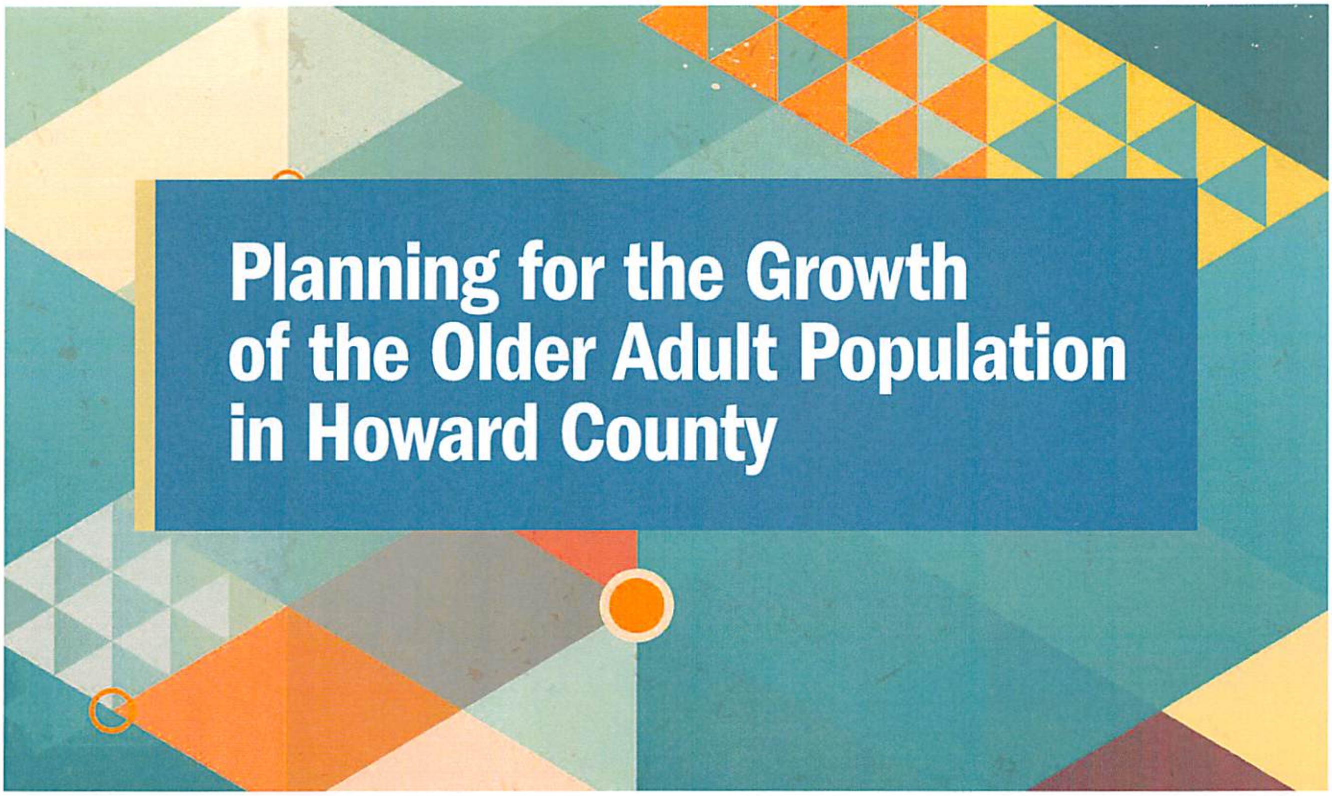

Planning for the Growth of the Older Adult Population in Howard County

Creating an Age-Friendly Community

A Report from the Howard County
Department of Citizen Services
2015

Howard County, Maryland
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Starr Sowers, Administrator, Office on Aging

EXHIBIT
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Appendices

Appendices are available online at:
www.howardcountymd.gov/AgingMasterPlan

Full report is also available online at:
www.howardcountymd.gov/AgingMasterPlan

July 2015

THIS REPORT, *Planning for the Growth of the Older Adult Population in Howard County: Creating an Age-Friendly Community* is the culmination of a year-long effort that engaged more than 1,600 community members from the public, private and non-profit sectors, as well as the faith community. It also involved countless hours of collecting, synthesizing and analyzing information to inform the priorities and recommendations you will see in the following pages.

What has emerged is a vision of Howard County as an age-friendly community where older adults comfortably age in place and residents of all ages have the resources they need to grow, thrive and live with dignity.

We are proud of the services already offered by our County's Office on Aging and the dedicated staff who work diligently every day on behalf of older adults in our community. The Office is recognized as a leader throughout the state and nation in creating and providing innovative programs and services.

It is also clear that every sector of our community must be engaged if we are to successfully address the complex issues that must be tackled. The Office on Aging is committed to working with our public and private partners, as well as interested residents, to make the vision described in this report a reality.

In the words of an African proverb: "If you want to go fast, go alone. If you want to go far, go together." We are excited to embark on this journey alongside you, as we continue our commitment to make Howard County a truly age-friendly community and one of the very best places for anyone to live.

We hope you will join us in this effort. If you are interested in getting involved in the work ahead, please contact the Office on Aging at 410-313-6410 or aging@howardcountymd.gov.

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Executive Summary

A seismic demographic shift is now taking place across the country. The U.S. Census Bureau report, *An Aging Nation*, shows that the population of adults 65 years and older will increase by 85% between the years 2012 and 2040. This increase reflects longevity gains across the population over the past 100 years and the aging of the largest generation in the nation's history, the Baby Boomers, born between 1946 and 1964.

Howard County, too, will experience unprecedented growth in the number and percentage of older adults in its population. The proportion of residents aged 65 and older will increase from 10.12% in 2010 to 21.63% in 2035. Many in this cohort will suffer one or more chronic health issues and, perhaps, the financial stresses of fixed-income living. Overall, it is a societal transformation that will affect everyone living in Howard County.

This report grew out of a senior center master planning project funded by Howard County Government. The project quickly expanded to encompass a broader view of the issues that must be addressed over the next twenty years to meet the needs of the county's growing older adult population.

Executive Summary

While a number of important resources are already in place, including Howard County's Office on Aging, the current service structure is not sufficient to address the projected growth. Community leaders in all sectors must consider the changes required to ensure that Howard County is prepared to meet the needs of the growing population of older adults and the people who care for them.

The process of creating this report included review of national practices and past Howard County studies related to aging, an online survey and focus groups of community members, development of scenarios to help define a "preferred future" for the county, and the engagement of a wide range of stakeholders from government, nonprofit, business and faith organizations.

What emerged was a vision for a "preferred future" of Howard County as an age-friendly community. Planning participants recognized that achieving this vision would benefit residents of all ages and abilities, and suggested that this should not be solely an "aging plan," but also a plan to achieve a high quality of life throughout the lifespan.

Six priorities were identified to achieve this preferred future, along with focus areas for initial action. The priorities are to:

- Provide advocacy, services and a safety net for vulnerable adults.
- Promote the physical, emotional and financial well-being of caregivers, as well as those for whom they care.
- Ensure that diverse housing options are available for Howard County residents to age in the community and to function as independently as possible.
- Provide affordable, accessible, reliable, safe, convenient, cost-effective mobility options to get people where and when they want and need to go.
- Optimize opportunities for a healthy quality of life for all residents that integrate physical, behavioral and spiritual well-being, in a manner that supports personal choice.
- Prepare residents for the implications of the new demographic reality at both the personal and community level.

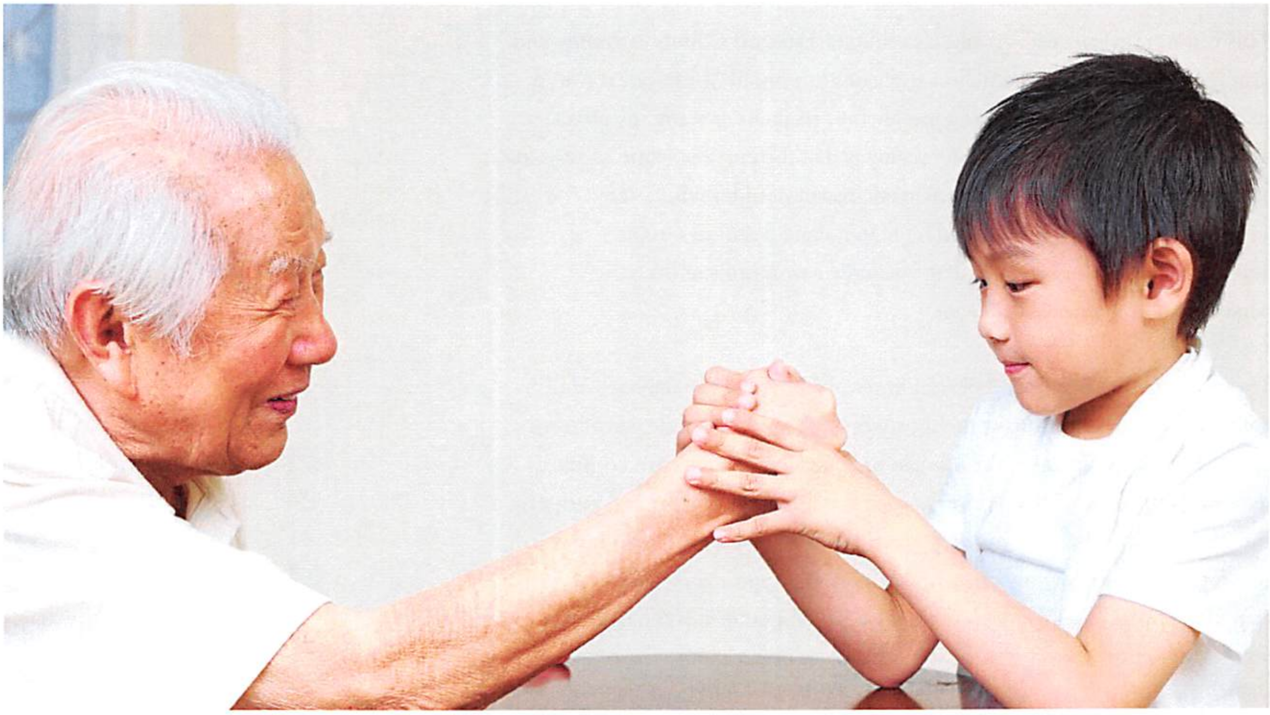
These priorities, of course, are not new. Rather, they affirm and build upon the work of previous studies, both in Howard County and across the nation. What is new is the concept of creating a vibrant collaborative framework as a means of accomplishing these goals. This approach recognizes that the efforts of individual organizations acting independently will be insufficient to the task of creating the preferred future. What is needed is an intentional approach to building a deeper level of collaboration that integrates the work of all the partners within the service delivery system.

This report creates a well-grounded vision of Howard County currently and proposes exciting implementation strategies to prepare for the next twenty years. The County is known as a jurisdiction containing many resources, so why is this report important? The reality is that the current scope of services is not sufficient to address the projected growth of older adults. In addition, many resources need to be better aligned and new ones developed so we can achieve an age-friendly community at both the personal and organizational levels.

The priorities are broad and descriptions are provided for activities and initiatives to start the improvement process. Some are simple, short term initiatives that can be taken by a single organization. Others are complex, requiring long term collaboration among numerous organizational partners and individuals. These complex goals will need systems change in order to accomplish the goals over time. In addition, the report suggests key elements of planning to support this process. Whether it is the collective impact model or a new variation of community organization, the outcome will be the same: a better future for older adults and family or community caregivers.

With leadership provided by the Department of Citizen Services and the Office on Aging, the Advisory Committee, Work Groups and Commission on Aging will be convened to lay out strategies specific to each priority. In addition, individuals, organizations, and businesses in the community will be engaged in this effort to create an environment that ensures an age-friendly community that is relevant across the lifespan of Howard County citizens.

Introduction



A seismic demographic shift is now taking place across the country. The U.S. Census Bureau report, *An Aging Nation,* shows that the population 65 years and older will increase by 85% between the years 2012 and 2040. This increase reflects both the consequence of longevity gains across the population over the past 100 years and the aging of the largest generation in the nation's history, the Baby Boomers, born between 1946 and 1964.

Howard County, too, will experience this unprecedented growth in the number of older adults. In 2010, 10.12% of Howard County residents were aged 65 or older. By 2025, this figure will rise to 17.49%. By 2035, it will reach 21.63%, based on calculations using data from Maryland State Department of Planning population projections. Not only will there be considerably greater numbers of older adults, there will also be more older adults in sheer numbers with at least one chronic health issue to address and, perhaps, the financial stress of fixed-income living. Such a societal transformation will affect everyone living in Howard County. Community leaders in all sectors must consider the changes required to ensure that Howard County is prepared to meet the needs of this growing population and the people who care for them.

Introduction

Howard County Government initially took the step of funding a facility master plan that could guide the design and development of the county's senior centers over the next twenty years. The project quickly expanded into a planning effort that encompassed a broader view of the issues that must be addressed over the next twenty years to meet the needs of a growing older-adult population.

> The current scope of services in Howard County is not sufficient to address the projected growth in the number of older adults.

A number of important resources are in place. Howard County's Office on Aging (OOA), for example, is a state and national leader in providing older adult services. It responds creatively and effectively to emerging community needs. The OOA pioneered an Aging in Place program that enhances home safety while reducing the cost of in-home services. It also developed a Senior Center Plus program, which offers support for older adults with cognitive and/or physical impairments, and the Kindred Spirits Social Club for adults with early stage memory disorders. OOA was first in the State to launch an Aging and Disability Resource Center (Maryland Access Point, or MAP) and it has been at the forefront in providing evidence-based health and wellness programs. *(See Appendix A for a full description of OAA programs and services.)*

Howard County also has excellent non-profit and for-profit service providers for older adults. Some, such as Neighbor Ride (a volunteer-based transportation service for those aged 60 and older), serve only older adults. Others, such as Howard Community College, serve a broad range of residents and provide certain services specifically for older adults. Still others, such as the Community Action Council, serve all ages while providing critical support for older adults.

With so many resources already available, why is this planning effort needed? Quite simply, the current scope of services in Howard County is not sufficient to address the projected growth in the number of older adults. Equally important, the level of service coordination, information sharing and partnership must be enhanced to successfully serve older adults and their caregivers in the coming decades.

As work on this project progressed, county leaders recognized that meeting the needs of this fast growing demographic will require a concerted effort by the entire community. The magnitude of the demographic shift, the extended timeframe covered by this report and the complexity of the issues that need to be addressed make it clear that a new approach to the planning and delivery of services for older adults is needed.

Introduction

A New Approach

This planning project was commissioned by the Department of Citizen Services (DCS), the human services arm of County Government, of which the OOA is an integral part. It was led by Ellicott City architectural firm KGRW & Associates, which assembled a team of experts in the fields of aging, research and futures thinking to complement their expertise in designing facilities for older adults.

The KGRW team reviewed many plans for aging developed in other communities across the country. Most of these plans reflect a traditional approach to planning that focuses on what is currently known or can be easily predicted and measured based on the tools in use today. They devote less attention to areas where uncertainty is high (such as knowing what societal changes will take place over the next twenty years) or where achievement of the desired goals requires active collaboration by many stakeholders.

Howard County took the concept of planning many steps further. The result was a far-reaching and thoughtful process undertaken by a broad consortium of aging and facilities experts, public- and private-sector leaders, community residents and County officials, all of whom lent ideas and expertise to the task of assessing the past, understanding the present, imagining the future and defining what it will take to realize that future.

As is fitting for a forward-looking community like Howard County, this planning project breaks the traditional mode of most such efforts in several ways:

- It **uses scenarios to explore future possibilities** outside the range of mainstream expectation. Looking back on the past, immense and sometimes unimaginable changes have taken place. The rise of the Internet and the many ways it has changed society is an excellent example; similar changes will surely take place over the next 20 years. While the future is inherently uncertain, scenarios provide the chance to explore possibilities and plausible outcomes, opportunities and challenges.
- It **focuses on the development of a "preferred future"** for Howard County as an age-friendly community and identifies the priorities that need to be addressed to achieve that future.
- It **calls the entire community to action.** While the OOA will play a key role, many organizations – public and private – will also need to join the effort. The key to success will be in engaging all residents and stakeholders in the process, now and in the years to come, to bring the "preferred future" into being.

- It **identifies a framework for continued planning, collaboration and implementation** that will make Howard County a truly age-friendly community. This includes a structure for engaging stakeholders, coordinating the efforts of multiple organizations, tracking progress and determining budget priorities.

Howard County is unique in many respects, not least of which is the fact that its largest city, Columbia, was explicitly conceptualized, designed and built with the future in mind. The county's spirit and energy are assets that few communities share. This report offers guidance for harnessing those forces to create a "preferred future" that benefits not just older adults, but the entire community. It serves as an invitation to all residents and organizations to engage in the many activities required to prepare for the demographic shift taking place and to ensure that Howard County remains a desirable place to live throughout the lifespan.

Legislative and Public Policy Background

IN THE POST-WORLD WAR II PERIOD, service providers, advocates, researchers and government officials recognized that the increasing older adult population presented new challenges for communities and health and human service systems. The Older Americans Act, passed by Congress in 1965, was the beginning of a federal response that, over time, established a national network of state and local entities with the mission of developing community-based service systems designed to support older adults in their own homes and communities.

Howard County became part of this movement in the 1970s, when the Older Howard Countians Act was enacted and became part of the County Code (Title 12 Health and Social Services Subtitle 5). The Older Howard Countians Act established a county Office on Aging (now part of the Department of Citizen Services), with responsibility for:

- Developing an annual plan for a system of services for the aged
- Administering services under the plan
- Coordinating services for the aged in Howard County
- Making policy recommendations to the County Executive and Council
- Applying for federal and State funds for services and programs

Howard County law also enables the OOA to be designated an area agency on aging, which under the Older Americans Act and related state law, authorizes it to be the local entity charged with planning and developing community services for older adults in Howard County. As an area agency on aging, the OOA is eligible to receive and administer certain allocations of federal and state funds.

The mission of area agencies on aging encompasses a wide variety of services, including information and referral, meals, health promotion and education, in-home services and advocacy for residents of long-term care facilities, as well as the flexibility to respond to specific needs and issues in its service area.

Since the 1970's Maryland's area agencies on aging have become primarily a public service system for older adults. With a few exceptions, most are units of local government, with services financed by public funds and provided by employees of local government. As a result, when the public identifies service needs for older adults, it often assumes that the response will come from the local office on aging or local government.

While this assumption may have been appropriate for specific aging-related issues in the past, it will not suffice for the scale of the demographic shift now taking place.

Demographic Change in Howard County

Planning for the needs of the growing number of older adults in Howard County requires a clear understanding not only of the size of the demographic shift, but also of the significance of changes in diversity, generational attitudes and greater longevity.

Growing Number of Older Adults

Over the next two decades, Howard County residents will become significantly older. Between 2010 and 2035 Howard County's total population will grow from 287,085 to 363,499, an increase of 26.6%. During the same period, the county's population aged 50 years and older will grow from 87,237 to 140,175, an increase of 60.7%, more than double that of the growth rate for the total population. The percentage of the population that is more than 50 years old will increase from 30.39% in 2010 to 38.56% in 2035. (Unless otherwise noted, 2013 Maryland Department of Planning population projections are the source for all demographic data in this section.)

AGE	2010		2020		2035	
0 to 49 years	199,848	70%	213,578	69%	223,324	61%
50 to 74 years	75,808	26%	99,233	30%	100,638	28%
75 years and older	11,429	4%	19,438	6%	39,537	11%
Total	**287,085**	**100%**	**332,249**	**100%**	**363,499**	**100%**

Figure 1: Howard County Census by age groups, 2010 to 2035.

	PERCENT GROWTH	NUMBER OF ADDITIONAL RESIDENTS	AVERAGE NUMBER OF ADDITIONAL RESIDENTS PER YEAR
0 to 19 years of age	9.5%	7,663	307
20 to 49 years of age	15.9%	15,813	633
50+ years of age	60.7%	52,938	2,118
50 to 74 years of age	32.8%	24,830	993
75+ years of age	245.9%	28,108	1,124
Total	**27.6%**	**79,267**	**2,642**

Figure 2: Number of additional Howard County residents per year, by age group.

