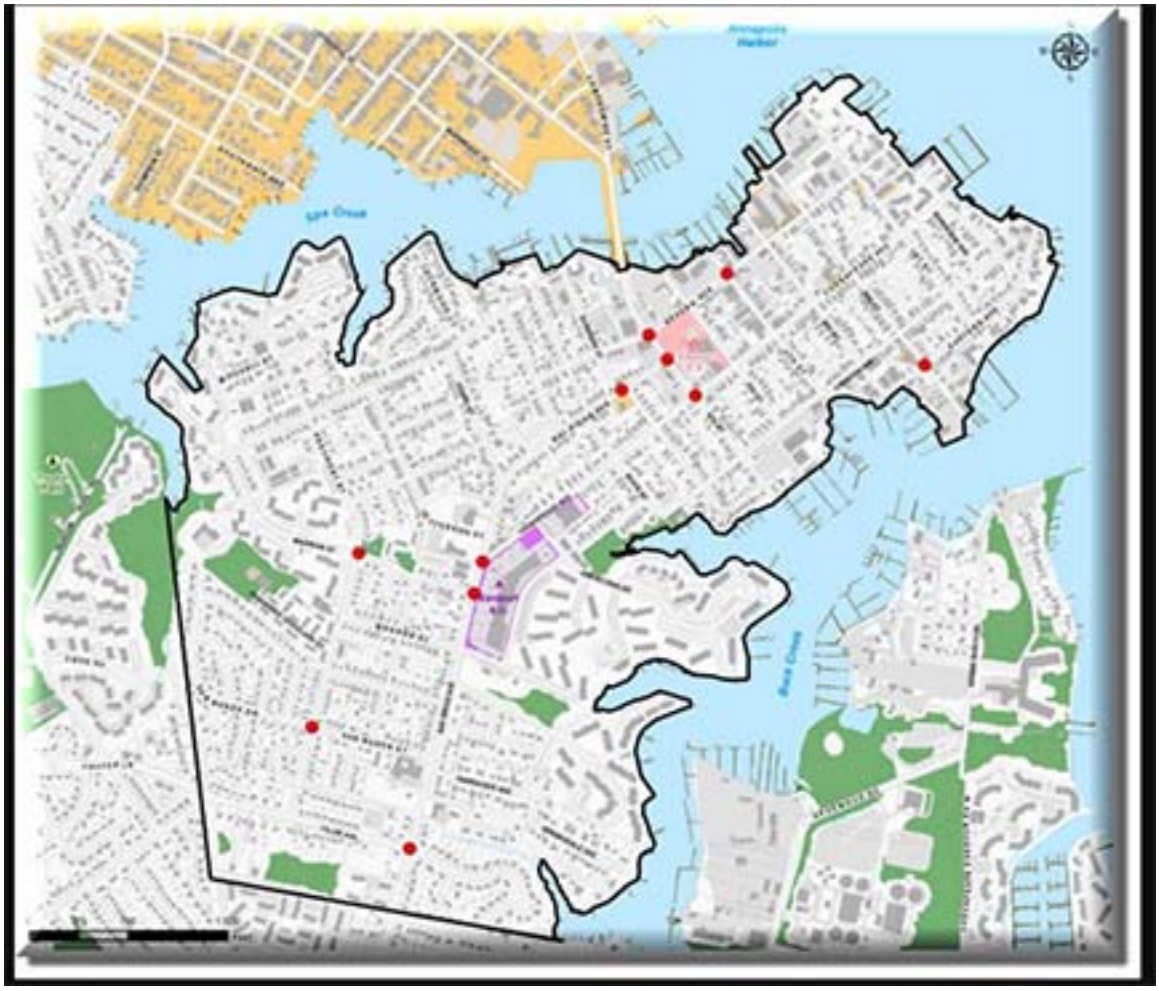
In recommending an Access Management Plan for the corridor, the MIIF team noted the existence of a significant number of mid-block curb cuts and private driveways in various parts of the corridor. They noted the left hand turn movements associated with these as a contributing factor in determining the corridor congestion and the v/c ratios that the study reported. The section between Chinquapin Round Rd. and Hilltop Lane is one example of such a segment. A good example of the type of modification the MIIF study is recommending is the recently approved change in access for the former State Auto Insurance building. This will redirect traffic flows to a traffic signal via a side street at South Cherry Grove.