Projections indicate that the population of adults over 75 will see the greatest growth. As of July 2010, Howard County adults aged 50 to 74 numbered 75,808 or 26% of the population. Residents over 75 numbered 11,429 or 4% of the population. Looking forward from 2010 to 2035, the number of adults aged 50 to 74 will increase by just 2% to become 28% of the population. Those over age 75, however, will increase by a full 7% to become 11% of the population. That means 28,108 more residents over the age of 75 will be living in Howard County in 2035.

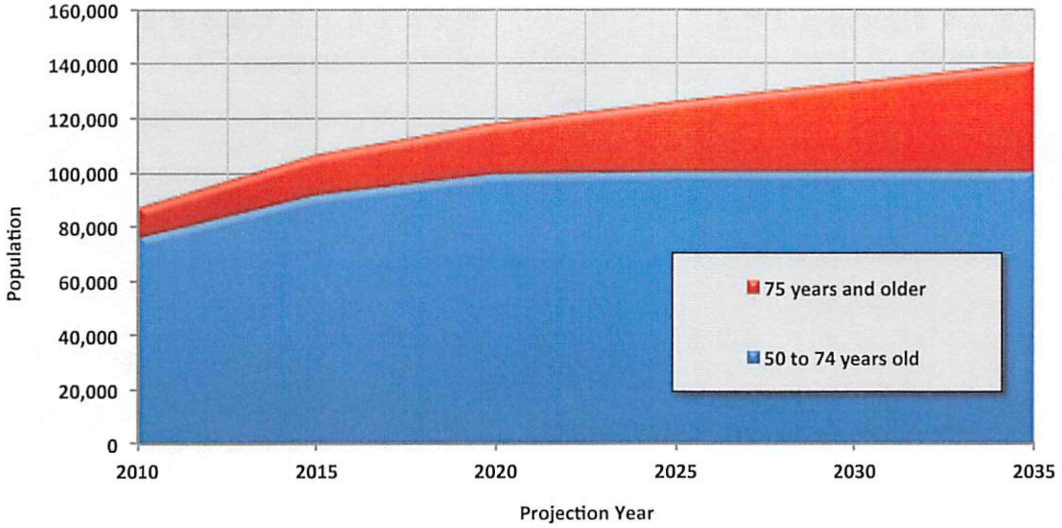


Figure 3: Howard County population projections for ages 50+, from 2010 – 2035.

This 75 and older demographic is an essential threshold for planning. Studies indicate that 75 years of age for the Boomer generation, born 1946-1964, may be functionally comparable to 65 years of age for the previous Silent Generation, born 1929-1945. For Boomers, the need for and participation in community-based programs is likely to be greatest at age 75 and beyond, when older adults typically require additional services. Given the expected growth in this population moving forward, the implications for the OOA and other service providers are vast.

Diversity

Howard County's 50+ population in 2035 will also become significantly more diverse. In 2010, 72% of the 50+ population was white, with 28% minorities. By 2035, minorities will be 51.45% of the county's 50+ population. In terms of languages spoken, the current predominance of foreign-born Korean residents among the older adult population may give way to increasing numbers of Spanish-speaking residents.

Demographic Change in Howard County

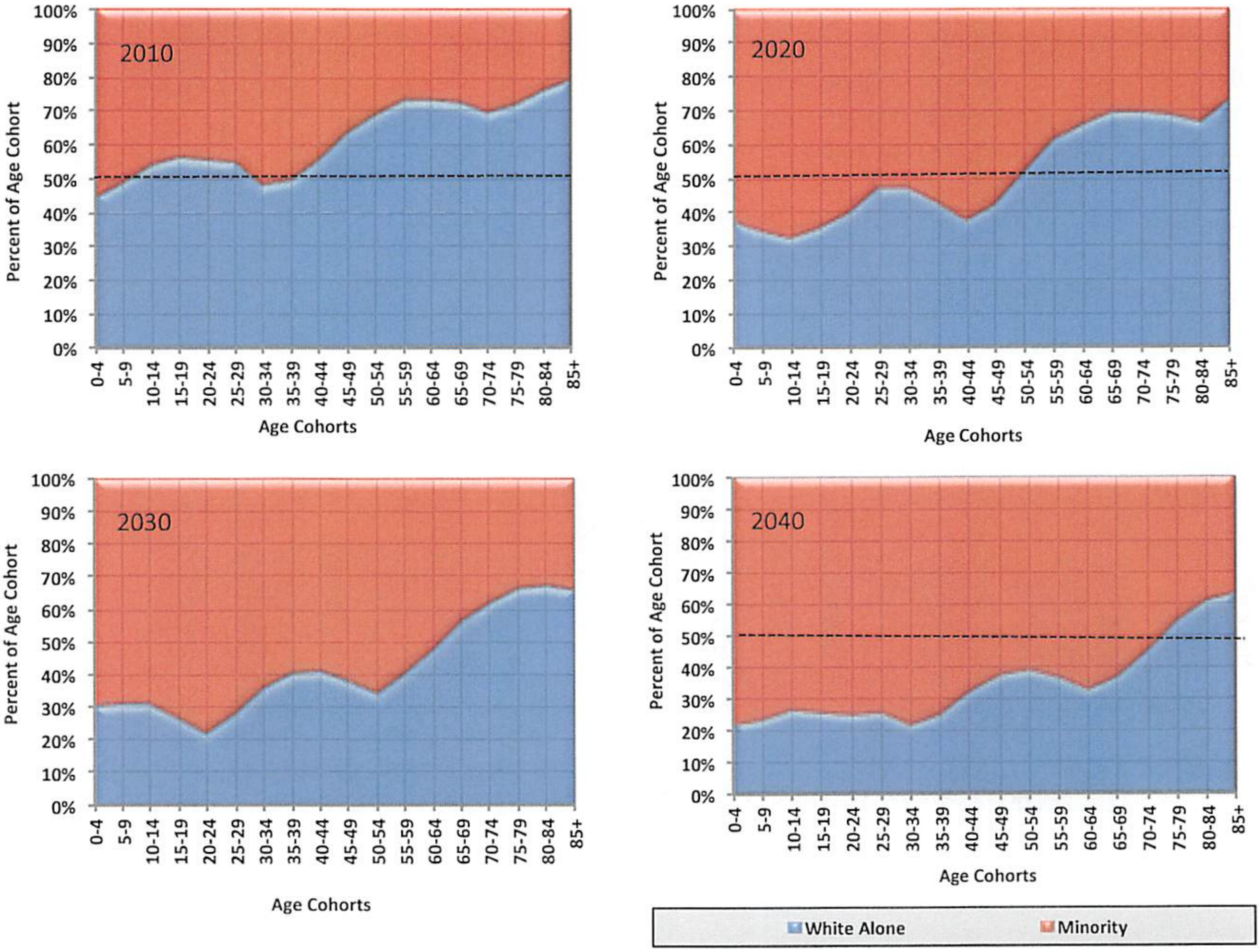


Figure 4: Changing percentages of minority population in Howard County; 2010-2040.

Economic Status

Howard County is one of the most affluent counties in the nation, with a median household income of $107,821 in 2012, more than double the national average of $53,046. Those 65 and older, however, are more likely than their younger counterparts aged 45 to 64 to have household income below the median. This may be due in part to retirement income being lower than employment income. *(See Figure 5.)*

Of concern is that 51% of Howard County homeowners over age 65 still carry a mortgage, compared to 35% nationally. When coupled with other debt, such as credit cards and their children's student loans, this may mean that significant numbers of older adults will not have the financial resources they need to see them through their retirement years.

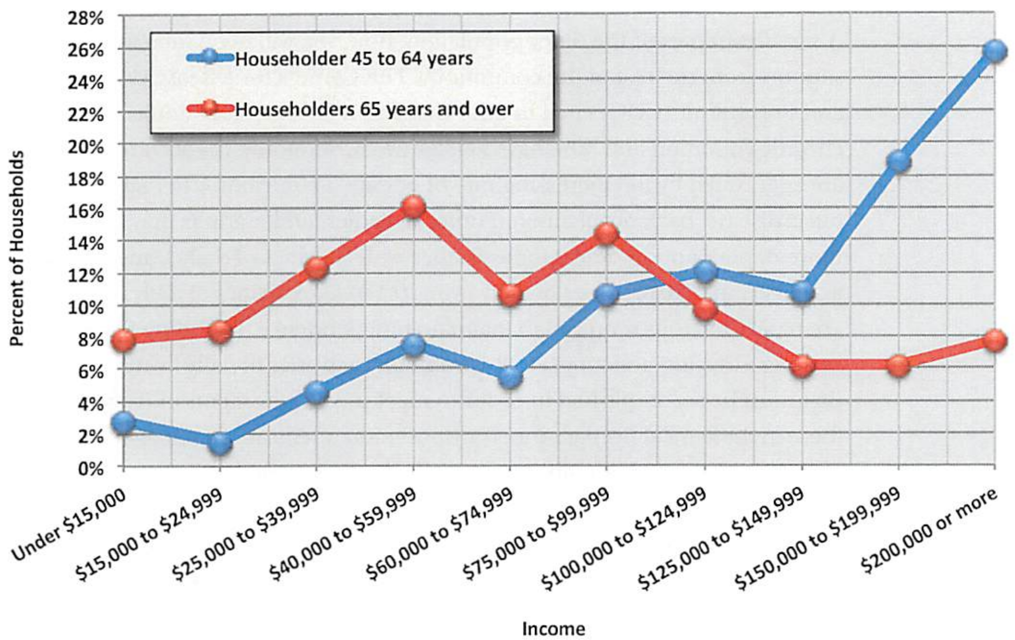


Figure 5: Income comparison between those 45-64 and 65+ in Howard County.

Longevity and Chronic Illness

Increased life expectancy over the past few generations is one of the major achievements of medical science. The implications of this are significant, as older adults today are able to remain in the workforce, volunteer and stay active far beyond the traditional retirement age. This continued engagement not only benefits the community, it can have a positive impact on older adults' mental and physical health.

Older adults who practice healthy behaviors, take advantage of clinical preventive services and continue to engage with family and friends are more likely to remain healthy, live independently and incur fewer health-related costs. An essential component to keeping older adults healthy is preventing chronic disease and reducing associated complications. Initiatives such as "life care" and evidence-based wellness programs can create opportunities for individuals to live the healthiest lives possible.

> Older adults who practice healthy behaviors, take advantage of clinical preventive services and continue to engage with family and friends are more likely to remain healthy, live independently and incur fewer health-related costs.

A significant part of the older population, however, will need increasing support from the rest of the community. The Centers for Disease Control and Prevention (CDC) cited in 2011 that about 80% of older adults have one chronic condition and 50% have at least two. Commonly, these conditions are aggravated by the increasing rate of obesity, a contributor to diabetes, heart disease, back problems and other maladies. Older adults may become more dependent on others for assistance with activities of daily living (ADLs) and instrumental activities of daily living (IADLs). Activities of daily living are basic functions required to maintain independence, including feeding, bathing, dressing, toileting, etc. Instrumental activities of daily living are tasks that must be accomplished in order to meet the requirements of daily living; these include meal preparation, transportation, medication management and administration, money management, telephone use, etc.

At 80 years of age and older, the risk for disease and disability increases more dramatically. Research shows that after age 80, individuals need significantly more help with both ADLs and IADLs. In 2014 the National Institutes of Health/National Institute on Aging published *Older Americans with a Disability: 2008–2012*. The report covers six types of disability that might commonly be experienced by an older adult, including impairment to hearing, vision, cognition, walking, self-care and independent living. The most common type of disability was difficulty in walking or climbing stairs, which was reported by two-thirds of those with a disability. With this diminished physical capability there is a higher risk of developing a mental health issue such as depression. This compounds the physical issues and may require the individual to have even greater care needs.

As the population ages, the prevalence of Alzheimer's disease and related forms of dementia also increases. The Alzheimer's Association estimates that about 11% of people 65 and over have Alzheimer's disease. Among those aged 85 and over, the Association estimates that 38% have the disease (Source: *The Alzheimer's Association 2014 Alzheimer's Disease Facts and Figures*). Given that Howard County's 85 and over population will increase by 253% between 2010 and 2035, rising from 6,606 to 23,334 people, caring for residents with Alzheimer's disease and related forms of dementia will become a major challenge.

The large increase in the number of older adults age 85+, along with the greater need for support services among that cohort, has profound implications. The community must prepare to provide strategic long term services and supports, including a coordinated network of formal care providers to support the existing informal system of caregivers.

Generational Shifts in Attitudes

The older adult population in Howard County will undergo another significant transformation in the next 15 to 20 years as the current generation of older adults, the Silent Generation, gives way to the aging Boomer generation. There are key attitudinal and mindset differences between these generations that must inform any planning for the future.

> Boomers are the first generation to reach age 65 and know with some degree of confidence they will live another thirty years, maybe more.

Each generation in living memory has reinvented the final stage of life. The G.I. Generation, born 1909 – 1928, took an early idea of "retirement" as a way station for people too worn out to work and refashioned it into a two-decades-long span of leisure. Retirement became a reward for a lifetime of labor: a time for activity, travel and security. The G.I.s gave rise to Sun City and other older-adults-only communities. They enshrined health care for the elderly as a right. They campaigned against stereotypes of the elderly as frail and infirm. They formed advocacy associations for all who joined them in retirement. They even changed the language: "old people" became "senior citizens."

Members of the next generation of older adults, the Silent Generation, largely accepted the broad outlines of aging bequeathed by the G.I.s, but they have changed the style. They are healthier and more active than any generation before them, and rebel against the idea of passively growing old. Bored by age-segregated communities, many empty-nesters of the Silent Generation are partial to urban condos near restaurants, museums and nightlife where they can mix with young people.

Today, with 10,000 Boomers reaching age 65 every day, the Boomer generation has begun entering retirement. With its prodigious size and sense of entitlement, Boomers have transformed American institutions at every stage in their passage through life. There is every reason to believe they will institute a transformative approach to growing old similar to the transformations engendered in their approaches to civil rights, the Vietnam War, the sexual revolution, Women's Liberation, the work ethic, the pursuit of material gratification and entrepreneurial risk taking.

Boomers are the first generation to reach age 65 and know with some degree of confidence they will live another thirty years, maybe more. They want to maintain their physical fitness, mental acuity and active social lives. And, as they get closer to the final passage, death, they want to explore the spiritual dimensions of existence, whether through organized religion or personal quest.

With so much time ahead of them, they are redefining what it means to be "old." In a recent study conducted by The Boomer Project, Boomers said that middle age starts at age 48 on average, while "old age" doesn't begin until 73 – eight years past the traditional retirement age.

Boomers are acutely aware that they have not accumulated enough money to live the active lifestyles they've enjoyed most of their lives, much less to age in place or protect themselves from the risk of runaway medical expenses and long-term care. Prodded by the collapse in their net worth, many Boomers are postponing retirement. In 1950, the average retirement age was 70. By 1990, it had bottomed out at 62. In the past few years, it has started moving back up.

One thing is certain about the future of aging: in many ways, Boomers will do it differently. But how? There are at least two possible options. One is for Boomers to transform everything about aging in American society. The other is to transform themselves and their own expectations about growing older. The first is externally focused and the second is internal. Whether Boomers will pick up the external, social causes they fought for a half century ago or turn inward in search of spiritual fulfillment is not possible to predict. Only time will tell.

Demographic Megatrends

The growth of the 50+ population has the potential to bring many benefits to Howard County, as they continue to engage in the life of the community. Older adults are often the backbone of community organizations and civic life, providing experience and wisdom along with their time.

The aging demographics of Howard County present multidimensional challenges for planners and forecasters. Three megatrends in particular will shape the context in which Howard County prepares for the future. These megatrends affect most communities in the United States.

Growing Dependence on Others

As noted earlier, the number of older adults in Howard County needing support and care from others will grow significantly over the next twenty years. In particular, a large proportion of the 80+ age group will require help from paid and family caregivers. This growth in caregiving demand will have significant implications for Howard County's economy, family structures and quality of life.

If researchers make significant advances in dementia treatment and care or in developing protocols that address some of the leading causes of frailty in older adults, Howard County and other communities may have fewer older adults depending on others for care. If, however, chronic disabling conditions increase among Howard County's older adults, the number of elderly who cannot live independently may also increase, putting further pressure on families and community resources.

Growing Diversity

The majority of Howard County's 50+ population will be non-white by 2035. This change in the county's older adult population has profound implications for service systems. The new majority will include many residents for whom English is not the primary language and who may have varied cultural attitudes toward services and the status of older family members. The county's public and private aging-services organizations will have to adapt to the growing diversity of the county's older adults and develop competence in working with varied cultures.

> As Howard County plans for its growing older adult population, it must monitor the financial and health status of its residents in mid-life today.

Growing Financial and Health Pressures

The traditional retirement model is based on people's ability to build financial assets (homes, pensions, investments, Social Security) throughout their working lives that can be used to sustain them during retirement. The model also assumes that most people are in good health in their middle decades and envisions that the majority will enter their 60s free from chronic disease, with minimal or declining debt burdens and growing assets.

Many analysts have noted that this traditional model is at risk across the U.S. Significant numbers of people in their 50s have not been able to save for retirement, carry significant debt and have less earning potential than their counterparts enjoyed twenty years ago. If this trend continues, many older adults, including those in Howard County, may face tight finances in the coming decades and require increased public resources. In addition, growing incidences of chronic disease, in part due to unhealthy lifestyles, could increase financial and capacity stress on the healthcare system.

As Howard County plans for its growing older adult population, it must monitor the financial and health status of its residents in mid-life today. If the overall economy improves, and the benefits of the improvement accrue to most residents, more people will be financially prepared for retirement. If residents adopt healthier lifestyles now, they will enter their older years with fewer medical problems. The financial and physical health of residents in their 40s and 50s today is likely a strong indicator of how many older adults will need help and support in 2035.

Gathering Information

The project team employed a variety of information gathering techniques to further ground the planning effort. These included a review of national best practices, an assessment of past studies performed in Howard County related to aging, an on-line survey and focus groups to hear directly from current Howard County residents, and the engagement of stakeholders from a wide range of community organizations. In addition, the project utilized a scenario approach to consider what the future might look like. These efforts are described below.

National Best Practices

In counties, cities and towns all over America communities are thinking ahead and planning for a future in which their population will be older. Indeed, the concern about the impact of aging on communities is international in scope. A rich literature exists, documenting how different communities are grappling with the implications.

The most prominent theme in this literature is recognition of the importance of moving beyond traditional concepts of programs and services for older adults. The emerging approach is to look at communities and their relationship with older residents more holistically. The result is a new movement to create communities more supportive of all residents as they age. Variously titled "livable communities for all ages," or "age-friendly" or "senior-friendly," this movement combines community planning, public health concepts and traditional health and human services in new configurations. The underlying theory behind age-friendly communities is that the physical and social infrastructure of communities must change if older adults are to live their lives independently and contribute to civic life in their neighborhoods.

Prominent among those developing such concepts are the World Health Organization (*Global Age-friendly Cities: A Guide, 2007*), the Center for Home Care Policy and Research, Visiting Nurse Service of New York (*The AdvantAge Initiative*), the National Association of Area Agencies on Aging (n4a) and Partners for Livable Communities (*A Blueprint for Action: Developing a Livable Community for All Ages, 2007*). While each of these organizations has its own conceptual framework, common themes emerged:

Access to Service and Resource Information Older adults and their caregivers must be able to find helpful services within their own communities. Especially important are organizations skilled at guiding older adults through service systems and making information such as eligibility criteria easy to understand.

Basic Needs Age-friendly communities must offer a safety net to ensure that no one goes hungry, is homeless or is subject to abuse or exploitation.

Housing Age-friendly communities must offer housing that is affordable and accessible for residents with disabilities, including those who use wheelchairs. Home repair and modification services need to be readily available for older homeowners and the community must include a sufficient supply of housing with support services, such as assisted living, for older adults who cannot live alone. Affordable housing for caregivers and service providers is also a major concern.

Zoning and Land Use Planning Many age-friendly community design concepts are linked to the new urbanism, which emphasizes walkable, pedestrian-friendly environments, public spaces that promote social connection, etc., attributes with obvious value for older adults. Aging advocates also suggest zoning that permits accessory housing, such as added apartments or small houses, to accommodate older family members.