The Eastport Transportation Study

Purpose: The City of Annapolis conducted a multi-model transportation study for its Eastport neighborhood, in the form of two separate documents, *The Eastport Transportation Study, Existing Conditions Report* and *The Eastport Transportation Study, Short-term and Long-term Recommendations Report.*

The objective of the Existing Conditions Report was to document and quantitatively assess baseline traffic and safety conditions, as well as the impact of future land use changes in order to develop a plan for improved traffic management and multi-model circulation and safety throughout the Eastport neighborhood. The Short-term and Long-term Recommendations Report provides short- and long-term recommendations and assesses future transportation conditions.

Study Area: The Study area is about one square mile and generally extends from Spa Creek in the North to Back Creek in the South; and from Truxton Park in the West to the Severn River. The study area has limited roadway access to and from downtown Annapolis and points North (US 50, West Street), and points South and West (Outer Neck, Forest Drive and Harness Creek); as well as limited opportunities for additional roadway capacity.



Intersection Analyzed: There were eleven intersections analyzed and they are shown in the study area graphic.

Date of Traffic Counts: The majority of vehicle traffic enters and exits Eastport via 6th Street. Based on counts taken in 2015, 6th Street has an annual average daily traffic volume of 21,000 vehicles per day, compared to 12,500 vehicles at Tyler Avenue. Bay Ridge Avenue, the East-West spine of the network, carries 16,500 vehicles per day between Tyler Avenue and Madison Street. Counts were validated using current traffic count data and field observations.

Study Time Frame: Baseline conditions are set at 2015 with projections out to 2020 (5 years) for the short-term analysis. The long-term time frame is not specified.

Methodology: Short-term intersection capacity analysis was performed for the estimated traffic in the year 2020. Volumes were developed by adding the existing traffic volumes, growth in existing regional and net site generated traffic for the four background developments. A Synchro model implementing Highway Capacity Manual 2000 methods was used to perform the analyses. Additionally, queuing at intersection approached was assessed with SimTraffic.

Due to Eastport's compactness, long-term speculative developments would have a large impact on certain intersections depending on their ultimate location, size, and development program. Rather than guessing on individual programs and locations, the study focused on the ultimate carrying capacity of Eastport's main travel way—Bay Ridge/ Chesapeake and 6th Street—with the goal of determining how many more vehicle trips (local and/or through) that these arterials can accommodate before congestion results in gridlocked streets, (arterial Level of Service F). Long-term forecasts assume Eastport's main arterials remain the same: two-lane road network with 25 mph speed limits. A couple of additional signalized intersections along Bay Ridge Avenue/Chesapeake were included in the traffic model. In order to estimate the maximum amount of traffic the network can maintain the existing traffic model was first validated using current traffic count data and field observations. Vehicle trips were added onto the validated network until LOS F conditions were reached.

Projected Development and Growth Assumptions: In the short-term using a 2020 design year, 4 pipeline developments are assumed built and operational and an additional growth in through traffic of 1% per year is assumed. The following developments were used to estimate the net trip generation for each background development using the 9th Editions of ITE Trip Generation Handbook and collected data:

1. Sarles / Petrini Property (South Annapolis Yacht Club), (84 marina berths, 30,000 S.F. warehouse, 3,000 S.F. general office)
2. Eastport Sail Loft (11 dwelling unit apartment building)
3. Griscom Square (12 dwelling unit townhouses)
4. Annapolis Yacht Club
    a. East side of 6th Street (11 employee general office, 108 marina berth, 130 member sailing club)
    b. West side of 6th street (59 seat restaurant, 35 marina berth, 10,000 S.F, Rec Center)

No long-term growth projections have been used in the methodology.