Transportation Age-friendly communities must offer multimodal transportation options, including public transit that is convenient and affordable, paratransit or door-to-door dispatched service and service provided by volunteers. An age-friendly transit service includes lift- or ramp-equipped vehicles that comply with Americans with Disabilities Act accessibility requirements.

Health and Supportive Services In order to serve aging populations well, communities must provide sufficient primary care practitioners; health and supportive services for in-home care; preventative health programs for screening, exercise and wellness; and innovative technology, particularly for in-home health care.

Culture and Lifelong Learning In age-friendly communities, lifelong learning and cultural activities are affordable and accessible.

Public Safety Police, fire and emergency responder personnel must be trained in older adult issues and coordinate services with health care and community organizations.

Civic Engagement and Volunteer Opportunities Age-friendly communities offer a wide range of meaningful volunteer opportunities, encouraging older adults to participate in civic life, including service on government advisory boards and committees.

Employment In age-friendly communities, employers provide employment opportunities for older workers who wish to remain in the workforce and support family caregivers with flexible work and leave policies.

Previous Howard County Studies

Over the past 15 years, a number of Howard County studies, plans and reports have addressed the issue of aging. Some were specific to older adults; others included aging as part of a larger community assessment, such as *PlanHoward 2030,* produced by the County Department of Planning and Zoning.

The discovery phase of this project incorporated an analysis of these efforts completed by the Department of Citizen Services in 2013. Past recommendations addressed the following themes:

Health The reports and plans called for special attention to fall prevention, elder abuse and neglect, caregiver needs and preventative healthcare. They also recommended education and outreach to inform target populations about resources, including those addressing chronic disease, inadequate insurance and behavioral health issues.

Housing Previous recommendations, including those in the Senior Housing Master Plan, emphasized development of more affordable housing, creation of a greater variety of housing options, including new housing that incorporates universal design principles, and an increase in private sector home repair and improvement services for seniors.

Transportation The reports and studies covered the full gamut of transportation issues, including access to public transportation, support for safe driving by older drivers, infrastructure improvements to create more walkable communities and development of transportation alternatives, such as volunteer programs like Neighbor Ride.

Services and Facilities Previous recommendations addressed the accessibility of public parks, senior and community centers, and gymnasiums/ fitness spaces for older adults, with services to be developed in numbers proportionate to the population.

Social Services and Programs The reports and studies recommended a wide mix of programs designed to fill gaps in the current system and respond to emerging needs, including support for non-English speaking and Limited

English Proficient residents, increased programs to combat crime and fraud directed at older adults, educational programs to prepare residents for their retirement years and mechanisms to make in-home services affordable.

Economic/Employment Recommendations included more financial education programs and tax incentives for older adults and caregivers.

Social Connection and Civic Engagement Previous reports and studies supported more opportunities for volunteering, intergenerational programming, private sector discounts and initiatives for community safety.

The most recent effort to address the issues presented by an aging Howard County was the Columbia Association's *Communities for a Lifetime,* completed in May 2014. Among the priorities identified were: transportation, helping seniors stay in their homes, social/cultural and education activities and health promotion and services.

The issues identified in these previous efforts are remarkably consistent over time and with national trends, especially in the areas of housing, transportation and aging in the community. While much good work has been undertaken in Howard County over the years, many needs in the community remain unmet. Review of these earlier plans and studies reveals common characteristics that have impeded progress.

For the most part, these plans did not include a viable mechanism or structure through which to implement the recommendations.

- In the absence of a structure for implementation, responsibility for implementation was often not clear or fell on County Government by default. County Government, however, is not necessarily equipped to fulfill the wide range of expectations or recommendations.
- Limitations on or lack of resources (funding, staff, volunteers, etc.) were not acknowledged. This is typical of most traditional planning efforts that produce a list of action steps, without the necessary commitment of resources to carry them out. Securing such commitment requires its own effort, beyond the planning stage.
- Previous planning efforts did not set metrics for tracking the progress made on action items or build in a system of accountability for achieving the desired results.

The resulting inability to fully implement previous plans underscores that a different approach is required to turn planning into successful action. This is in keeping with the growing recognition across the nation that complex issues such as the creation of age-friendly communities cannot be solved by any individual stakeholder. A community-wide, collaborative effort that can address issues at a system-wide level – not only at the level of individual organizations – is essential.

These conclusions led the planning group to struggle with what became one of the defining questions of this project: What must be different about this report to avoid it being yet another plan released with fanfare, only to be relegated to the shelf?

Community Input

Current input was obtained from the community through three different means: a widely publicized on-line survey, focus groups and the engagement of two groups of key stakeholders.

On-line Survey

With national trends and past Howard County studies in mind, the KGRW team conducted a quantitative research study among county residents. More than 1,200 adults participated in an on-line survey in May and June of 2014.

The purpose of the survey was to collect input and perspective from a wide range of stakeholders in Howard County about potential services, programs and facilities that can support the needs and wants of older residents. It was designed to capture how adults think, feel and use existing resources; what their needs, expectations, attitudes and behaviors are now; and how those might change over time.

The survey required respondents to be current residents of Howard County, aged 45 and older, who said they plan to live in the county for the foreseeable future.

The survey required respondents to be current residents of Howard County, aged 45 and older, who said they plan to live in the county for the foreseeable future. While some 45 to 60 year olds may have objected to being part of an "older adult" survey, their perspectives were important when considering what services will be needed twenty years from now. In the end, 29% of respondents were aged 69 and older, 61% were 50-68 and 10% were 45-49.

It is important to note that survey respondents did not necessarily reflect the full spectrum of county residents. Their mean household income, for instance, was $118,000, compared to $107,000 for all Howard County households. In terms of education, 50% had a graduate or professional degree, compared to 30% of the general population.

Survey respondents reported a high quality of life in Howard County. On a five-point scale, 87 percent rated their own quality of life as "good" or "excellent." Income appears to influence how highly respondents rated their quality of life. Of those with income of $100,000 or more, 94% reported their quality of life as "good" or "excellent," compared to 80% of those with incomes under $100,000.

However, the respondents did not think everyone else in the county had an equally high quality of life. Those aged 69 and older, for instance, rated the quality of life of older adults in general about eight points lower than they rated their own. This perception that older adults (other than themselves) have a lower quality of life is a common finding in research conducted by the Boomer Project, which believes it reflects a mindset that views aging as a problem, rather than seeing it as "the promise of living longer lives."

Asked about life in Howard County as an older adult, respondents rated "availability of healthcare services you need" as the top priority, followed by "remaining in your home as you grow older," "recreational activities available to you," "transportation options to make it possible to easily get around" and "opportunities for social engagement and interaction."

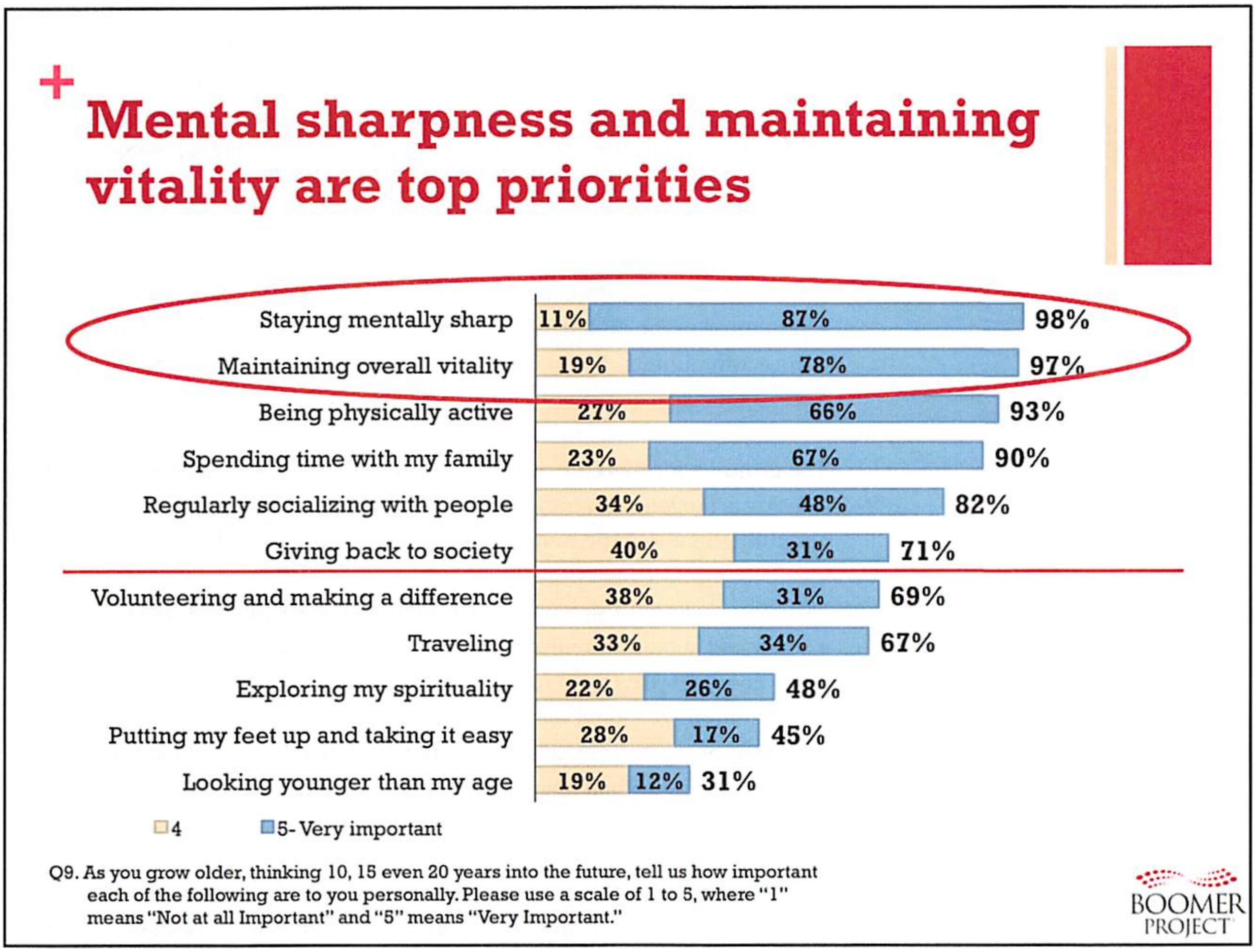
However, when asked about the ability of organizations to deliver or perform services in areas important to older residents, some significant gaps appeared. The largest gaps – transportation options, remaining in your home, and having opportunities to participate in intergenerational activities – have major implications for the county. These are top concerns today and can be expected to continue to be top concerns for older adults in the future.

SCORES OF "4" AND "5" ON 5-POINT SCALE	IMPORTANCE	PERFORMANCE	GAP
Availability of the healthcare services you need in Howard County	96%	76%	-20
Remaining in your home as you grow older	84%	37%	-47
Recreational activities available to you in Howard County	81%	69%	-12
Transportation options to make it possible to easily get around in Howard County	79%	28%	-51
Opportunities for social engagement and interaction in Howard County	74%	58%	-16
The educational opportunities available to you in Howard County	65%	73%	+8
Opportunities for you to volunteer in Howard County	62%	66%	+4
Activities that encourage and support intergenerational interaction in Howard County	53%	26%	-27
Employment opportunities in Howard County	45%	27%	-18

Figure 6: Survey findings on importance vs. performance in key areas of concern to older adults.

Survey respondents indicated that they plan to remain "active" as they grow older and seek things to do and activities in which they can continue to participate. When asked how their activities might evolve over the next ten or more years, most respondents said they would either participate at the same level, or increase participation. When asked what other kinds of activities they would like to see offered, the list was long and varied, but most responses were around "things to do." Exploring the longer view, virtually every respondent indicated that "staying mentally sharp" and "maintaining overall vitality" is important or very important to them. *(See Figure 7.)*

This interest in engaging in activities puts more emphasis on the need to be able to move around "on demand" across the county. The respondents expressing greatest need for help with transportation were those with incomes under $100,000, aged 69 and over, or living in Elkridge/Laurel.



+ Mental sharpness and maintaining vitality are top priorities

Q9. As you grow older, thinking 10, 15 even 20 years into the future, tell us how important each of the following are to you personally. Please use a scale of 1 to 5, where "1" means "Not at all Important" and "5" means "Very Important."

BOOMER PROJECT

Figure 7: Survey findings on the top priorities for older adults.

Interestingly, when asked to identify transportation options available in Howard County, 45% of older adult respondents were unaware that "special transportation for the elderly" exists and 38% did not know if there was "special transportation for the disabled." There is a clear need for improved communication about existing transportation options in Howard County.

Three in five respondents considered themselves to be prepared to navigate the issues related to growing older. There were significant differences between the generations, with 75% of those aged 69 and older thinking they are prepared, compared to only 55% of those aged 45 – 68. This points to an opportunity to provide the younger cohort with the tools and information they need to prepare for their future.

Finally, a new life stage for many older adults will see them providing care for an older relative or friend. Almost three in ten respondents provided care in the previous month, with women and those aged 45 – 68 most likely to be caregivers. *(For complete results of the Community On-Line Survey, see Appendix C.)*

Focus Groups

A series of focus groups were also conducted with key audiences under-represented in the on-line survey, primarily lower- and middle-income and ethnic communities. Seven focus groups were held in October 2014, with more than 70 participants, in total.

The groups addressed the same issues covered in the online survey, discussing housing arrangements, transportation use, recreational and leisure activities, and thoughts about the future of growing older in Howard County.

Participants shared a wide range of opinions and perspectives. For example, when asked about future living arrangements, one participant said, "I don't worry about 20 years from now." Another in the same session said, "I think about it often. My home will need modifications." Overall, participants seemed more concerned about current needs than long-term planning. This could reflect individual finances, which are perhaps more focused on short-term obligations.

When asked about living in Howard County today, participants talked about current living arrangements and increased housing expense. They said there are not enough affordable options for senior living. While some live in older adult communities or buildings and enjoy the camaraderie developed among members of these communities, they do not feel they have a wide range of housing choices. Few, if any, reported living with their adult children and none said they want to eventually live with them. The participants prefer living independently, in full control of their lives without burdening their children.

When asked about the future when they may no longer be able to live alone, few had concrete plans. Most said they will deal with it when the time comes. There was interest in different types of housing, where resources could be shared. There was also interest in getting assistance during transitions, such as moving out of a single-family home or into a senior-living apartment, which several identified as difficult and confusing.

Most participants still drive, but also admit they have already made accommodations for their age, such as not driving at night, in bad weather or during rush hour. Many participants use Howard County transit options, but find them unreliable. Bus routes do not always go where they live or want to go and the frequency of buses is insufficient. A few mentioned the RTA Mobility on-demand transit service for seniors, but the fare and the need to schedule two days in advance are deterrents.

> For older adults, maintaining "control" over their lives is the essence of living independently.

Overall, participants thought there should be more County transportation options, along with community-based solutions like ride-sharing programs, neighborhood rides and new services like Uber. As one participant said, "Transportation means control." Another said, "I understand my limitations and I am slowing down, but that doesn't mean I've stopped living." For older adults, maintaining "control" over their lives is the essence of living independently.

Almost all focus group participants, like the survey respondents, reported getting out and about and engaging socially in Howard County. They understand the benefits of activity. Many attend activities at senior centers and also go to libraries, churches, the community college, other community facilities and a wide variety of locations throughout the region. Those who currently live in age-restricted buildings or communities also participate in on-site events and activities, when available. Overall, these older adults prefer to engage in activities with people of all ages, not just other seniors. They said doing so "keeps me young."

Focus group participants raised concerns about being isolated as they grow older, with transportation and living independently at home top concerns. When the day comes that they can no longer drive or live independently, they fear being stranded or limited in mobility and access to social activities. This must be reflected in any long-range plan for older adults in Howard County. Given that some lower-income residents do not have long-range plans in place, there is a serious need for community-based support in advance of the increased number of older adults.

Stakeholder Engagement

Two planning groups were created to involve a wide range of community stakeholders in this project. Both top-level policy makers and professionals with program expertise needed to be engaged in this planning effort for it to be successful.

The Advisory Committee included leaders of key organizations and sectors in the community. The larger Working Group included both leaders and program staff from an even wider range of community organizations, who brought hands-on knowledge of the needs of older adults in Howard County.

Both groups participated in a back-and-forth process to develop the scenarios described in the next section, develop a vision for a "preferred future" for aging in Howard County and identify key priorities for action. Both groups also engaged in vibrant discussions of how efforts to address the priorities could best be "governed" to assure successful implementation.

Scenarios for Imagining the Future

The unprecedented demographic shift that will take place over the next 20 years, along with the recognition that past planning efforts have not yielded the needed results, led to the use of a scenario approach to envision the future of aging in Howard County.

Scenarios are particularly well suited to planning efforts such as this one, where the timeframe under consideration is long or where many factors will come together to shape the outcome.

Scenarios are stories about what could happen in the future. They set up a series of premises that invite exploration of a broader range of opportunities and challenges than can be predicted by considering past or current events alone. Scenarios are particularly well suited to planning efforts such as this one, where the timeframe under consideration is long or where many factors will come together to shape the outcome.

Four scenarios were developed for this project. These included an *expectable* future that extrapolates existing trends and expectations; a *challenging* future that presents a set of plausible issues and outcomes; and two *aspirational* futures characterized by visionary action leading to surprising success.

Development of these scenarios drew from information gathered in the discovery phase of this project, as well as input from the members of the Working Group and original research conducted by the KGRW team. The research was organized according to the following "drivers," which are key factors likely to play a significant role in shaping the future of older adults in Howard County:

- Generational attitudes on aging
- Demographics of Howard County
- Health, wellness and long-term care
- Technological supports for aging in place
- Howard County economy
- Housing
- Transportation
- Local government/governance

The KGRW team scanned trends and emerging developments in each of these topic areas and also solicited input from the Working Group regarding the expectable, challenging and aspirational outcomes of these drivers in the year 2035. Based on this research, the team wrote preliminary forecasts, which were used in individual interviews of Advisory Committee members to access their best thinking about the future. Based on these interviews, the team refined the forecasts as an input to scenario development.

The process produced four scenarios describing the potential future of aging in Howard County:

- **A Haven in the Suburbs** An *expectable* future in which Howard County maintains its high quality of life and provides an expanded offering to older adults that evolves to meet the needs and preferences of the Boomer generation.
- **Aging in a Hard Place** A *challenging* future in which economic recession and cuts in federal employment swell the ranks of vulnerable older adults and reduce the funding available to meet their needs.
- **A Village on a Cloud** An *aspirational* future in which high-tech entrepreneurship and a focus on strengthening community come together to create a new infrastructure for 21st century living, with new tools for older adults.
- **Keepers of the Meaning** An *aspirational* future in which policymakers detach physical and mental decline from the construct of chronological age, prompting a reorganization of social structures all across the lifespan.

The following matrix permits side-by-side comparison of the scenarios across a range of relevant dimensions. *(The full narrative description of each scenario is included in Appendix D.)*

Scenario Matrix

This matrix compares the four scenarios across key dimensions at three levels: the "macro environment," the county and the Office on Aging.