Analyzed Improvements: The following improvements were a part of the short-term projections:

1. Additional lane capacity by restriping 6th Street
2. Adjust signal timing and cycle length at 2 intersection

The following improvements were a part of the long-term projections:

1. Signal improvements along Bay Ridge
2. Signal improvements along Chesapeake
3. Assumed signal optimization in the study area

Study Findings and Conclusions: The SimTraffic simulations under the short-term scenario show traffic conditions similar to those in existing conditions. Results show that none of the studied intersections nor any of the studied intersection movements degrade to a failing LOS from existing conditions. Furthermore, studied area intersections remain at an overall level of service of C for AM, PM, and Saturday peak hour scenarios. 95% queue length increases modestly.

In the long-term, at 1,850 vehicles per hour along Bay Ridge and Chesapeake Avenue, the roadway network begins to operate in unstable traffic flow conditions; this is the peak capacity. Beyond this traffic volume, long queues persist and accessing Bay Ridge and Chesapeake Avenue from the side streets becomes difficult. This traffic volume includes the use of signal optimization, which assists the timing of signals to efficiently move traffic through the network.

The maximum peak hour volume of 1,850 vehicles was then compared to the projected year 2020 peak hour volumes. The PM peak hour was projected to be closest to this limit at 1,550 vehicles per hour, or 300 trips / hour below ultimate capacity. This is an estimate of the additional capacity remaining in the most restrictive peak hour. Under the assumptions used in the model, 300 additional trips per hour (after year 2020) can go through the network during the PM peak before the ability of the roadway network to process vehicle traffic breaks down. These additional trips can take the form of additional through traffic, or trips that are locally generated from new developments, or some combination of both.

Comments: The sector study will include 2017 traffic data for this area. It will review and take into consideration the findings of this study.

PALS Land Use/Transportation Evaluation for the Forest Drive Corridor

Introduction: The Partnership for Action Learning in Sustainability (PALS) is a program administered by the National Center for Smart Growth at the University of Maryland, College Park (UMD). It is a campus-wide initiative that links UMD students and faculty to provide low-cost assistance to local governments.

This independent study was an exploratory use of ArcGIS and CommunityViz tools. The intent was to create a tool that can be applied to any corridor to analyze and generate landuse / transportation alternatives. With increased familiarity with the software and the study area, many alternative scenarios might be studied. In the future, if successful, this University effort might be adapted as a planning tool for other corridors.

The City of Annapolis engaged PALS to provide assistance in creating new databases and planning tools to aid in planning.

Purpose: To date there are three PALS projects. We reviewed these studies as another resource for the Forest Drive/Eastport Sector Study.

a. A existing land use inventory data base of the city
b. An experimental CommunityViz based model of the Forest Dr. Corridor
c. An inventory database of land likely to re-develop or develop in the Forest Dr. Corridor