	EXPECTABLE FUTURE	CHALLENGING FUTURE	ASPIRATIONAL FUTURES	
	Scenario 1 **A Haven in the Suburbs**	**Scenario 2** **Aging in a Hard Place**	**Scenario 3** **A Village on a Cloud**	**Scenario 4** **Keepers of the Meaning**
MACRO ENVIRONMENT				
National Economy	· Periodic national recessions (Howard County is largely protected due to proximity to Baltimore and Washington) · "Sharing economy" grows, but remains marginal	· Severe economic recession · Many jobs lost to automation and intelligent systems · Federal spending cuts yield large reductions in federal employment	· Steady economic growth driven by advances in technology · Private sector innovates to meet the needs of the growing older adult market	· Economy grows while policy reforms address social and economic inequities · Informal "sharing economy" strengthens community bonds
National Government	· Politics at all levels becomes less polarized and more pragmatic	· Political polarization at national level	· Governments at all levels use technology to increase citizen engagement	· Major rethink of social structures, often instigated by Boomers
Social Security Reform	· Means testing · More sophisticated phased eligibility structure	· No reform · Benefits cut by one-quarter in late 2020s	· Individualized, risk-adjusted distribution scheme · Payments increase over time	· Converted into social safety net for all ages · Includes "negative income tax," or minimum guaranteed income
Medicare Reform	· Means testing · Cuts in reimbursements and coverage	· No reform · Program overwhelmed by growing older adult population	· Reforms incentivize use of knowledge technology to ensure high quality and high value	· Converted into social safety net for all ages · Emphasis on health throughout the life course

	EXPECTABLE FUTURE	CHALLENGING FUTURE	ASPIRATIONAL FUTURES	
	Scenario 1 **A Haven in the Suburbs**	**Scenario 2** **Aging in a Hard Place**	**Scenario 3** **A Village on a Cloud**	**Scenario 4** **Keepers of the Meaning**
MACRO ENVIRONMENT				
Health, Health Care, and Long-Term Care	· Health care system reform and medical advances slowly improve population health · Expanding alternatives to institutional long-term care	· Health care system bifurcates between rich and poor · Many cannot afford quality long-term care · High burden of family caregiving	· New technologies promote health and wellbeing for all ages · Community-based alternatives to long-term care prove effective	· Health care system promotes making health the default throughout the life course · Older adults are most often cared for within the family
Technology Supports for Aging in Place	· Older adults benefit from in-home monitoring, caregiving robots, and enhanced tools for communicating with loved ones · "Internet of Things" merges real and virtual worlds	· Affluent older adults can afford high-tech products · Products for poor and middle class vary widely in quality and safety · Dependence on technology makes older adults vulnerable to Internet "brownouts"	· Partnership between Village and private sector creates online platform for data sharing among older adults · Private sector offers older adults a spectacular array of products for aging in place	· Older adults use smart devices to monitor and improve their health and wellbeing · Communications technologies bring people together
Boomer Generation	· Boomers start "encore" careers that offer a chance to learn something new or make a difference in their communities	· Boomers fight hard to preserve entitlements · Caught in a "catch-22": either dependent on younger workers or taking jobs from them	· Boomers continue to contribute to the economy and to their communities	· Boomers take a leadership role in redesigning social structures around the life course

	EXPECTABLE FUTURE	CHALLENGING FUTURE	ASPIRATIONAL FUTURES	
	Scenario 1 **A Haven in the Suburbs**	**Scenario 2** **Aging in a Hard Place**	**Scenario 3** **A Village on a Cloud**	**Scenario 4** **Keepers of the Meaning**
HOWARD COUNTY				
Housing	• New condos increase population density and provide walkable communities • Persistent lack of affordable housing	• Shortage of affordable housing increases cost of home, health and long-term care • Many neighborhoods in Columbia decay	• New developments embrace universal design and inclusionary zoning • Multiple housing options available across a wide range of income levels	• Government builds walkable communities • Affordable housing expands as county comes to appreciate low-income populations
Transportation	• Howard Transit upgrades service to attract "riders of choice" • Bus rapid transit service launched in 2020s • Para transit service expands for older adults with disabilities	• Gas prices rise significantly • Bus service curtailed to reduce liability for para transit under ADA • Senior shuttles and Neighbor Ride are expanded, but cannot meet need	• Transit network of autonomous electric vehicles operates on dedicated lanes envisioned by James Rouse • Private cars continue to operate on county roads	• Howard Transit upgrades equipment and expands service significantly • Walkable communities relieve stress on transit system
Local Governance and Government	• Widespread desire to meet needs of older adults, but not at expense of younger generations	• Recurrent discord between older adults and young families • County officials beholden to priorities of national and state agencies	• 311 phone system, real-time county simulation • Highly effective collaboration among public, private and nonprofit sectors	• Effective community collaboration around shared vision in areas like health and education
Attitudes on Poverty in Howard County	• Low-income populations seen as key to service sectors, but little is done to help them stay in county • Poverty remains invisible for most residents	• Fear of poverty, strain on human services, and stigma of FARM-eligible schoolchildren lead many residents to resent low-income populations	• Economic vitality supports expansion of services to low-income populations • "Rising tide lifts all boats"	• Residents come to see relationship between rich and poor as a key indicator of community wellbeing • Residents realize that the poverty line is higher in Howard County

	EXPECTABLE FUTURE	CHALLENGING FUTURE	ASPIRATIONAL FUTURES	
	Scenario 1 **A Haven in the Suburbs**	**Scenario 2** **Aging in a Hard Place**	**Scenario 3** **A Village on a Cloud**	**Scenario 4** **Keepers of the Meaning**
OFFICE ON AGING				
Population of Concern	• Residents over 65 or in some cases over 50 • Vulnerable older adults	• Indigent, disabled and socially isolated adults over 65	• Residents over 65 • Older adults with physical and mental disabilities	• All ages • Special attention to needs of people with disabilities
Evolution of Senior Centers	• "Senior" dropped from the name to attract Boomers • Programs focus on maintaining vitality • Centers adapt to local preferences	• Health, wellness, and educational programming reduced • Programs focus on indigent, disabled and socially isolated	• Senior Center Plus programs expand significantly	• Senior centers become "vitality centers" in late 2010s to match Boomer preferences • Evolve into "community vitality centers" as age becomes less significant as a differentiator

The Preferred Future

The intent of the scenario process was not to choose one of the four as the "preferred future," but rather to elicit deep thinking and conversation about the elements of each that resonated with participants. The vision of the preferred future for Howard County that emerged was of an age-friendly community that enables residents of all ages to enjoy the highest quality of life possible. Below are key characteristics of the preferred future envisioned by project participants and the priorities that emerged through this process and call for further action.

Key Characteristics

There will be improved synergy, communication and collaboration among county-wide partners in the public, private and nonprofit sectors. These parties will engage in regular multi-stakeholder conversations at all levels of their organizations and the collaborative environment will be supported by a business environment in which the private sector is willing to invest in new business models to meet the needs of older adults.

Howard County will serve as a model for the rest of the country for its ability to meet the needs of its most vulnerable residents. Delivery of these services will benefit from a combined data platform that will be created to bring together data from electronic medical records and case management systems used by all agencies. This platform will allow service providers to better address the needs of their clients and will allow leaders to track the county's performance against an established set of metrics of community wellbeing. The platform will also provide a real-time inventory of capacities and needs within the county so that all community assets can be brought to bear, including the capacities of those who are receiving services.

Services for older adults and their caregivers will be collocated physically or virtually where appropriate, but will in general be distributed throughout the community, with centralized access. The available services will include respite care and other caregiver supports, along with opportunities for lifelong learning, recreation and social interaction. These services and activities may take place in what is today called a senior center or in other settings, such as online or in-home. The County and its nonprofit partners will provide services according to a sliding-scale fee structure based on need and ability to pay.

By 2035, the county's health care system will evolve into what one participant called "Howard County Life Care," a multi-stakeholder system that defines a healthy way of life across the lifespan in all domains, not just in health care. This life care system will draw upon all sectors of the county and will proactively address issues related to health, creating opportunities for all residents to live the healthiest life possible. The county will build up the health-care workforce and other relevant workforces to support better health throughout the community.

A wide range of housing options will be available that are high-density, multigenerational, use principles of universal design, are mixed-use and mixed-income, and for which zoning rules require connectivity to convenient, scheduled and accessible transit options. Innovative housing arrangements to meet the needs of older adults across the income spectrum may include rent controls for caregivers and health care workers, affordable housing for caregivers embedded within age-friendly condo developments and a house-sharing model where a tenant pays no or reduced rent in exchange for providing services for others in the home.

In 2035, the vast majority of county residents will be able to plan for their own later years, in large part because they have learned financial planning and other relevant skills throughout their lives. Training in these areas will be provided in many languages and delivered in ways that are culturally appropriate across the county's diverse population. At the same time, important public conversations on issues relevant to aging will take place throughout the community. For example, a public conversation about the concept of aging-in-place will educate many older adults about opportunities to stay in their communities, even while moving to more age-friendly residences. This and other public conversations will create a populace more prepared for healthy aging than previous generations.

The preferred future provides an aspirational vision of the county as a place that supports the ability of older adults to age successfully. Participants felt strongly that this was within Howard County's reach. The critical question is, of course, what needs to be done to achieve that vision?

Community-Wide Priorities

The planning process identified six priorities essential to securing the preferred future. They provide a picture of what must be done to become the age-friendly community desired by older adult residents and envisioned by planning participants.

The descriptions below offer guidance on a wide range of activities and initiatives related to each priority. Some are simple, short-term projects that can be undertaken by a single organization. Others are complex, requiring long-term collaboration among numerous partners – and often significant systems change and/or funding.

Some stakeholders are identified, but it must be noted that these are not comprehensive lists. Rather, they are intended to suggest the spectrum of organizations or sectors that should be included.

For each priority, "focus areas" offer recommendations for initial starting points for taking action. Given the 20-year timeframe addressed by this report, an ongoing openness to emerging and even as-yet-unknown opportunities in each area will be critical. Planning efforts will need to be highly adaptive in order to accommodate these new opportunities, what is learned during implementation of different strategies and on-going changes in the economic and political climate. At every step, the preferred future of an age-friendly community must serve as True North to guide decisions and resource allocations.

Priority 1: Provide advocacy, services and a safety net for vulnerable adults.

The OOA, as an aging and disability resource center, serves not only older adults but also younger adults with disabilities. So it is not surprising that when addressing the issue of vulnerability, Howard

County looks at the entire adult population and not just older adults. The Code of Maryland Regulations (COMAR) defines "vulnerable adult" as an adult who lacks the physical or mental capacity to provide for his or her activities of daily living.

Vulnerable adults, by virtue of their dependence on others, are at risk for abuse, neglect or exploitation. Some may self-neglect. They may have become isolated from their communities. They are especially vulnerable during community-wide emergencies and disasters. The growing number of vulnerable older adults with limited English proficiency is an additional concern.

Vulnerable adults, by virtue of their dependence on others, are at risk for abuse, neglect or exploitation.

Researchers have not developed reliable estimates of the number of older adults who could be considered vulnerable, but with advanced age the incidence of chronic illness, physical and cognitive disability increases, therefore increasing an individual's chance of becoming dependent on others for daily care. As the number of the oldest old grows in Howard County, incidents of neglect, exploitation and abuse have the potential to increase significantly. With the 80 and older population in Howard County more than tripling between 2010 and 2035, a corresponding rise in elder abuse and neglect cases will likely present more challenges for social service and law enforcement agencies. In addition, Howard County may see increases in the number of older adults who live alone and suffer from self-neglect and behavioral health disorders, such as hoarding.

Devising an effective strategy to provide support for vulnerable adults is challenging for several reasons:

- Since many victims of neglect, abuse and exploitation are isolated, either in institutions or in their own homes, their plight may be invisible to the larger community until it is too late.
- Public agencies are cognizant that competent older adults have the right to make decisions about their own lives. Taking away that right to self-determination is a serious legal proceeding and must be exercised only in extreme situations. Howard County residents must understand that everyone, including individuals with behavioral health disorders, has the right to self-determination. The answers are not quick or easy and often require a coordinated response from a number of individuals and agencies.
- The public agencies that address the needs of the vulnerable elderly often have limited resources and face legal and organizational barriers when they seek to work together.

- Research shows that most abusers and exploiters of the elderly tend to be people they know, including family members and caregivers. In our emerging cyber culture, however, these traditional abusers have been joined by a growing number of scam artists, who often employ sophisticated schemes to prey upon isolated older adults.

While the task is difficult, the needs of vulnerable older adults must be addressed. Components of a community strategy identified during this planning process include:

- Interagency collaboration, such as the Vulnerable Adults Committee, which can coordinate responses to vulnerable individuals with complex needs.
- Development of protocols that map and define how agencies respond to cases of exploitation, abuse and neglect, so that interagency responses can be more effective.
- An ongoing community education campaign, informing the public about issues surrounding legal competency, the rights of individuals and measures older adults can take to protect themselves against fraud and exploitation.
- Outreach to limited-English speaking populations to ensure they can be linked to resources when needed.
- Plans for taking necessary measures to protect vulnerable adults during community-wide emergencies.

Howard County currently provides for vulnerable adults through the OOA's Long Term Care Ombudsman Program, Senior Care Program, Community First Choice, Caregiver's Support Program and others; a designated Senior Liaison in the Police Department; the Adult Protective Services Program of the Howard County Department of Social Services; and the Vulnerable Adults Committee. These efforts must be continued as there will be an increased need for services and support for vulnerable older adults. In addition, the Vulnerable Adult Committee should be formalized to strengthen its effectiveness.

Focus Areas

- Expand community education and outreach on elder abuse and individual rights for self-determination.
- Develop and promote a range of self-care resources for caregivers, including a screening tool to identify those who may be struggling with anger or depression.
- Enhance the coordination among those agencies with a role to play in the welfare of vulnerable adults, including in times of emergency.

Priority 2: Promote the physical, emotional and financial well-being of caregivers as well as those for whom they care.

As noted earlier in this report, the key demographic that is most likely to need support is the population aged 80 years and older, which is projected to almost quadruple between 2010 and 2035 in Howard County. It is clear that caregivers – both family and professional – will play an ever more crucial role in the lives of older adults.

Adequate resources are needed to provide the support family caregivers require to effectively fill this critical role while maintaining their own well-being.

For the near future, most of the burden of caring for frail elderly will be borne by family caregivers in Howard County, as elsewhere in the United States. The caregiver role is often thrust abruptly and unexpectedly on family members, with little or no time to prepare. The demands of caregiving can take a huge toll on the health and wellness of the caregiver. Adequate resources are needed to provide the support family caregivers require to effectively fill this critical role while maintaining their own well-being.

Family caregivers need a manageable and user-friendly directory of existing services, whether online, in print or both. They also need assistance navigating the healthcare system, including help identifying the questions to ask healthcare providers and others providing care to their loved one. Family caregivers are sometimes ignored by healthcare providers and are not involved sufficiently in developing care plans. Information could be compiled in a family binder, perhaps electronic, about the person receiving care, including lifestyle, pet and plant requirements, entertainment and leisure preferences, hobbies, etc.

The need for education and evidence-based programming for family caregivers is becoming critical. Direct care workers often receive some formal training, while family caregivers generally are left to figure it out on their own. Programming should include subjects such as caregiver self-care and such practical topics as nutrition, medication management and patient transfer from bed to chair, along with the use of assistive devices and other technologies. Other important topics should include care transitions between home, hospitals, rehabilitation, skilled and sub-acute nursing, and other facilities; financial, legal and personal planning related to caregiving; and end-of-life planning, including advance directives. Whenever possible, this education should take place in a venue convenient for the caregiver, including in the home. Creating an effective education model based on existing best practices could be a collaborative effort between service providers and Howard Community College.

Another important educational component for older adults should address grandparents raising grandchildren. This education needs to include legal and financial matters, physical and mental health, parenting concerns, health insurance coverage, respite services, financial assistance and other supports.

Education is also required for those working in the healthcare system. Healthcare providers must better understand the caregiver's role in the health of individual patients. Most unpaid caregiving falls on women and often includes caring for multiple generations – elderly parents and young children – at the same time.

In addition, adult day care and caregiver respite services must be strengthened. Existing services provided by the OOA, along with non-profit and faith-based organizations, should be expanded. For example, the hours of the OOA's Senior Center Plus and Kindred Spirits programs could be extended to a full workday or beyond. Other areas that require improvements include transportation planning and support (also addressed in Priority 4 below), assessment and mediation of claims of caregiver neglect, services for patients with Alzheimer's or dementia, and dedicated counseling for caregivers during periods of personal or family crisis.

At the same time, the county must prepare for an increased demand for direct care workers. An AARP Public Policy Institute report states the number of family caregivers available for older Americans will drop dramatically in coming years. Today there are more than seven potential caregivers, aged 45-64, for every person aged 80 and older. In 20 years there will be four. Looking even further out, between 2030 and 2050 the number drops to just under three. This means more people will have to rely on fewer family caregivers, including family members, partners or close friends.

One of the major challenges will be to identify effective ways to recruit, educate and retain skilled workers in a community with a high cost of living like Howard County. If workers who are traditionally low-paid cannot afford to live in the county, transportation options must be available to bring them in and out from surrounding jurisdictions. Work on the housing and transportation priorities must take the needs of this critical and growing workforce into consideration.

New technologies and community-based approaches should be leveraged to support both family and direct-care workers. This must be accomplished in ways that create a community-based support network for caregivers; enhance and expand training for caregivers; strengthen access to information (building on Maryland Access Point); and respect both the caregiver and the care recipient.

Efforts in this area need to involve caregivers and their advocates, along with people and organizations with relevant expertise, such as therapeutic recreation, mental health and occupational therapy. More broadly, these efforts must engage healthcare providers, regulatory agencies, schools, the faith-based community, respite providers, employers, human resources departments and the media.

Focus Areas

- Develop an expanded, coordinated network of resources and supports for caregivers to include needs assessment, care management and respite care.
- Expand training opportunities for caregivers that can be available in multiple formats to best suit the individual caregiver.
- Develop strategies to enhance the recruitment, education and retention of direct care workers, including options for housing and transportation.

Priority 3: Ensure that diverse housing options are available for Howard County residents to age in the community and to function as independently as possible.

This issue was seen as a primary means of sustaining and enhancing quality of life for older adults. New housing options should be cost-effective, equitable and inclusive; offer flexible design; and account for the needs of different ethnic groups.

In *PlanHoward 2030*, the County's latest General Plan, the County recognized the need for a variety of housing options to support the County's older population. These included promotion of affordable alternatives for those wishing to downsize, promotion of housing built according to universal design principles, support for retro fitting and increased housing that includes support options.

Participants believed that incremental responses to the housing challenge in Howard County will not be sufficient to prepare the county for the growth of the older adult population. Instead, they propose a major reassessment of the housing options that are or will be available in the coming years. In particular, new housing options should be developed that are population-dense, age-friendly, mixed-use (e.g., walkable communities that combine residential and commercial development), multigenerational and affordable for those struggling to make ends meet.

Many people and organizations must be involved in the effort, including regulating and zoning authorities; the Columbia Villages and other homeowners associations; builders and developers; designers, landscape and building architects; caregivers and their advocates; and older adults from all socioeconomic levels.

New housing options should be developed that are population-dense, age-friendly, mixed-use (e.g., walkable communities that combine residential and commercial development), multigenerational and affordable for those struggling to make ends meet.

Increasing the amount of housing that is more accessible will benefit not only older adults, but also those with disabilities. In planning such housing, the community must look at "visit-ability" and universal design principles. Visit-ability provides basic levels of accessibility to allow people with physical disabilities to visit the house, but not enough to live there and function independently. Universal design refers to the design of products and environments for use by all people, including those with disabilities, without the need for adaptation. Examples of universal design include no-step entries, one-story housing, wide hallways and easily reached controls and switches. Legislation mandating universal design or visit-ability, or at least new incentives to encourage builders and developers to incorporate universal design principles, needs to be explored.

Retrofitting the county's existing housing stock will also be required to achieve this goal. Home improvement or handyman programs to assist older homeowners and tenants with home repairs and upgrades could be created to support this. Retrofitting could be supported by better promotion of the county's livable home tax credit and by making rental properties eligible for the credit. Where retrofitting is not feasible or desired, relocation assistance through relocation planners and transition coordinators could be offered.

New affordable housing options will be required for the considerable number of workers needed to support a larger older adult population. Beyond long-term direct care workers, these include police, firefighters and social service providers. Among the ideas that emerged was to establish "inclusionary zoning" regulations in Columbia, where they do not currently exist, that would require a certain proportion of housing for each of several income levels. Expansion of the County's Moderate Income Housing Units (MIHU) program would also increase the stock of affordable housing.

There was wide recognition among participants of the need to expand subsidized housing, both the housing stock and the supply of vouchers. New subsidized housing stock should address needs beyond conventional older adult facilities, including those of older adults who are homeless. Vouchers were seen as a critical part of this effort, while the challenge of funding was also acknowledged. Steps should be taken to make information about housing options more streamlined and accessible.

The need for greater creativity in addressing the types of housing permitted and adopted in Howard County was also identified. Among the many opportunities to promote affordability, social connection and support by caregivers are housing units that are separate but part of a family home, group homes, senior apartments, communal living arrangements, mixed-use buildings with combined residential and commercial spaces, transitional or emergency housing options and affordable housing designed for mentally or chronically ill older adults. In some parts of the county, adopting and expanding housing types may require modification of covenants and restrictions enforced by Columbia Association and other Home Owners' Associations (HOAs).