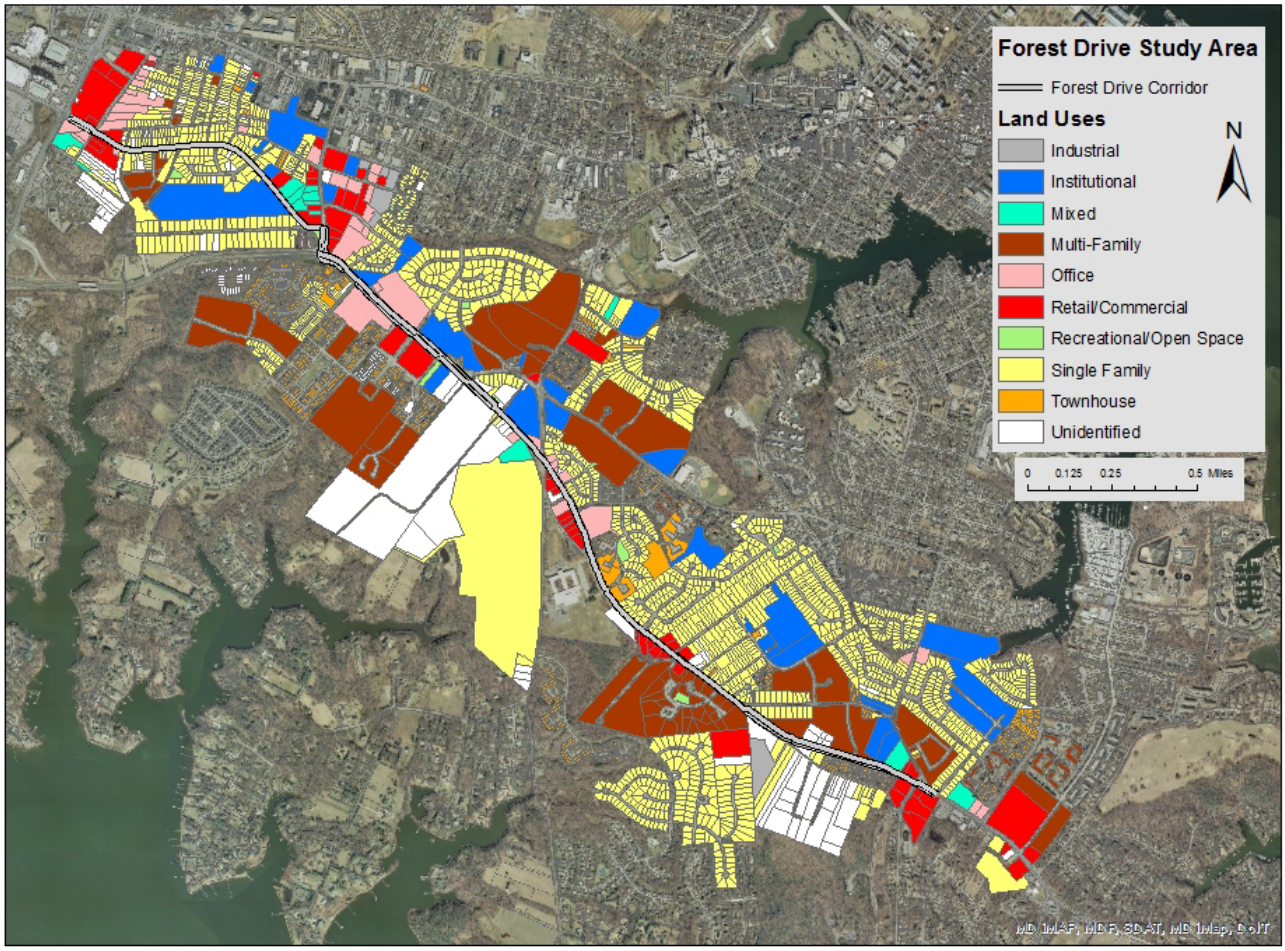
The first PALS project is the development of a land use inventory (with clear land use classification) for about 14,000 properties, in two time periods, 2007 and 2016. The City adopted the County's land use categories and identified 14 primary land use categories and 40 secondary land use categories (subcategories of the 14 categories) that were used in the pilot area. The final outputs of this effort are two GIS layers of all properties of 2007 and 2016 in the City of Annapolis. Each property point is associated with many attributes, including 14 primary land use categories and 40 secondary land use categories for the pilot area. The inventory is based on the state's Maryland property view data available in 2016.This valuable inventory is still in the process of being checked and refined by city staff. Once completed, it will provide more accurate numbers regarding city land uses such as the number of city residences and the amount of commercial square feet. This final list is not anticipated to be ready in time to be used in the Forest Drive study but will inform other city planning efforts.

The second PALS project used a draft version of the land use database as a starting point and applied traffic data and traffic generation assumptions to the land uses along Forest Drive. It also applied the sketch software tool CommunityViz to the GIS databases to produce a tool to generate various land use/transportation alternatives and assess their impacts. The goals of the study were to:

- Assess the potential and need for expansion of Forest Drive as a result of assumed land use changes on adjacent parcels within City boundaries.
- Identify parcels most suitable for new development or redevelopment and generate an alternative development scenario using CommunityViz sketch software, and
- Develop a build-out analysis procedure that is applied to land parcels

The third is an inventory database of land likely to re-develop or develop in the Forest Dr. Corridor. Like the first project, this effort is still in the process of being refined.