Focus Areas

- Encourage innovative design and technology that supports aging in place, including new housing models that incorporate support services.
- Explore affordable housing options through zoning changes, federal and State support, loan guarantees, subsidies and tax credits.
- Provide education to the public about aging in the community, including home modification and financing options.

Priority 4: Provide affordable, accessible, reliable, safe, convenient, cost-effective mobility options to get people where and when they want and need to go.

This priority goes hand-in-hand with the housing reassessment described above. In the meantime, however, expanded options for public transportation should be developed. This must be accomplished in environmentally sustainable ways and should provide for door-to-door transportation with no gaps in infrastructure, such as missing sidewalks or crosswalks. Many expressed the aspiration not just to meet, but rather to exceed the requirements of the Americans with Disabilities Act.

According to *PlanHoward 2030*, about 90% of work, shopping and school transportation in Howard County occurs by car. Responses to this report's community survey are consistent with the finding: 96% of respondents were licensed drivers, with no perceived limitations on their driving capabilities, such as not being able to drive at night. *PlanHoward 2030*, however, envisioned a future in which transportation becomes multimodal, with people using public transportation, walking and cycling in addition to cars.

Accomplishing this will require collaboration among many parties, including the County Office of Transportation, Regional Transportation Agency (RTA), Department of Public Works, Department of Planning and Zoning, the

Columbia Association, service organizations like Neighbor Ride, the Village in Howard, residents themselves and new transit players like Uber and Lyft. Many relevant initiatives are now underway, including Howard County's Bike and Pedestrian Plans and the Columbia Association's 20-Year Plan, which need to be coordinated as part of a comprehensive effort.

> This must be accomplished in environmentally sustainable ways and should provide for door-to-door transportation with no gaps in infrastructure, such as missing sidewalks or crosswalks.

An obvious way to strengthen transportation options in the short term is to expand public bus service, including routes and service hours, and to improve the rider experience by providing such amenities as shelters at all bus stops. Another suggestion is for the RTA to connect with Baltimore and Washington metro systems during non-peak hours and implement a multi-day pass similar to the SmarTrip® system used by the Washington Metropolitan Area Transit System. This system employs a fare card with an embedded computer chip to record the balance of value on the card. An incentive program, such as one in which every tenth ride is free, may also increase ridership.

In addition, RTA should review its bus routes to ensure that service reaches community assets that are critical for older adults, such as Howard County General Hospital, the OOA, senior centers and other social service outlets. The County could expand RTA Mobility, its paratransit service that dispatches vehicles to pick up passengers who cannot access regular bus routes. Paratransit services could also provide door-to-door rather than curb-to-curb service. The community could more broadly establish a network of public and private shuttles to supplement RTA services. An example of this type of transport is the Columbia Association Senior Events Shuttle. The shuttle is free and offers curb-to-curb evening and weekend transportation to cultural events throughout Howard County for groups of four or more adults aged 60 and older.

County stakeholders should also improve the coordination of and access to transportation services. For example, "mobility managers" could help residents use a variety of transportation modes, working one-on-one with riders or planning system-wide coordination. Travel training would help residents who have difficulty navigating public systems. Ways to provide additional physical and emotional support to riders should be explored. Information about transportation options needs to be readily available to the public, along with the opportunity to ask questions and voice concerns about current transportation services. Residents could be encouraged to offer their input on transportation issues through the Paratransit Committee, Transportation Advocates and Public Transportation Board meetings.

As the county continues to diversify its transportation options, increased marketing and education related to the available services is needed. A user-friendly website that allows access to existing information and resources, along with travel training, could help increase ridership. Transportation service information should be provided in multiple languages in announcements and transit maps, and in video and audio content.

Discussion of the transportation priority was far-ranging. While self-driving cars were the greatest prompt to the imagination and would be a major improvement for older adults if widely available and affordable, other trends offer more near-term opportunities. For example, Howard County could seek a collaborative-consumption transit provider, such as Zipcar and Car2Go. Driver training and rehabilitation programs, such as those offered by AARP, could help older drivers refresh skills and learn to compensate for age-related changes in vision, hearing or reaction time.

Focus Areas

- Improve access to and frequency of bus routes, including improvements to bus stops, better marketing of bus services (such as schedules in multiple languages) and travel training.
- Increase the efficiency of paratransit services, including emerging transportation options.
- Increase the supply of volunteer transportation programs, including those utilizing incentives, such as the time-bank model.
- Increase the number of driver support programs offered in the county, such as the AARP Mature Driver Course.

Priority 5: Optimize opportunities for a healthy quality of life for all residents that integrate physical, behavioral and spiritual well-being in a manner that supports personal choice.

In the community survey, 96% of respondents ranked "availability of the health care services you need in Howard County " as "very important," the highest rating score of any single issue. A strong health care system is a vital component of an age-friendly Howard County. As the number of older residents increases, the county's health system will face unparalleled challenges.

The goal is to optimize healthy behaviors for all residents regardless of age in a manner that is consumer-driven, cost-effective and evidence-based. Such efforts must preserve the dignity of individuals and be rooted as far as possible in the broader community. This priority is not viewed as the exclusive domain of older adults, but rather as the imperative to promote healthy lifestyles early on and to focus on illness prevention throughout the lifespan.

This will require greater collaboration across traditional boundaries than has existed in the past. Participants noted that the health care system is going through a major transformation and that health care providers are now incentivized to promote healthy living (e.g., through capitated health care payments) to a greater extent than they have been in the past.

This priority is not viewed as the exclusive domain of older adults, but rather as the imperative to promote healthy lifestyles early on and to focus on illness prevention throughout the life span.

Two statewide shifts brought context to the discussion. First, Maryland's new All-Payer Hospital System Modernization initiative, an innovative model approved in 2014 by the Centers for Medicare and Medicaid Services (CMS), is changing the way hospitals are reimbursed by creating incentives for them to coordinate services with community-based health and social service systems. This change, along with reforms generated by the Affordable Care Act, is creating the possibility of a more integrated, outcome-based healthcare system, which could be especially beneficial for older adults. Second, the advance of "big data" analytics and other technologies creates greater awareness – for healthcare providers and individuals – of the consequences of lifestyle and healthcare decisions.

As this priority extends far beyond health care as currently conceived in 2014, participants identified a wide range of people and organizations who must be involved going forward. These include Howard County General Hospital and other healthcare providers, of course, but also schools, restaurants, businesses (both as employers and as participants in the broader ecosystem of health choices), consumers and their advocates, caregivers, the media, health insurers, complementary and alternative medicine providers, Howard Community College (both for workforce development and for health as a component of general education) and multiple County departments (e.g., Health, Citizen Services, Recreation and Parks). National organizations could be tapped for knowledge and resources, such as the American Public Health Association (APHA), the Society of Behavioral Medicine (SBM), AARP and the Patient Centered Outcomes Research Institute (PCORI).

A key activity for this priority will be to improve the public's health literacy by providing information in ways they can and want to receive it. Health communication is an area of significant innovation, particularly in the realms of social media, gaming and other technologies. It's not unusual for friends to motivate each other to exercise more regularly or improve their health choices through social media outlets and apps. Even among populations with higher rates of chronic disease, public health practitioners are creating new ways to encourage healthy choices. Strides forward that have been made elsewhere should be further investigated and innovations that hold the greatest promise adopted.

Mental health, specifically among older adults, is an additional area of importance for this priority. Assessing the need for increased mental health services for older adults, their caregivers and other family members will be essential. As the population of older adults expands, many households will experience the emotional and financial stress of caring for them. It will be necessary to promote cross-training among mental health, behavioral health and aging services providers. The Behavioral Health Task Force recommendations, released in March, 2015, should be reviewed closely for their relevance to older adults.

More than any other priority discussed in this report, healthcare issues will require fundamental changes throughout the county as the population ages. Given the flux in the larger national healthcare environment, only a few of these changes can be anticipated by current trends. Others will be wholly new. This said, there are a number of existing initiatives in the county that should be continued and where possible expanded, including free and low-cost exercise options that promote mobility throughout the life span; improvement in food options, such as farmers markets and the Roving Radish (a local low-cost healthy meal delivery service funded by the Horizon Foundation, United Way of Central Maryland and others); expanded opportunities for social interaction among older adults; and expanded "healthy living" education in the schools.

In addition, larger systems-level changes need to be addressed consistently over time in ways that respond to changing technologies and other conditions. These include improving the healthfulness of the physical environment and infrastructure, also addressed by housing and transportation priorities.

Access, care coordination and preventative health within the healthcare system must be encouraged and new models, such as a "hub and spoke," where more intensive, specialized care is delivered by "hubs" while preventative, primary care is delivered by the "spokes," need further exploration. Multiple sectors, including government, the business community and nonprofits, must be involved in the exploration of alternative models and their potential application to Howard County.

In discussing the emerging technology component in healthcare, the need to create a county-wide health information network that would combine data currently used by social service agencies, healthcare providers and others working in health-related fields was identified. As "big data" applications become more sophisticated, they will more quickly recognize social, infrastructural and behavioral patterns that predict ill health and suggest healthier alternatives. Other communities and organizations are doing similar work. Given its affluence, proximity to leading research organizations and penchant for innovation, Howard County could assume a leadership role in developing such a network.

Focus Areas

- Expand current and identify potential new models for health and wellness activities targeted toward older adults.
- Expand behavioral health services for older Howard County residents.
- Conduct a behavioral health awareness campaign.
- Expand efforts to reduce hospital re-admissions by Medicare recipients by strengthening collaboration between hospitals serving Howard County residents, community-based organizations and long-term care facilities.

Priority 6: Prepare residents for the implications of the "new demographic reality" at both the personal and community level.

Preparing residents for the longevity revolution and its implications is a critical component of making Howard County an age-friendly community. On-going education for people of all ages and extensive public dialog is essential to that preparation.

Topics such as financial planning, long-term care and aging in place can no longer only be the concern of older adults or professionals in the aging field. The public must also become engaged in these conversations. First, individuals will need knowledge and skills in these areas so they can better prepare for their own, longer lives. Second, there is a need for community-wide conversations on these topics to engage people across the entire age spectrum in looking at the issues of aging in new ways.

A "lifelong learning curriculum" is called for, to broadly disseminate what is already known by experts on aging. Younger generations need to be engaged, not just because they may share a home with an older adult or be thrust into the role of caregiver, but also in order to plan early on for a much longer lifespan. This education should include legal and financial knowledge for all age groups, an understanding of legal rights that change as people age, retirement planning and more. Educational programs could also help develop emotional resilience and offer coping mechanisms for life's challenges, such as divorce, job loss, domestic violence and abuse, illness and death. For older adults, many of whom may wish to postpone retirement, programs that support new job skills, retooling for the new economy and new technology knowledge would be beneficial. Throughout, the emphasis should be on self-empowerment and providing the information necessary for good decision-making. The goal of civic education must be to help people grow and develop at every age and level of ability.

> A "lifelong learning curriculum" is called for, to broadly disseminate what is already known by experts on aging.

New, community-wide public conversations also need to take place. Widespread public dialog will help ensure that the populace as a whole understands the impact of aging on both the individual and public policy levels.

There are many avenues within the county for reaching residents, including senior and community centers, libraries and wellness facilities. Membership organizations of service providers, such as the Association of Community Services and Coalition of Geriatric Services, can serve as conduits to reach people being served. Technologies like social media offer greater opportunity for residents to receive, respond and contribute to messages from experts. The Inter County Broadband Network can be utilized to wire-in major players and facilitate information sharing. Older methods of public address, such as billboards and public service announcements in the media, also remain important. Combining the expertise of professionals with the energy that comes from public engagement, a lively public dialog on issues of community-wide importance can be created.

Education and outreach efforts must be approached with sensitivity to cultural diversity and consideration must be given to the diversity of languages spoken by county residents. This can pose a challenge to service providers, yet it is also an opportunity to bridge cultures in a common effort.

All generations, socioeconomic groups, races and ethnicities need to be part of the civic education and public conversations around these important issues. Those with critical expertise, such as financial planning, health, caregiving and aging must all be involved. Howard Community College could be engaged for curriculum development and the Howard County Public School System could develop a course on financial and retirement planning for high school juniors and seniors. County Government and the media can also be key players in both educational programming for individuals and the community-wide dialog.

Focus Areas

- Develop a lifelong learning curriculum to address issues such as health and wellness, financial and retirement planning, and coping skills.
- Develop a sustainable strategy to use electronic, print and social media to communicate consistent information for adults to plan for the future; involve public, business and non-profit stakeholders in its development and implementation.
- Promote a public dialog that can encourage and support families in having conversations related to aging, such as personal decision-making for advance directives.

A New Level of Collaboration

A key take-away from this planning effort is the need for deeper, on-going collaboration among stakeholders to realize progress on these priorities. This reflects the growing recognition that individual agencies, acting alone, do not have the capacity to solve such complex challenges. It will require a system-wide approach.

Research for this project identified an evolution now under way in terms of how communities are organizing themselves to effect change. Both the Advisory Committee and the Working Group discussed this evolution in order to identify how Howard County can best move forward to create the types of systems change needed to implement the priorities described above.

Research for this project identified an evolution now under way in terms of how communities are organizing themselves to effect change.

Members of both groups expressed considerable interest in utilizing a "coordinated collaboration" model. One leading example of this is Collective Impact. This model creates a structure through which many disparate efforts by many different stakeholders can be effectively aligned in order to achieve a shared goal. Key elements of Collective Impact are having a common agenda or goal, shared metrics, mutually reinforcing activities among participating organizations, continuous communication and backbone support. It is worth noting that any collaborative model, including Collective Impact, provides a means to an end; it is not the end itself, nor is this level of structured engagement necessary for every undertaking.

Participants offered the following input on how a collaborative model might be applied:

- The initiative should connect relevant initiatives that are already underway, such as efforts by Howard County General Hospital to improve population health, the OOA to enable residents to age in community and the Board to Promote Self-Sufficiency to reduce the incidence of poverty. This would reduce the duplication of effort that participants realized was occurring, spark greater synergies and efficiencies, and ensure that new ideas spread more rapidly.
- The initiative cannot be conceived only as a project on aging or for the sole benefit of older adults. Defining the initiative that way would reduce the interest of stakeholders outside of what is explicitly considered the aging community, whose support could contribute to more innovative strategies and their speedier, more widespread adoption. Also, such a definition would set up a false dichotomy between serving the interests of older adults and serving the interests of the community as a whole. In fact, issues of aging affect everyone in the community, both now (e.g., through a relationship with a parent or grandparent) and in the future (e.g., as they themselves age). Noting that for decades Howard County has been known for its high quality of life, participants suggested defining the initiative in terms of *achieving a high quality of life throughout the lifespan.* This would make explicit that the standard should be applied across the entire population, ensuring adequate attention to the needs of older adults without deviating from values the county has embraced in the past.
- Resources need to be allocated to support these new collaborative efforts. Of particular concern was having the infrastructure, or backbone support, necessary to provide the underlying coordination that will be critical for the success of any collaborative effort.

It was clear from the discussions that making Howard County an age-friendly community will require closer alignment between multiple organizations and initiatives than currently exists. How to achieve this dovetails with the question raised earlier about how to best ensure that priorities identified in this report are, indeed, implemented.

THE PATH FORWARD:
Implications for the Office on Aging

The findings and recommendations in this report carry special significance for the OOA, its programs, services and facilities. *(For review of existing OOA services and programs, see Appendix A.)* Looking forward, the following issues are of particular note.

Population Served

The OOA must continue its efforts to reach out to and serve the growing diversity of older adults in Howard County. This requires addressing language and cultural barriers in a community that has foreign-born residents from around the world.

Compared with the county's overall 50+ population, the OOA's clients and participants are more likely to be female. This is in keeping with national trends, which show that males participate in aging service programs in numbers much lower than their proportion of the population. This gender disparity and its implications for overall population health needs to be addressed.

The growing number of family caregivers must be considered in program development. In its capacity as a trusted resource for information and assistance, the OOA will continue to play a valuable role for those needing support services. The potential demand for support and respite services will require a clear definition of its future role in this area.

The OOA has already expanded its services beyond the older adult population to include younger adults with disabilities. In particular, Maryland Access Point (MAP) and community-based, long-term services and supports serve this younger population. This expansion is consistent with policy direction at the federal and State level, but has important implications for the future design and direction of the OOA.

Eligibility Standards

Some OOA programs, such as the community-based, long-term care services and supports, have income and assets standards. Almost all of OOA's community-based, long-term care services are subject to federal and State regulations. These services are increasingly financed by Medicaid and reflect the financial and medical restrictions of that program. In an affluent jurisdiction like Howard County, a growing number of adults need services, but do not meet Medicaid eligibility. Meeting the needs of this "gray area" population will be a challenge.

Business Models

The growing demand for services will require the OOA to pursue revenue-generating business models to support continued program enhancements. All fee-for-service models should include provisions for a sliding scale to ensure that low-income older adults are not denied access to needed services.

Role of Senior Centers

The role, configuration and even the name of Howard County's senior centers must continue to evolve to meet the changing needs and attitudes of older adults. The findings in this report point to some key changes to consider in planning for the senior centers of the future. These include:

- Embed existing OOA services, such as MAP, in the centers to make those resources more accessible.
- Collocate other older adult services within the centers, making them convenient one-stop locations for residents.
- Include Senior Center Plus and/or Kindred Spirits programs to benefit both participants and their caregivers.
- Continue to expand hours of operation to meet needs of the younger cohort of older adults.
- Increase the amount of multi-generational programming provided.
- Re-name and brand the centers, to better attract those who have not yet availed themselves of the benefits of participation.

(For more detailed recommendations regarding the future growth and development of senior centers, see Appendix E, Facilities Master Plan.)

The OOA has embraced this vision for its senior centers. It is working closely with the County's Department of Technology and Communications Services to give all existing centers the capability to support expanded programming and services. As outlined in Appendix E, Facilities Master Plan, it seeks to garner the support needed for the development of new and expanded centers that can incorporate a greater array of services. To ensure that the centers are state of the art, it will begin the process of obtaining national accreditation from the National Institute of Senior Centers (NISC), a constituent unit of the National Council on Aging (NCOA).

In addition to developing the "senior centers of the future," OOA's plans for the next eighteen months include:

- Play a key role in the community-wide work needed to make Howard County an age-friendly community, as described in this report.

- Implement a new evidence-based caregiver support program, Powerful Tools for Caregivers, that will be the first of its kind in Maryland.
- Continue to work with Stanford University to expand the number of languages in which evidence-based programs are offered.
- Expand the scope of its elder abuse awareness campaign to address concerns for the county's most vulnerable residents.
- Develop a fee-based, on-line training program based on its highly successful Aging in Place program to share information with geriatric professionals, caregivers and older adults.
- Work with partner organizations to expand capacity to provide free temporary loans of durable medical equipment within the county.
- Explore possible partnerships with disability organizations that provide transportation services for their clients.

Long term, the OOA is well positioned to continue its leadership role in planning and coordinating older adult services. It is held in high esteem throughout Maryland and its staff is highly qualified, responsive to client needs and passionate about their work. Its senior centers and services provide a strong physical and programmatic infrastructure upon which to build.

The OOA is already on the right track. Its challenge will be to get there faster to meet the growing demand for services. It alone cannot do everything that needs to be done, however, and its work cannot occur in a vacuum. The community as a whole must be engaged in order for the county to become an age-friendly community.

The next section of this report provides recommendations for building a framework to support the level of community engagement and collaboration needed to achieve that goal.

THE PATH FORWARD:
A Community-Wide Call to Action

As noted earlier, much good work has been accomplished in Howard County through the efforts of myriad organizations and yet it has not been enough to make substantial progress toward the goals outlined in past plans. This affirms that the traditional planning process is only minimally effective for achieving large-scale change.

As community organizer Paul Born states in his book, *Community Conversations*, "The issues facing communities and those at risk – the unemployed, disabled persons, single parents, *and senior citizens*, to name a few – are complex. Yet the system that serves those in need yields simplistic solutions. Services such as counseling, income support, and housing are calibrated to solve single issues. They are sorely lacking in the face of personal and community problems that are *multifaceted, adaptive, and interconnected*." [Emphasis added.]

The issues that Howard County must address to become an age-friendly community are clearly multifaceted and interconnected. Throughout this planning effort, participants were clear that making sufficient progress in a timely manner to meet the needs of a growing older adult population will require the work of the entire community and a systems-wide approach. They recognized that the efforts of individual organizations acting independently will be insufficient to the task. An intentional approach to building a deeper level of collaboration that integrates the work of all the partners within the service delivery system is required.

Throughout this planning effort, participants were clear that making sufficient progress in a timely manner to meet the needs of a growing older adult population will require the work of the entire community and a systems-wide approach.

The approach must also be highly adaptive. A typical project of this kind would produce a series of action steps with a timeline for completion. Without the commitment of all needed stakeholders and dedicated resources – which are beyond the scope of this project to guarantee – such recommendations give a false sense of promise regarding the outcome. Much will change in the environment as soon as any plan is completed, making some action steps irrelevant and missing new opportunities as they emerge.

Achieving the preferred future envisioned in this report calls for a fundamental change in approach, one that provides a framework for the collaboration required for large scale, systems-level change. Fortunately, there is a growing body of work from communities taking on the challenge of heretofore intractable issues that provides a rich resource of lessons learned. Closer to home, the Department of Citizen Services has gained insights into what works to build strong collaborations through the launch of the Board to Promote Self-Sufficiency, its management of the MultiService Center, development of the Coordinated System of Homeless Services and co-facilitation of the Early Childhood Advisory Council. This combined knowledge and experience has informed the recommendations below.

Taken together, the recommendations provide a roadmap for how to operationalize over the short-term and organize for long-term action and impact. What emerges is a framework to support the high degree of collaboration required for this type of community-wide effort, one which also fosters innovative approaches and the accountability needed to ensure that progress is made in a timely manner. It engages stakeholders, identifies solutions for which resources are available or can most readily be obtained, and provides opportunities to utilize existing resources differently.

Systems-wide change takes time; it is necessary to "go slow in order to move fast." By focusing over the next twelve to eighteen months on building an infrastructure that can support this new approach, the county will build the foundation for lasting, long-term success.

Creating a Framework for Change

The following recommendations are inter-related. Each contributes to the success of this approach by bringing all available resources to bear on the challenge of meeting the needs of Howard County's growing older adult population. They are based on an assumption that there will be a commitment of time, energy and resources to this effort.

Recommendation 1: Actively engage the community in the vision of becoming an age-friendly county.

It will not be enough for the findings and recommendations of this report to be made public. Organizers must find ways to continue to solicit public input, to hear people's concerns and ideas, and to provide ongoing opportunities for residents to be involved in meaningful ways. Their engagement and support for the work to be done will be critical.

By the same token, the findings and recommendations in this report have meaning for every organization and sector in the county. Each must consider the implications for its programs and services. Though a wide range of organizations were involved in the planning process, many more will need to be engaged.

There is a significant difference between "buying in" to someone else's vision and "ownership" of that vision. Taking the time to build a sense of ownership among the widest range of stakeholders possible will build the foundation needed to make progress in a timely manner. To sell short the importance of this recommendation is to invite failure.

County Government will need to take the initial lead in developing public engagement, but must make every effort to involve other stakeholders to keep this a community-wide effort. Outreach plans must evolve as the work progresses.

Recommendation 2: Convene workgroups to begin work on each of the priorities identified in this report.

The membership of the workgroups must include a wide range of stakeholders, including non-traditional partners and not just the usual suspects, to broaden both the range of thinking and the level of community engagement. Older adults, as service users, must also be included.

Groups should initially focus on understanding the gaps, duplications, inefficiencies and opportunities in the county's current service delivery systems and analyze existing resources. This will further inform the specific strategies to be undertaken.

To be effective, the workgroups will also need to develop a common understanding of the issues they will address, with members coming to agreement on primary focus areas. Too often, there is an assumption that everyone has the same understanding of a goal or strategy, only to realize too late that efforts are not aligned or worse, are at cross purposes. Checking to see if participants share a common understanding is an important step in this process.

This does not mean that every organization will undertake the same activities. Instead, everyone's efforts must be aligned and contribute to making progress toward shared goals. In the most successful collaborative efforts, each organization makes use of its core competency, trusting other activities to those agencies that have the relevant expertise. This brings the added benefit of avoiding mission creep, which is all too common among organizations trying to do it all on their own.

The focus of the workgroups will likely evolve over time. This may be because goals were met, more has been learned about what does (and doesn't) work or funding or political priorities have changed. The membership of the groups must also evolve to ensure that the "right eyes" remain on the issues being addressed.

The Department of Citizen Services has committed to convening these groups initially, with the expectation that leadership for each will evolve out of the membership. Any existing groups that could be used for this purpose should be considered to avoid creating duplicative efforts.

Recommendation 3: Establish a coordinating body in the County Code to ensure that the diverse efforts being undertaken across priorities are integrated and aligned.

Howard County should reestablish an Interagency Aging Committee (IAC) to serve as an on-going vehicle to support comprehensive planning and enhanced coordination of service delivery. This group should include key public agencies (such as the OOA, the Health Department, Social Services, Housing, Transportation and Citizen Services), non-profits (such as the Hospital and Columbia Association), representatives from the business and faith communities and older adults. Its role would be analogous to that of the Local Children's Board regarding child well-being and the Board to Promote Self-Sufficiency regarding poverty reduction.

A functioning IAC was in place many years ago; it stopped meeting when the leadership of several primary member agencies changed. To strengthen the role, accountability and sustainability of this group, two initial steps must be taken:

- Establish the IAC and its membership in County Code. Legislating its creation will require action by the County Executive and County Council.
- Require that the IAC submit an annual report to the County Executive, County Council and community, to include an update on key community measures regarding the status of older adults, activities undertaken during the course of the year and recommended priorities for the coming year.

The workgroups described in Recommendation 2 should either be subgroups of the IAC or in some way connected to it. IAC members should be engaged in the work of the groups to ensure that the efforts of each are integrated into the comprehensive community effort.

Initiatives conceived or piloted through the IAC should eventually find a permanent home in an organization with a mission closely aligned with the project and the capacity to operationalize it.

Recommendation 4: Establish key community indicators to measure the county's progress in achieving its goals for older adults.

Determining which indicators will be most useful in tracking progress is not an easy task. These questions should be considered when developing metrics for a plan of this type:

- Is the metric associated with the goal of becoming an age-friendly community or one of the priorities?
- Does the metric measure something meaningful?
- Can the data required by the metric be collected in a cost-effective matter? (Ideally it is already being collected by an organization for another purpose.)
- If it is not being collected, will collecting it be expensive and/or will the process of collecting it create barriers between those collecting it and the people supplying it? (This last consideration should be weighed in every data collection effort involving clients of programs or services.)

Community stakeholders must agree on the indicators related to their area of focus. Coming to consensus on the choice of indicators will engender robust discussion that deepens participants' understanding of the issues and the goals to be achieved. Following are proposed metrics for consideration:

Vulnerable Adults

- number of reported and substantiated (as needing protective services) cases of abuse in persons 60+
- number of people trained to identify signs of abuse and exploitation

Caregivers

- number of caregiver training programs and counseling sessions provided
- number of paid direct care workers serving Howard County residents

Housing

- number of subsidized housing rental units serving older adults
- number of livable-home tax credits granted annually
- number of new housing units that meet universal design standards

Transportation

- number of older adults using RTA's fixed routes
- number of passenger trips provided by non-profit transportation services such as Neighbor Ride and the Columbia Association
- number of older adult driver education/rehabilitation classes provided in Howard County
- percent of bus stops that meet or exceed the Americans with Disabilities Act (ADA) standards

Health Care

- percent aged 50+ who engage in physical activity
- percent aged 50+ reporting physical health not good
- percent aged 50+ reporting mental health not good
- number of patients 65 and over re-admitted to Howard County General within 30 days

Civic Education

- number of lifelong learning programs offered in Howard County
- number of resource guides or similar information published in languages other than English
- percent of older adults admitted to hospital with advance care directives already in place

There must be a mechanism for all stakeholders to stay abreast of the progress being made. The Results Scorecard, already used by the Department of Citizen Services and all of its Offices, would be an ideal platform upon which to maintain data for each indicator. This web-based software program tracks data, shows trends, provides the story behind the data and links to relevant research findings. The Department has the capacity to manage data on community indicators and post the Scorecard on its website so that it is easily available to the community.

Recommendation 5: Develop common methods of data collection.

The IAC, workgroups and the individual organizations that are part of the system of service delivery must have good information on which to base policy, budget and planning decisions.

Agencies serving older adults should collect data in as similar a fashion as possible, keeping in mind that funder or regulatory requirements may impede this. For example, in collecting demographic information, agencies might adopt a common approach, such as capturing age by date of birth, so that data can more easily be combined for analysis. Achieving consensus on these details is no small matter.

Efforts should also be made to develop a common reporting system, such as the one used by agencies serving the homeless population. If this isn't possible because of funder or other regulatory requirements, agencies must develop the ability to let different data systems communicate with each other so that information can be shared.

Data has no value if it isn't utilized. Processes must be developed to share information among stakeholders and regularly evaluate its meaning. At the systems level, the IAC and it workgroups should engage in this evaluation, but it also has implications for individual organizations.

Recommendation 6: Create a learning community around the issues of age-friendly communities, collaboration and systems change.

The approach called for in this report will be a new way of doing business for many organizations. Even those that have engaged in other collaborations will need to learn how to work with new partners. As such, there will be a need for peer-to-peer information sharing, training and technical assistance.

Building trusting relationships among participants will be crucial. To promote both a high level of collaboration and innovative ideas, an environment of trust must be created so that new solutions can emerge. Stakeholders need to be comfortable taking well-reasoned risks, knowing that not every effort will be successful. There will still have been value in the attempt, if the knowledge gained is shared so that all partners can benefit from the experience. The IAC can play an integral role in fostering an environment in which trust and learning flourish.

Learning about best practices will be extremely helpful, but the door also needs to be left open for innovation. Partnerships with area universities offer opportunities for support in this area.

Another required element involves looking at and building the capacity of existing organizations. Many human service organizations struggle to build the infrastructure needed to support high-impact service delivery. This must be taken into consideration and addressed if they are to effectively contribute to making Howard County an age-friendly community. Howard County could continue its support for capacity building among human service nonprofits through the Community Service Partnership program and encourage other local funders to also provide support for agencies looking to enhance their organizational effectiveness.

Recommendation 7: Provide the "backbone" or infrastructure support essential to managing this effort.

The work done in communities that have successfully utilized the Collective Impact model demonstrates the importance of having what is termed "backbone" support. It is a crucial ingredient in turning talk into action.

Members of the IAC and its workgroups can and should be expected to be active participants in the work being undertaken. But it is also true that they have agencies and programs to run; this work will not be their entire focus. The backbone provides the support to ensure that plans are carried out.

As the County's area agency on aging, the OOA can be expected to provide the backbone support for much – though not all – of the work called for in this report. The IAC should evaluate, on a case-by-case basis, which agencies are best situated to provide this support as initiatives are developed.

Given its existing capacity, the OOA will be able to provide only limited support without additional resources. Adding at least one staff person would move efforts forward more quickly. This will require funding for a new position, which should be made a priority. Other organizations that take on this role for major initiatives may also need additional funding.

Recommendation 8: Track – and celebrate – the process changes that are made within the organizations and systems serving older adults.

While most focus will be on progress made on the community indicators identified in Recommendation 4, thought should also be given to how process changes will be captured. This includes such things as memorandums of understanding created, changes to an agency's operations (i.e., eligibility criteria or translation of materials into multiple languages), new data points gathered and the number of partner agencies. These activities are the building blocks for strengthening the service delivery system.

In addition, it will be important to take the time to celebrate progress made. Publicizing process improvements will not only recognize the efforts of the agencies making changes, but also spur others to begin transforming their operations. This should be the responsibility of the IAC and each of its work groups.

THE RECOMMENDATIONS above provide guidance for creating a structure that can support the essential work described in the priorities section of this report. Much of this framework can be accomplished or be well underway over the next eighteen months. During this development phase, the workgroups should be charged with developing actionable plans to address those focus areas that hold the most promise for impact.

With this structure in place, along with action plans generated by the organizations that will carry them out, the county will be well positioned to make good progress toward the goal of becoming an age-friendly community.

Conclusion

The priorities outlined here are not new. As noted, they have been captured in past studies conducted in Howard County and in work done at the national level. Building on the previous work, three observations resulting from this planning process provide new insight into creating an effective path forward.

- First, an undertaking of this magnitude requires **systems-level change** to achieve the desired outcomes in the community.
- Second, community leaders will need **flexibility** to respond to environmental changes and opportunities, rather than adhering to a fixed, step-by-step action plan.
- Third, the community must understand that the scope of the demographic shift now underway makes it essential to **accelerate progress** toward the larger goal of maintaining a high quality of life for all county residents across the lifespan.

What has emerged from this planning process is not only a vision of an age-friendly Howard County, but a framework for a collaborative approach that can support the work that needs to be done to make the vision a reality.

Creating the preferred future will, no doubt, evolve as more residents and organizations reflect upon the information provided in this report and engage in the next steps of implementation. It has been clear from the start of this effort that achieving the vision of an age-friendly community would require something more than a simple timeline of tasks for the Department of Citizen Services or the OOA to achieve. The broader community must engage in creating this future.

The framework outlined above points the way. By focusing over the short term on operationalizing a structure that can support the high degree of collaboration needed, it creates the foundation for effective, long-term action and, ultimately, success.

With Howard County's wealth of resources, actively engaged population and emphasis on innovation, there is no question that becoming an age-friendly community is within reach.

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Sage Policy
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There is Unmet Demand for Independent Senior Housing in Howard County, MD – An Evidentiary Exploration

Submitted by:

Sage Policy Group, Inc.

Submitted to:

Erickson Retirement Living Stakeholders

November 2017

EXHIBIT
C

There is Unmet Demand for Independent Senior Housing in Howard County, MD – An Evidentiary Exploration

Executive Summary

Raging Demand Growth Meets Already Strained Supply

This report concludes that the supply of independent living units for seniors in Howard County is inadequate. This inadequacy has emerged due to a confluence of forces, including the ongoing aging of the population and the county's elevated affluence.

In the year 2000, about one in six Howard County residents was 55 years or older. By 2010, that figure exceeded 21 percent, or more than one in five. By 2015, nearly a quarter (24.2%) of Howard County residents were aged 55 years or older. To put this in absolute terms, between 2000 and 2015, the number of Howard County residents 55 or older increased from 39,223 to 73,526.

One can see how this occurred. Over time, many moved to prestigious communities like Columbia, especially during the eighties and nineties when they were in their thirties, forties and fifties. Now, many of these residents are entering their fifties, sixties, seventies, and beyond. This is true of other communities, including Clarksville, Laurel, Ellicott City, and Sykesville.

Among the submarkets that comprise the Baltimore metropolitan area, Howard County is associated with the fastest projected growth in households headed by someone aged 75 or older. This population is associated with the highest income in the region for that cohort. Howard County is also associated with a population of 45 to 64 year olds marching toward retirement that enjoys an elevated level of median household income. This presages future demand for independent units.

While the availability of independent living units has declined across the Baltimore metropolitan area, the supply of independent living units has been especially strained in Howard County. There, only 780 senior living units are designed for independent living. That is a significantly lower total than in Baltimore County (7,050 units; Baltimore County has 2.7 times Howard County's total population, but 9 times as many units) and in Carroll County (1,141 units; about one-half of Howard County's population, but 46 percent more units).

A useful measure is independent living penetration, a measure defined as independent inventory divided by the number of households aged 75+. The penetration measure is approximately twice as high in Baltimore and Carroll counties. In other words, to have a penetration level as high as in these two neighboring jurisdictions, Howard County would have to nearly double its number of independent living units.

Should Howard County fail to meet growing unmet demand, it will mean:

1) hardship for seniors hoping to remain in Howard County as they age;
2) loss of tax base associated with a large and growing population of affluent seniors;
3) loss of economic vitality due to lost spending power;
4) loss of potential community volunteers who support quality of life.

There is Unmet Demand for Independent Senior Housing in Howard County, MD – An Evidentiary Exploration

Introduction

Erickson Retirement Living (Erickson) commissioned Sage Policy Group, Inc. (Sage) to analyze the supply of independent living senior housing in Howard County, MD relative to demand. Sage has studied issues of senior housing on a number of occasions, including previously for Erickson and the Health Facilities Association of Maryland.

This report begins with a demographic overview of Howard County and the larger Baltimore region in the context of older residents, paying specific attention to measures of wealth, the demographics of age, and consequent demand for independent senior living opportunities (as opposed to purely assisted living facilities). Characterizations of demand are juxtaposed against the existing supply of senior living facilities in Howard County and in the balance of the Baltimore metropolitan area.

At the heart of this analysis are two principal findings: 1) Howard County is home to a large and growing population of affluent seniors; and 2) Howard County supplies are relatively small number of opportunities to living independently once they have chosen to leave what had been their primary residence. The dearth of senior housing opportunities in Howard County is especially stark relative to surrounding jurisdictions.

Demographic Overview

- **An Affluent, Aging Population**

Howard County is one of the world's most affluent communities. Situated in the heart of the Washington-Baltimore corridor (and arguably the Boston to Miami corridor), Howard County residents benefit from one of the most expansive, professional employment-oriented labor markets on Earth. The abundance of employment opportunities has helped supply the societal resources necessary to support an elevated quality of life, including in the form of what is arguably Maryland's finest public school system. That in turn has attracted additional in-migrants to the county, including affluent, highly educated families.

Over time, many have moved to Columbia, Maryland, one of America's most prestigious communities. Much of this in-migration to Columbia occurred during the eighties and nineties when they were in their thirties, forties and fifties. Now, many of these residents are entering their fifties, sixties, seventies, and beyond. This is true of other communities in Howard County, including Clarksville, Laurel, Ellicott City, and Sykesville.

In the year 2000, nearly 16 percent, or one in six residents, was 55 years or older. By 2010, that figure exceeded 21 percent, or more than one in five residents. By 2015, nearly a quarter (24.2%) of Howard County residents were aged 55 years or older. To put this in absolute terms, between 2000 and 2015, the number of Howard County residents 55 or older increased from 39,223 to 73,526, an increase approaching 88 percent.

Despite this prolific growth, Howard County actually has a lower share of residents aged 55+ relative to Maryland (26 percent) and the United States (26.5 percent). This is primarily because of the ongoing appeal of Howard County to younger families and their attending in-migration.

This will almost certainly change over the coming decade, however. As of 2015 a plurality of Howard County's population was 45 to 54 years of age (16.4 percent). This cohort is decidedly larger in Howard County than in other geographies. Over the next decade, this population will also be over the age of 55. Exhibit 1 supplies additional relevant statistical detail.

Exhibit 1: Howard County Senior Living Demographic Growth

	2000		2010		2015	
45 to 54 years	38,322	15.50%	47,565	17.00%	49,733	16.40%
55 to 59 years	12,617	5.10%	18,121	6.50%	21,700	7.10%
60 to 64 years	8,138	3.30%	14,558	5.20%	16,296	5.40%
65 to 74 years	10,370	4.20%	15,596	5.60%	21,954	7.20%
75 to 84 years	5,955	2.40%	7,511	2.70%	9,645	3.20%
85 years and over	2,143	0.90%	3,229	1.20%	3,931	1.30%
Total 55 years and over	**39,223**	**15.9%**	**59,015**	**21.2%**	**73,526**	**24.20%**

Source: U.S. Census Bureau

Indeed, the Baltimore metropolitan area when considered in its totality is projected to experience greater growth in older demographic cohorts than other primary senior living markets. According to data made available by the National Association of Realtors and ESRI, the Baltimore Metro Area is associated with 1) disproportionately large older population; 2) faster projected increase in the percentage of households aged 75 years or older; and 3) a more affluent older population. That helps set the stage for findings to come. Exhibit 2 supplies relevant statistical detail.