Study Area: The PALS corridor study area covers the 3.5 miles of the Forest Drive/Bay Ridge within City limits including the section form Edgewood Road Rd to Route 2. It also looks at a simplified road network feeding into the corridor as shown in Figure 1 below.



Intersections analyzed: This study focuses on road links, not intersections. Its model included a limited number of corridor links and intersections.

Date of traffic counts: This study did not utilize actual traffic counts to establish an existing conditions baseline. It generated a baseline based on a theoretical estimate of traffic based on ITE rates for the existing land uses identified in the database, which is still in the process of being refined and should cover uses in the study area though 2012. It is important to note that due to the time constraints of this student exercise, the author did not have the opportunity to calibrate the findings to reflect available actual 2012 traffic counts.

Two of the figures in the report, Figures 2 and 3, show the current level of service on the various roadway link segments of the corridor in the morning and evening rush hour, derived from the Maryland Statewide Transportation Model (MSTM).

The MSTM uses household estimates based on Census 2000 data adjusted to the base year 2012, as well as employment data from the BRTB/BMC, also derived from the 2000 Census (not 2010). This model shows severe congestion (LOS F) in 2012 (baseline year for the model) on roadway links in much of the corridor and on adjacent roads.

Comments: The MSTM model is a very macroscopic one that relies on outdated data or peak hour counts of traffic and a simplified road grid. It does not correlate with any of the more recent studies of the corridor.

Another limitation is that this PALS study assumes a new worst cases scenario for growth. It identifies approximately 324 parcels out of the 3,500 within the chosen study area as being suitable for redevelopment based on their existing land uses and assumes that full redevelopment would occur on all of them within 23

years. This resulted in a simplified maximum build-out of allowable uses that was assumed to add nearly 7,000 new morning peak trips and almost 8,000 afternoon peak trips to the corridor. This number differs significantly from the growth in daily traffic volumes projected by the 2016 MIIF. Again, due to the time constraints of this student exercise, the author did not have the opportunity to re-calibrate the assumptions and growth to reflect other factors such as environmental constraints, city development approval time frames or market absorption rates and trends.

Study Time Frame: The study time frame is 2012 to 2035 or a 23-year time frame.

Methodology: Using an un-calibrated baseline, the author of this PALS project applied data on trip generation from the 9th edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual to determine morning and afternoon peak trip generation rates for the various existing land uses found within the Forest Drive corridor. Once compiled, peak AM trips and peak PM trips were added as new fields to the GIS shapefile and the ITE rates were applied to the parcels using the ArcGIS Field Calculator. Each parcel was thus assigned a specific uncalibrated baseline number of peak trips for both morning and afternoon from which to make comparisons at later stages.

This study also used the CommunityViz Build-Out Wizard tool as a way to represent future development within the corridor area. In the modeling of the impacts, the study assumed build-out by 2035, the same horizon year of the travel demand model. There are drawbacks to this approach. The study was limited to one alternative scenario—Max Zoning Build-Out—with input criteria that closely resembled the bulk and density requirements and allowances in the Annapolis City Code. Each land use category was assumed to have only a single use (e.g. an "R3" zone is assumed to be 100% residential). These build-out scenarios are theoretical possibilities but in practice impossible. They do not take into account various constraints such as market demand, environmental features including Critical Areas, location of infrastructure, stormwater management requirements, etc.

Comments: This study raised the issue of small-scale infill and redevelopment activities in areas outside the Opportunity sites focused on in the 2009 City Comprehensive Plan. The main strength of this study's approach to traffic approach is that it closely aligned traffic and land use in an effort to better test the impacts of changes in land use mixes. However, the base model for the study is very dated and macroscopic and was not verified or tested in the field. A theoretical build-out was then added onto this number. The methodology should be refined with a model that reflects field-verified observations and the build-out analysis needs to account for real world impediments.