Exhibit 2: Baltimore MSA v. Other Primary Market income and demographic growth, 2015

		Baltimore MSA	**Other Primary Markets**
Households aged 45 to 64 years	Percent of All Households	40.3%	39.5%
	Median Income	$85,201	$77,312
Households aged 75 years and over	Proj. Annual Growth (%)	2.6%	2.4%
	Percent of All Households	10.3%	9.8%
	Median Income	$38,040	$35,310

Source: ESRI 2015, National Association of Realtors

Among the submarkets that comprise the Baltimore metropolitan area, Howard County is associated with the fastest projected growth in households headed by someone aged 75 or older. This population is associated with the highest income in the region for that cohort. As reflected in Exhibit 3, Howard County is also associated with a population of 45 to 64 year olds that enjoys an elevated level of median household income. This population is steadily migrating toward retirement age and many will seek different housing contexts than those in which they have been living.

Exhibit 3: Baltimore Area Submarket Demographic Trends

	75+ Households				45-64 Households			
	# of Households	Proj. Annual Growth	% of All Household	Median Income	# of Households	Proj. Annual Growth	% of All Household	Median Income
Anne Arundel	19,479	3.3%	9.3%	$49,412	86,480	-0.9%	41.4%	$106,261
Baltimore	41,115	1.4%	12.8%	$38,499	125,069	-1.5%	38.9%	$80,782
Carroll	6,471	2.5%	10.7%	$40,334	28,092	-2.1%	46.4%	$106,902
Harford	8,913	3.1%	9.5%	$40,491	40,358	-1.3%	43.1%	$95,929
Howard	**8,129**	**4.4%**	**7.3%**	**$55,175**	**50,525**	**-0.1%**	**45.2%**	**$133,992**
Queen Anne's	2,143	4.4%	11.1%	$48,005	8,732	-0.8%	45.1%	$97,994
Baltimore City	24,098	1.4%	9.6%	$22,824	90,333	-1.6%	35.9%	$42,922

Source: NIC MAP Report – 3Q17

• Income and Wealth Dynamics Suggest Elevated Demand for Independent Living Units

In 2013, Sage conducted another analysis on behalf of Erickson with the goal of determining what income and wealth dynamics imply regarding demand for units in continuing care retirement communities. That was four years ago, before the recent surge in stock and real estate prices that have brought aggregate American household wealth to a record high. Despite that, the 2013 study concluded that the top one-fifth of U.S. households in terms of wealth and income can sustain indefinite stays in a continuing care context even under the least optimistic of the three scenarios embodied within the report. More importantly, it also found that many people in the middle quintiles of wealth and income can afford lengthy stays in senior living facilities due largely to Social Security income and their relatively limited exposure to financial downturns.

It may seem like an odd and facially inaccurate thing to say, but given the affluence of Howard County, more than 20 percent of county residents are in the top fifth.[1] According to the U.S. Census Bureau, more than 55 percent of Howard County residents earn in excess of $100,000 per year (2015 inflation adjusted dollars), while roughly 33 percent earn more than $150,000 and 18 percent earn more than $200,000. WorldAtlas ranks Howard County as the third wealthiest county in the U.S.

There are additional considerations. There are likely prospective seniors living in other communities who would value the opportunity to grow older in Howard County, known for its parks, its inclusive communities, and its centrality to nearby major U.S. cities. It is projected that the population of senior citizens (65 years or older) will approach 56 million by 2020. It is at that point that the demographics explode. That senior population will expand to nearly 73 million by 2030. This population represents another source of demand for independent senior units in Howard County.

Rising Demand for Units Meets Dwindling Available Supply

Even before the demographic explosion to come, the Baltimore metropolitan area's supply of senior living opportunities has become strained. As indicated in Exhibit 4, the region's senior housing occupancy has risen steadily in recent years, with annual rent growth generally above 3 percent.

The explanation is relatively straightforward. During the housing downturn and financial crisis, relatively little new supply came online. But the Great Recession didn't slow the aging process, and with wealth and senior population on the rise, available inventory is quickly being swallowed by demand. Of the nation's 31 senior living primary markets, only San Jose is associated with higher occupancy.

The stabilized occupancy in the Baltimore region is even higher when one exclusively considers independent living facilities rather than the combination of independent, assisted living, and nursing care facilities. As of 2017:Q3, the Baltimore region's independent living facility occupancy rate was 95.2 percent and climbing. This segment encompasses fewer than 7,700 units, which means that in the entire Baltimore region, there are roughly 370 independent living units available. Please see Exhibit 5 for relevant summary detail.

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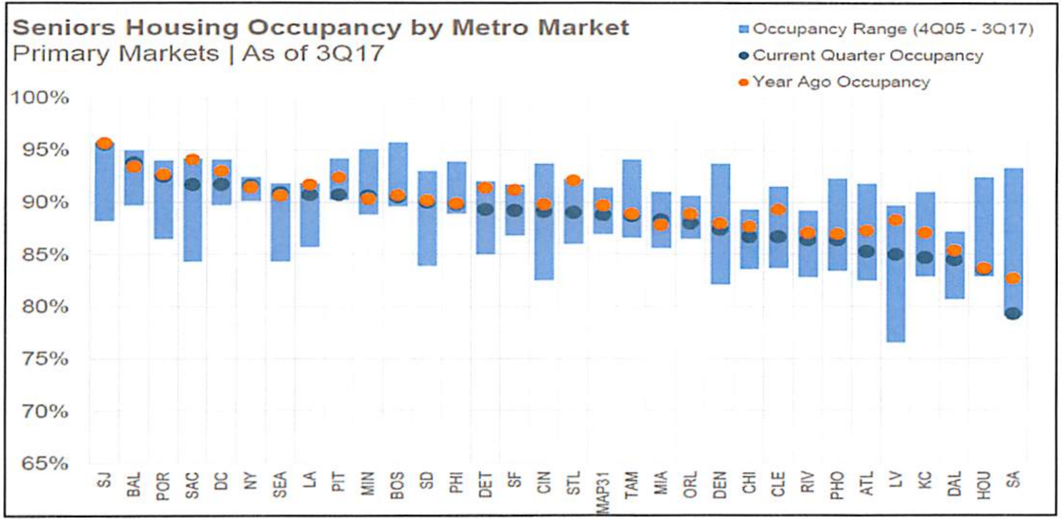
[1] This harkens to the apex of Garrison Keiler's career, when he suggested that every child in Lake Wobegon is "above average."

Exhibit 4: Senior Housing Occupancy by Metro Market



Source: NIC MAP Report – 3Q17

Exhibit 5: Trends by Senior Living Facility Type, Baltimore Metro Area

	Majority Independent Living			Majority Assisted Living			Majority Nursing Care		
	Units	Stabilized Occupancy	YoY Rent Growth	Units	Stabilized Occupancy	YoY Rent Growth	Units	Stabilized Occupancy	YoY Rent Growth
3Q2017	10,185	95.2%	3.1%	4,206	90.5%	5.7%	11,659	90.0%	2.3%
3Q2016	10,192	94.6%	4.3%	4,236	90.4%	2.1%	11,654	90.3%	2.6%
2015	9,975	93.9%	2.6%	4,314	92.0%	1.4%	11,658	91.7%	2.6%
2014	9,843	94.3%	2.5%	4,230	92.6%	2.5%	11,614	91.2%	4.0%
2013	9,755	92.6%	2.3%	4,230	91.2%	3.0%	11,726	89.8%	4.6%

Source: NIC MAP Report – 3Q17

- **Shortage More Severe in Howard County**

The supply of independent living units is even more strained in Howard County. There, only 780 of 1,405 senior living units are designed for independent living. That is a significantly lower total than in Baltimore County (7,050 units; Baltimore County has 2.7 times Howard County's total population, but 9 times as many independent living units) and in Carroll County (1,141 units; a bit more than one-half of Howard County's population, but 46 percent more units).

Exhibit 6: Senior Housing Property Information, Q32017

	All Senior Housing	Independent Living (IL) Senior Housing	Independent Living Penetration
Howard County	**1,405**	**780**	**8.7%**
Baltimore County	8,695	7,050	16.6%
Carroll County	1,406	1,141	16.7%

Source: NIC MAP Report – 3Q17

In this regard, a helpful measure is independent living penetration. This measure is simply defined as independent inventory divided by the number of households aged 75+. This penetration measure is approximately twice as high in Baltimore and Carroll counties than it is in Howard County. In other words, to have a penetration level as high as in these two neighboring counties, Howard County would have to experience nearly a doubling in its number of independent living units.

Howard County is presently home to just two continuing care retirement communities: Vantage House in Columbia and Miller's Grant in Ellicott City. Independent living at Miller's Grant is presently 98 percent reserved according to their own data. The 2 percent that is available equates to six units available for sale. At Vantage Point, 194 out of 205 independent living units (95%) are occupied. Even if one presumes that the other eleven units are unreserved, that means that Howard County, with a population exceeding 300,000, is home to 17 available independent living units. That translates into .0005 independent living units per Howard County resident aged 65 or older.

Conclusion

Available data indicate that Howard County's supply of independent living units for seniors is inadequate. Should Howard County fail to meet unmet demand, it will mean:

1) hardship for seniors hoping to remain in Howard County as they age and the families that depend upon them in various ways;
2) a loss of tax base associated with a large and growing number of affluent seniors;
3) loss of economic vitality due to lost spending power;
4) loss of potential community volunteers who support quality of life.

Doubling the number of independent living units in Howard County (presently totaling 780) would merely serve to bring the independent living penetration measure to a level already observed in Baltimore and Carroll counties. Even that would not guarantee sufficient supply given the overwhelming Howard County-specific demographic forces described in this report.

Erickson Living at Limestone Valley

Howard County, Maryland
July 28, 2017

Adequate Road Facilities Test Evaluation and Traffic Study

Prepared for:

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EXHIBIT
D

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APPENDIX A – Concept Road Improvement Plan

APPENDIX B – Intersection Turning Movement Counts and Aerial Photos

APPENDIX C – Intersection Capacity Analysis Worksheets, CLV Worksheets

APPENDIX D – Trip Assignment for Background Developments

APPENDIX E –Synchro and Simtraffic

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Professional Certification: I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland, License No. 29931, Expiration Date: 01/08/2018.

CARL ROBERT WILSON, JR.
No. 29931

7/28/17

Prepared by: Carl R. Wilson, Jr., P.E., PTOE
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INTRODUCTION AND SUMMARY OF FINDINGS

Study Purpose

The Traffic Group, Inc. has prepared this Adequate Road Facilities Test Evaluation and Traffic Study to quantify the impact the proposed development of Erickson Living at Limestone Valley will have on the surrounding road network in Howard County, Maryland. The subject site is situated on the north side of MD 108 (Clarksville Pike), west of Sheppard Lane. A Continuing Care Retirement Community (CCRC) with up to 1200 units is proposed. In addition, a 240 bed Assisted Living Facility (ALF) will also be constructed on-site. A Concept Plan for the development is shown below as Figure 1.1 and Appendix A.

Access to the property is proposed via one point along MD 108 and a secondary point along an extension of Linden Linthicum Lane (Proposed Public Access Road). The MD 108 access will operate under stop control and left turns out of the facility will be restricted. The access point along Proposed Public Access Road will operate under stop control. Traffic signalization is proposed at the intersection of MD 108 and Linden Linthicum Lane/Proposed Public Access Road will. Full buildout of the project is expected within six years.

Study Criteria/Methodology

This study was conducted in accordance with Chapter 4 of the *Howard County Design Manual – Volume III (Road and Bridge Design)*. Chapter 4 details the requirements for the Adequate Road Facilities Test Evaluation, which require that the first intersection of a Major Collector or higher classified roadway with another Major Collector or higher classified roadway in all directions from the subject site be reviewed and analyzed.

Since the site will generate more than 100 trips, a Chapter 5 Traffic Study is also required, which subjects all classified intersections within one-half mile of the property to review, however, improvements are not required at these locations.

All intersections ae reviewed using Critical Lane Volume (CLV) methodology. Intersections that are controlled by Maryland State Highway Administration (SHA) must exhibit Level of Service "E" or better conditions during all study periods.

Because of the complexity of this project, a Synchro model was prepared for the MD 108 corridor.

In addition to traditional road improvements that may be required as part of the Adequate Road Facilities Test Evaluation, road improvements that will provide additional community benefit are proposed in conjunction with the CEF (Community Enhanced Floating) Zone requirement for this site. Details on the proposed improvements will be provided in later sections of this document.

Scope of Services

The principal scope of services undertaken for this study was as follows:

- Conduct a field inspection to collect physical information concerning the nearby road system, including a compilation of traffic signal plans, aerial photography and ground level photographs.

- Collect intersection turning movement counts during the morning and evening peak periods at each study intersection while public school is in session.

- Apply a regional growth factor to the road network to incorporate the design year.

- Prepare trip generation and trip distribution forecasts for all approved background developments.

- Prepare trip generation and trip distribution for the development of the subject site.

- Undertake intersection capacity analysis to determine existing and projected levels of service at all study intersections using Critical Lane Volume (CLV) methodology.

- Prepare a Synchro model and SimTraffic simulation to detail existing and projected future operations.

- Provide an overall evaluation of traffic operations, including recommendations for improvements at appropriate concept plans.

Summary of Findings and Recommendations

This analysis will show that the Adequate Road Test Facilities study intersections are currently operating with an acceptable CLV under existing conditions. When considering the impact of background traffic, the intersection of MD 108 at Sheppard Lane is projected to operate at Level of Service "F" conditions during both the morning and evening peak periods. All other remaining Chapter 5 intersections will feature acceptable operations.

With the additional impact associated with the development of the subject site, the intersection of MD 108 at Sheppard Lane will continue to exhibit Level of Service "F" conditions.

Since this project is seeking CEF Zoning, additional road improvements are proposed above and beyond what would typically be required to satisfy Adequate Road Facilities Test Evaluation requirements. Below, the proposed improvements are detailed:

MD 108 at Sheppard Lane

Sheppard Lane currently intersects MD 108 at a 55 degree angle, which is substandard and has a negative impact on intersection operations. In addition, the Sheppard Lane approach features just a single lane for traffic accessing MD 108. Finally, the existing left turn lane from eastbound MD 108 to Sheppard Lane is only 175 feet long which results in significant queuing that blocks the through lane. The following improvements are proposed at this location:

- Realign Sheppard Lane to the west at an angle of a minimum of 70 degrees as acceptable to SHA.

- Widen the Sheppard Lane approach to provide two lanes onto MD 108, including a separate right turn lane and separate left turn lane.

- Provide a continuous left turn lane along eastbound MD 108, approaching Sheppard Lane.

- Widen the westbound MD 108 approach to provide two thru lanes and a separate right lane.

- Reconstruct the traffic signal and provide pedestrian accommodations as required by SHA.

- Provide interconnection of the traffic signal along MD 108 to MD 32.

Not only do the proposed improvements at MD 108 at Sheppard Lane improve the CLV to an acceptable level, but queuing is significantly reduced on all approaches. The queuing is an operations issue that is present under existing conditions. The reduction of queues would provide significant benefits to all roadway users.

MD 108 at Linden Linthicum Lane/Proposed Public Access Road

The existing intersection of MD 108 and Linden Linthicum Lane features stop control for the minor approach. As a result, significant delays are encountered during the peak period for left turning traffic. The following improvements are recommended to mitigate delays and improve operations at this intersection:

- Install traffic signalization once approved by SHA.
- Provide an extension of Linden Linthicum Lane (Proposed Public Access Road) on the north side of MD 108 to provide site access and potential future connections to commercial properties to the west.
- Convert the existing right turn lane along eastbound MD 108 to a shared thru/right lane.
- Convert the westbound MD 108 auxiliary lane to a shared thru/right lane.

The construction of these improvements, including the Proposed Public Access Road on the north side of MD 108, will provide a significant community benefit. The new road will allow property owners on its west side to potentially have signalized access to MD 108. While the elimination of unsignalized access points is not recommended, drivers will have a choice to utilize signalized access to the MD 108 corridor, particularly during peak periods. In addition, the installation of the traffic signal at Linden Linthicum Lane is consistent with elements of the *Clarksville Pike Streetscape Plan* which was adopted by Howard County in 2016. The implementation of the signal will allow for synchronized traffic signals between Sheppard Lane and MD 32, which will significantly enhance operations providing a community benefit.

MD 108 at Site Access

A limited access point is proposed along MD 108, opposite the existing access point for River Hill Garden Center which is approximately 475 feet west of Sheppard Lane. At this access point, which will operate under stop control, a left-in/right-in/right-out is proposed. A separate left turn lane will be provided into the site. The following enhancements are also proposed in conjunction with the access point:

- Construct a five lane section along MD 108 in between Linden Linthicum Lane and Sheppard Lane, covering a distance of approximately 1,300 feet.

- Provide separate acceleration and deceleration lanes into the subject site, based on SHA requirements.

- Provide appropriate channelization to restrict left turns out of the subject site.

The construction of the five lane section along MD 108 is consistent with the Clarksville Pike Streetscape Plan and will match the section of MD 108 to the west of Linden Linthicum Lane. This construction will provide a significant benefit to roadway users, as queuing for Sheppard Lane will no longer block thru traffic along MD 108. A preliminary Concept Plan showing the proposed road improvements can be found in Figure 1.2. A full size version of the plan is included in Appendix A.

As previously stated, the improvements proposed in conjunction with the development of Erickson Living at Limestone will provide significant community benefits in conjunction with the proposed CEF Zoning for this site. All improvements will be consistent with SHA requirements. The details and methodology used for this study are detailed in the sections that follow.

ILLUSTRATIVE SITE PLAN

Note: conceptual plan subject to final engineering and architectural refinement.

Figure 1.1 - Site Concept Plan

SITE DATA

NEIGHBORHOOD 1

INDEPENDENT LIVING UNITS	730
CCRC ACCESSORY SPACE[1]	68,000SF +/-
PARKING	
700 GARAGE[2]	
190 SURFACE	

NEIGHBORHOOD 2

INDEPENDENT LIVING UNITS	470
CCRC ACCESSORY SPACE[1]	40,000SF +/-
PARKING	
680 GARAGE[2]	
110 SURFACE	

CARE CENTER

(assisted living, memory care, skilled nursing)

240 UNITS +/-

TOTALS

INDEPENDENT LIVING UNITS	1,200
CARE CENTER UNITS	200 +/-
CCRC ACCESSORY SPACE[1]	108,000SF +/-
PARKING	
1,380 GARAGE[2]	
300 SURFACE	
1,680 TOTAL	

Notes:

1. CCRC Accessory Space consists of building areas allocated for resident amenities, resident services, food service, campus administration, and campus services. CCRC Accessory Spaces are typically located within clubhouse buildings (CB) as well as on the ground/first floor of independent living buildings.
2. Resident parking is provided in garages below independent living buildings

marks thomas

0' 100' 200' 300'

N

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HOWARD COUNTY, MARYLAND
JULY 28, 2017

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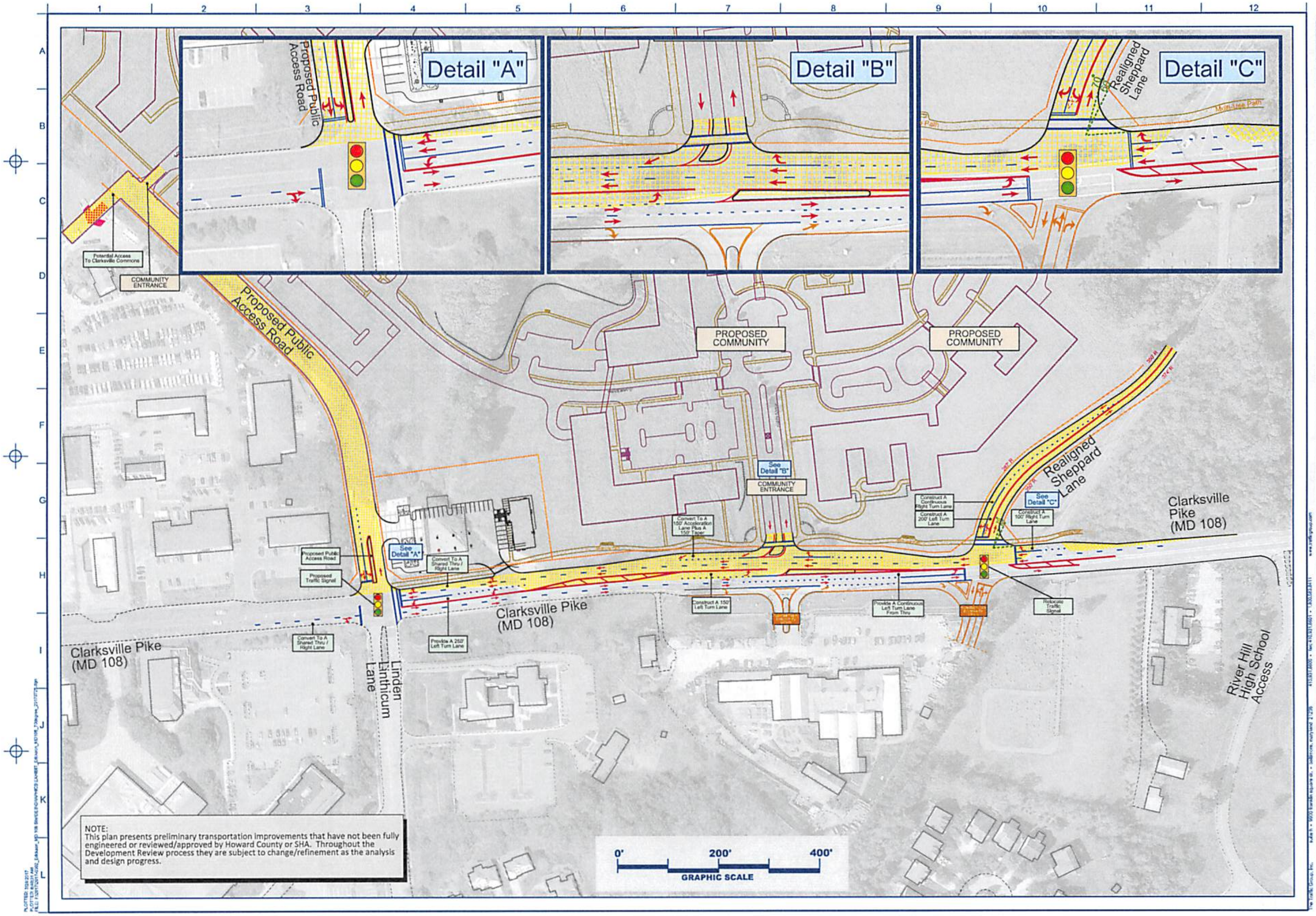

NOTE:
This plan presents preliminary transportation improvements that have not been fully engineered or reviewed/approved by Howard County or SHA. Throughout the Development Review process they are subject to change/refinement as the analysis and design progress.