Proposed Development and Growth Assumptions: The PALS study assumed a maximum zoning buildout would occur within the corridor within the next 23 years. This buildout included redevelopment of all undeveloped and underdeveloped parcels in the study area. In addition to this, it assumed all projected growth that was identified by the BRTB/BMC model though 2035. This represents a double counting of development.

Analyzed Improvements: The PALS study did not analyze planned or possible road improvements; this was not part of the scope of the study.

Comments: One hoped for outcome is a tool to better test and quantify the traffic behavior changes and traffic impact reductions that can be achieved in an enhanced low scale mixed use community with many comfortable travel mode choices combined with and many desirable destinations close-by. This has yet to be realized.

Study Findings and Conclusions: The Study is incomplete and uncalibrated. Therefore, no conclusions can be drawn.

Figure 2: 2012 Levels of Service (LOS) on Forest Drive Area Road Segments

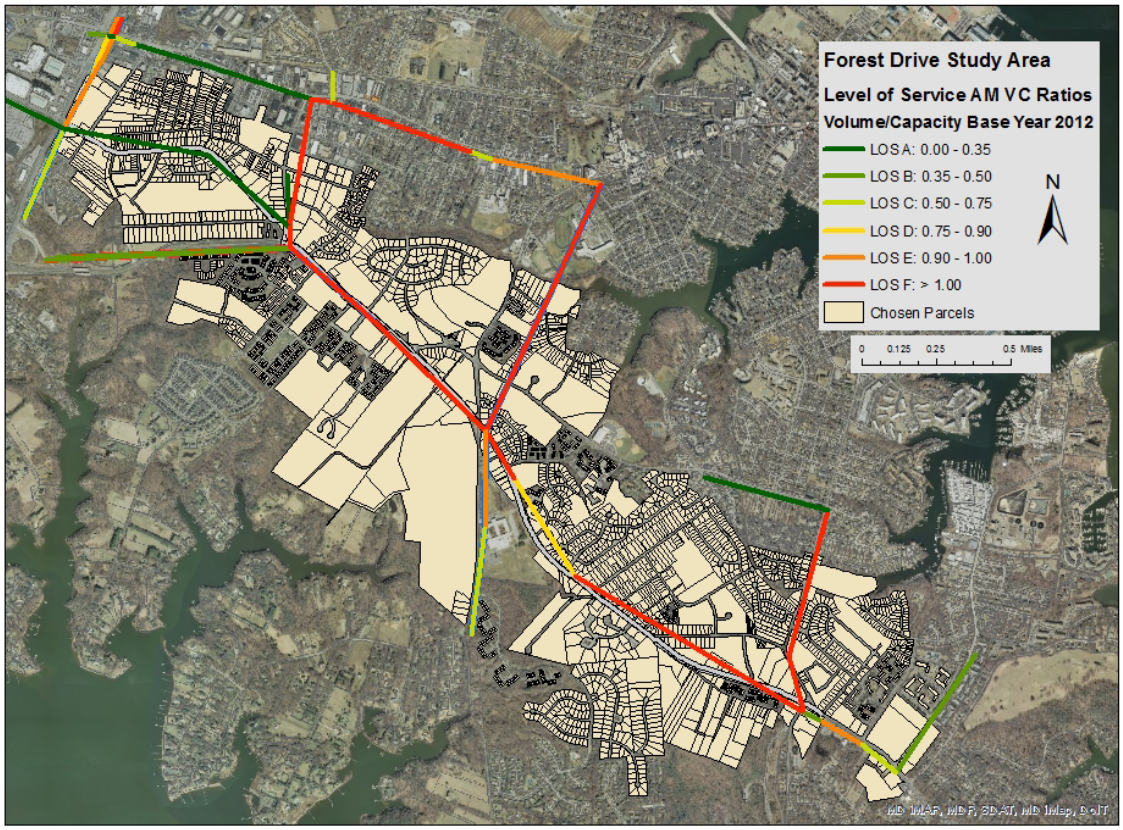
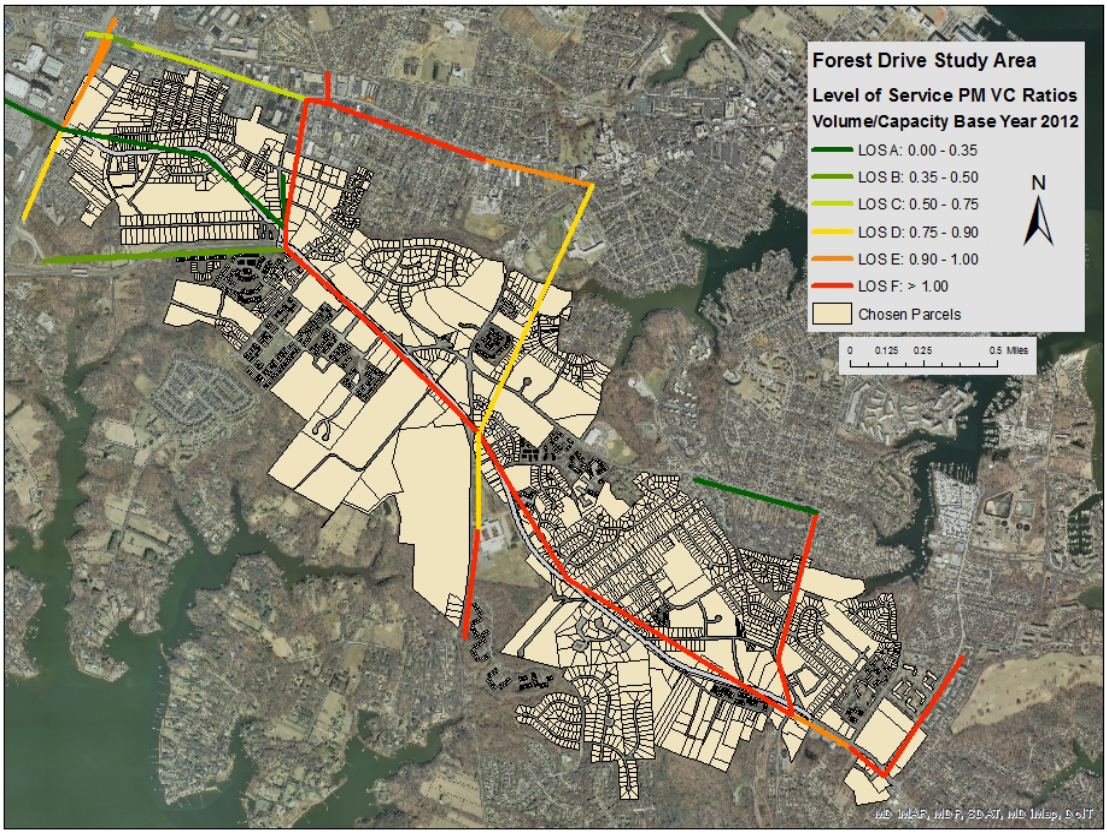


Figure 3: 2012 Levels of Service (LOS) on Forest Drive Area Road Segments PM



Conclusion

There have been a number of previous studies of Forest Drive and Eastport. This paper reviewed the following:

1) **Forest Drive Corridor Study,** 2015, published by the City of Annapolis (Referred to here as the FDCS. It is sometimes referred to as the Traffic Concepts, Inc. study)
2) **Major Intersections and Important Facilities Study** (MIIF), 2016, published by Anne Arundel County.
3) **The Eastport Transportation Study**, 2016, published by the City of Annapolis
4) **PALS Land Use/Transportation Evaluation for the Forest Drive Corridor**, 2016, published by a student with the University of Maryland/ Partnership for Action Learning in Sustainability

Each of these reports provides some useful insights; however, the Forest Drive/Eastport Sector Study will depart from these studies in terms of methodology and scope. The new, refined traffic model will be used to analyze different scenarios depending on future changes to land use and development patterns. It will consider regional growth and simulate actual traffic conditions in the study area.