NORTH

Clarksville Pike (MD 108)

Erickson at Limestone

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Figure 1.2 - Road Improvement Concept Plan

EXISTING TRAFFIC CONDITIONS

Site Information

The proposed Erickson Living at Limestone Valley community will consist of a Continuing Care Retirement Community (CCRC) containing up to 1,200 units and a total of up to 200 beds in an Assisted Living Facility (ALF). The subject site is located on the north side of MD 108 (Clarksville Pike), south of Sheppard Lane in Howard County. Currently, the property is used as a farm.

Study Area

Based on Howard County's Adequate Road Facilities Test Evaluation requirements, the following intersections were identified to be included for the Chapter 4 study:

- MD 108 at Sheppard Lane
- MD 108 at Great Star Drive

Since the site will generate more than 100 peak hour trips, the MD 32, Westbound Ramp at MD 108 is also included to satisfy Chapter 5 Traffic Study.

To further complete the CEF Zoning Study, additional signalized and unsignalized local roads were also included in the study. They include:

- MD 108 at Auto Drive
- MD 108 at Linden Linthicum Lane

Figure 2.1 details the study area.

MD 108 is owned and operated by SHA. The roadway extends for a distance of 15.24 miles from the Montgomery County Line to MD 175. In the vicinity of the subject site, the roadway is classified as an urban minor arterial on the State Secondary system. MD 108 is inventoried in the east/west direction. There are no access controls in the vicinity of the subject site.

Along property frontage MD 108 features one travel lane in each direction. There are limited shoulders available and no existing pedestrian facilities. Immediately opposite the proposed access point for the Erickson Living at Limestone Valley community is a full movement access point for River Hill Garden Center which operates under stop control. The access point features short acceleration and deceleration lanes in addition to a bypass lane.

With the exception of Linden Linthicum Lane, all study intersections are controlled by traffic signalization. Generally, the corridor features separate left turn lanes along mainline MD 108 with shared thru/right lanes. A two-way center left turn lane is available from Auto Drive to Linden Linthicum Lane.

The intersection of MD 108 and Sheppard Lane currently intersects at a 55 degree angle which is considered substandard. In addition, the minor approach only features a single lane approaching MD 108. Observations indicate that the existing left turn lane along eastbound MD 108 is too short to accommodate peak hour demand.

Figure 2.2 contains a summary of the existing lane use of the study intersections. Additional details, including aerial photographs, can be found in Appendix B.

Crash Data

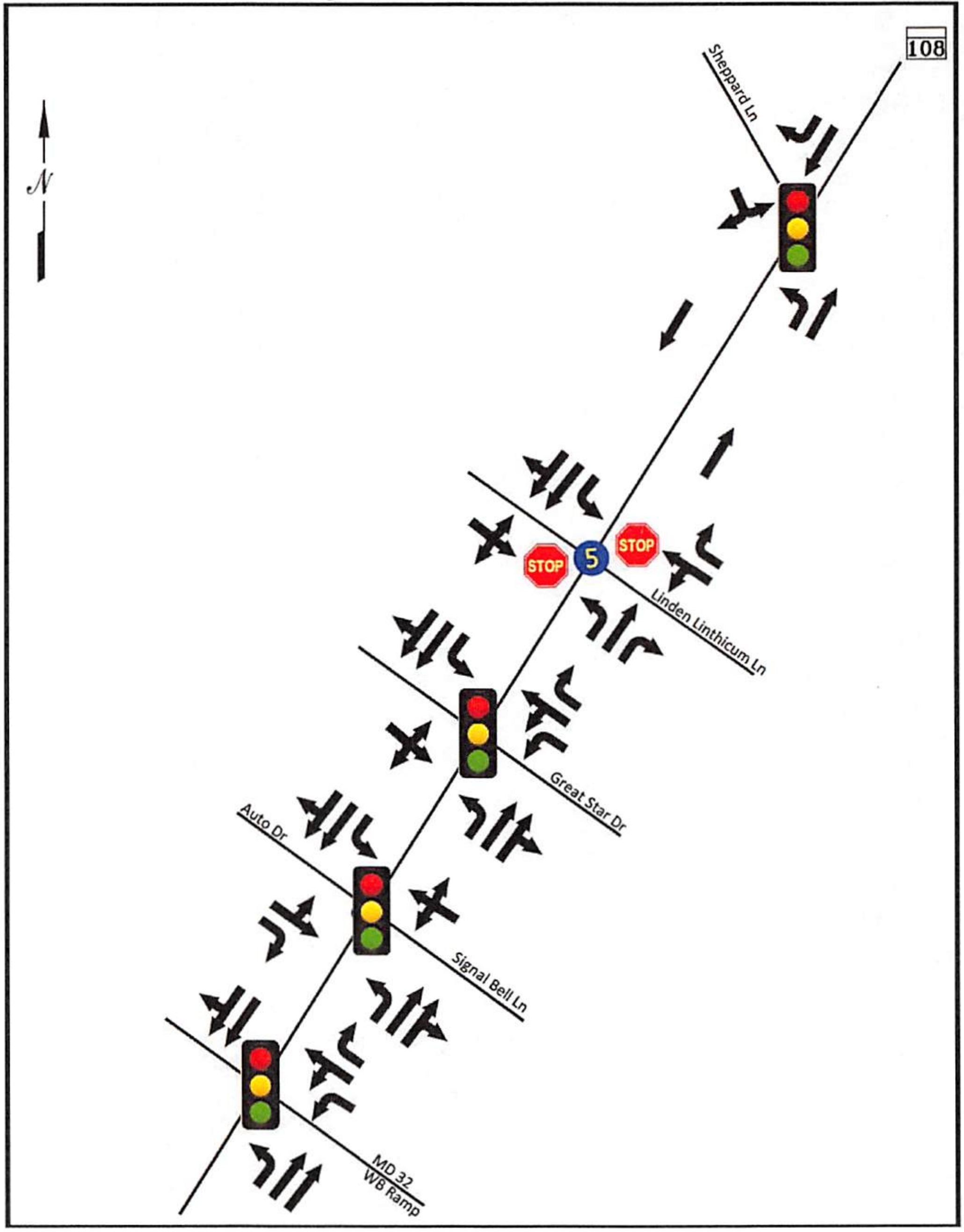
Crash data was obtained from Howard County representatives for all study intersections. The data, compiled by SHA encompasses the most recent three-year period extending from 2014 through 2016. All summarized data can be found in Appendix F.

A review of Appendix F shows that there are no discernable patterns related to crashes that warrant improvements. The most notable pattern involves left turn crashes at the intersection of MD 108 at Great Star Drive. The development of the subject site will not add any left turns to the affected movements, so no improvements should be required of this developer.

It is important to recognize that this data accounts for crashes that involve personal injury or involves property damage that is significant enough for vehicles to be towed from the scene.

Figure 2.1 – Study Area Map

Figure 2.2 – Existing Lane Use



Clarksville Pike Streetscape Plan and Design Guidelines

Howard County adopted the ***Clarksville Pike Streetscape Plan and Design Guidelines*** on February 1, 2016. The document sets forth different criteria and standards that should be accounted for within the Clarksville Pike (MD 108 corridor). Multiple elements within the design guidelines are incorporated within the improvements that are proposed in conjunction with Erickson Living at Limestone Valley. Among them:

- **Installation of Traffic Signalization at Linden Linthicum Lane** – It is acknowledged within the design guidelines that the minor approach along Linden Linthicum Lane suffers from a high level of delay during peak periods. To mitigate this delay, the installation of traffic signalization is proposed.

- **Pedestrian/Bicycle accommodations** – Within the site frontage, the construction of a continuous shared use path is proposed. The shared use path will permit the safe and efficient of pedestrians and bicycle within the corridor. Connectivity to west is also proposed beyond Linden Linthicum Lane.

- **Implementation of Crosswalks** – In conjunction with traffic signalization at Linden Linthicum Lane, the introduction of crosswalks is also proposed. Crosswalks will allow pedestrians to safely cross MD 108 and minor streets.

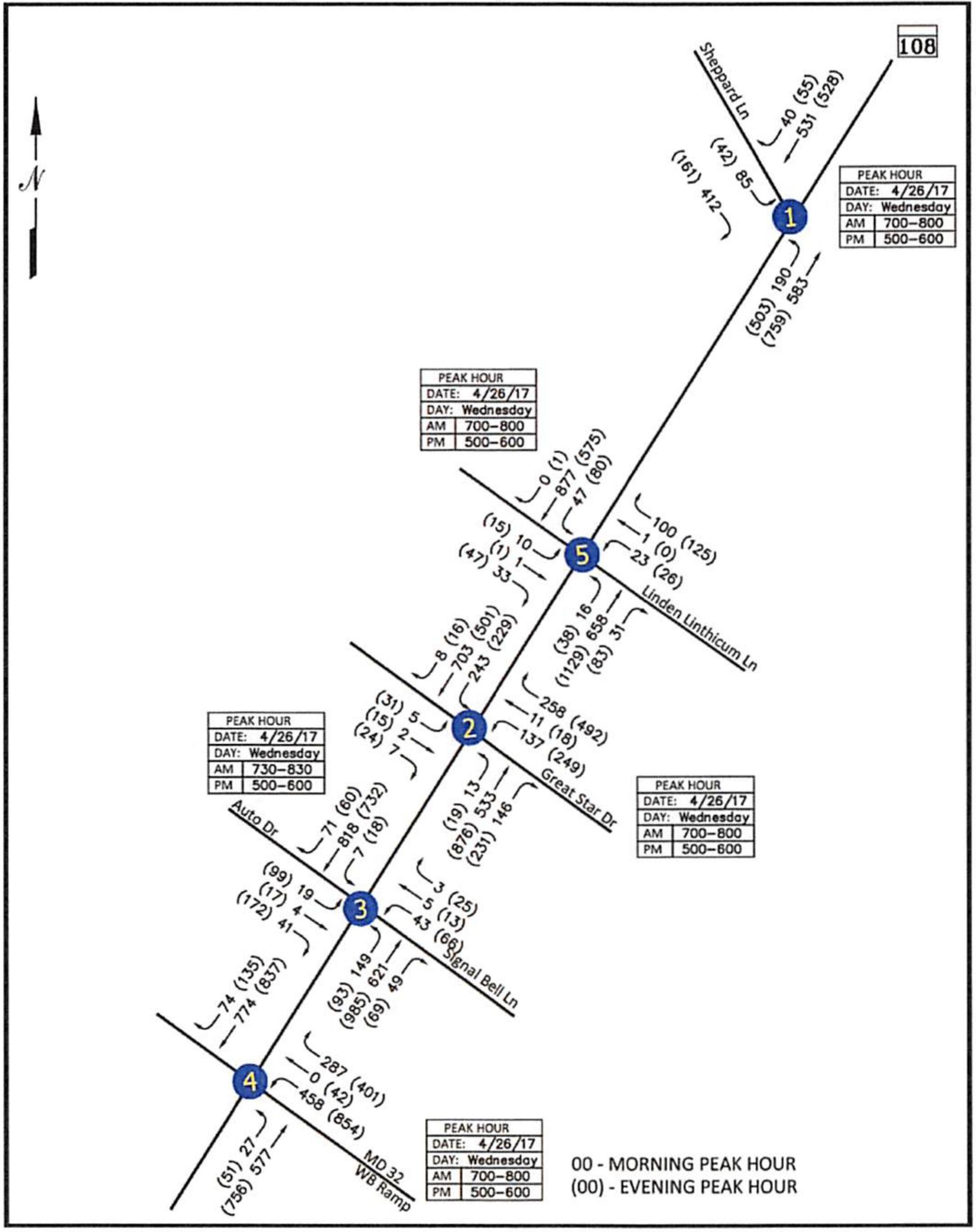
- **Development of Roadway Cross Sections** – The area immediately west of the subject site features four travel lanes and a two way center left turn lane. While not specifically stated within the design guidelines, this cross section will be maintained along property frontage to Sheppard Lane. By continuing this cross section, corridor will be significantly enhanced.

Traffic Volumes

Intersection turning movement counts were collected at each of the study intersections between the hours of 6:30-9:00 AM and from 4:00-6:30 PM on a typical weekday while public school was in session. The additional count hours above the standard data collection periods were added because the initial counts showed the peak hours began at 7:00 AM and ended at 6:00 PM. The resulting volumes will, however, show that those peak hours are true peaks, as the 15 minute intervals decreased beyond the peak periods.

River Hill High School, which is located to the east of the subject site, is in session from 7:00 AM-2:30 PM. As previously stated, this school was in session at the time of the data collection and its impact is fully accounted for within this analysis. Figure 2.3 details the existing peak hour traffic volumes. Full details on the turning movement counts can be found in Appendix B.

Figure 2.3 – Existing Traffic Volumes



Analysis of Existing Traffic Conditions

Intersection capacity analysis was undertaken at each of the study intersections using Critical Lane Volume (CLV) methodology. The results are summarized below in Table 2.1. Full details on the CLV analysis can be found in Appendix C.

Table 2.1 – Summary of Existing CLV

AM Peak Hour	Existing LOS / CLV
MD 108 @ Sheppard Lane	C/1218
w/improvements	---
MD 108 @ Great Star Dr	A/719
MD 108 @ Auto Dr/Signal Bell Ln	A/712
MD 108 @ MD 32 WB Ramps	A/780
MD 108 @ Linden Linthicum Ln	A/773
w/improvements	---
MD 108 @ Site Access/Garden Center	---
PM Peak Hour	**Existing LOS / CLV**
MD 108 @ Sheppard Lane	C/1234
w/improvements	---
MD 108 @ Great Star Dr	C/1171
MD 108 @ Auto Dr/Signal Bell Ln	A/808
MD 108 @ MD 32 WB Ramps	B/1124
MD 108 @ Linden Linthicum Ln	C/1300
w/improvements	---
MD 108 @ Site Access/Garden Center	---

A review of Table 2.1 shows that each intersection is currently operating with an acceptable level of service using CLV methodology.

A Synchro model was also developed for the MD 108 corridor using the model provided by Howard County Department of Public Works (DPW) Traffic Engineering as a base. The model was calibrated to match existing queue length found along MD 108. Table 2.2 summarizes the *Highway Capacity Manual* (HCM) results developed from the Synchro model.

Table 2.2 – Summary of Existing Delay (HCM – in seconds)

Intersection	Control Type	Existing LOS / Delay	
		AM	PM
MD 108 @ Sheppard Lane	Signal	C/33.0	C/20.3
SB		D/41.7	C/34.0
NB		---	---
EB		C/22.1	B/15.9
WB		D/40.7	C/26.2
MD 108 @ Great Star Dr	Signal	B/12.1	C/27.4
SB		B/16.5	C/22.8
NB		B/19.9	D/46.2
EB		B/12.8	C/24.0
WB		A/8.2	B/14.0
MD 108 @ Auto Dr/Signal Bell Ln	Signal	A/8.1	B/10.7
SB		C/20.1	C/24.8
NB		C/20.5	C/26.1
EB		A/5.4	A/7.6
WB		A/8.9	A/8.2
MD 108 @ MD 32 WB Ramps	Signal	C/21.7	C/32.4
NB		D/43.0	D/47.8
EB		A/5.5	B/15.7
WB		B/14.5	C/25.8
MD 108 @ Linden Linthicum Ln	Two Way Stop		
SB/LTR		F/365	F/>999
NB/LT		E/46.5	F/384.0
EB/L		B/11.4	A/9.6
WB/L		B/10.2	C/16.9
w/Signal & Improvement	Signal	---	---
SB		---	---
NB		---	---
EB		---	---
WB		---	---

As shown in Table 2.2, the minor street delay at Linden Linthicum Lane is very high during both peak periods. The implementation of signalization to reduce the delay is discussed in later sections of this document.

A SimTraffic model was also developed based on the Synchro input. The SimTraffic model incorporates queuing found at study intersections. Table 2.3 details the results of the SimTraffic analysis. Appendix E contains output from the models.

Table 2.3 – Summary of Existing Queuing (in feet)

Intersection	Available Storage	Existing	
		AM	PM
MD 108 @ Sheppard Lane			
SB/LR, LTR FOR BACK'D	---	403	164
SB/LT	---	---	---
SB/R	---	---	---
EB/L	---	---	---
EB/TR	---	---	---
EB/L	150 Exist./>1200 Total	223	233
EB/T	---	400	603
EB/R	---	---	---
WB/L	---	---	---
WB/T	445	451	381
WB/T	---	---	---
WB/R	265	165	92
MD 108 @ Great Star Dr			
SB/LTR	---	38	99
NB/L	200	80	147
NB/LT	200	88	302
NB/R	200	103	240
EB/L	---	40	149
EB/T	580	217	593
EB/TR	580	156	554
WB/L	200	128	205
WB/T	>1200'	135	177
WB/TR	>1200'	107	161
MD 108 @ Auto Dr/Signal Bell Ln			
SB/LT	---	45	118
SB/R	250	53	115
NB/LTR	---	75	119
EB/L	190	84	114
EB/T	360	109	241
EB/TR	360	81	221
WB/L	180	27	68
WB/T	580	203	223
WB/TR	580	140	230

Table 2.3, con't – Summary of Existing Queuing (in feet)

Intersection	Available Storage	Existing	
		AM	PM
MD 108 @ MD 32 WB Ramps			
NB/L	430	259	478
NB/LT	>1800	230	565
NB/R	350	283	440
EB/L	400	39	90
EB/T	440	179	300
EB/T	440	149	290
WB/T	350	321	420
WB/TR	350	202	411
MD 108 @ Linden Linthicum Ln			
SB/LTR	---	91	189
SB/L	---	---	---
SB/TR	---	---	---
NB/LT	>400	66	373
NB/R	200	79	473
EB/L	190'	28	35
EB/T	>1200	26	109
EB/TR	---	---	---
EB/R	>500	<25	<25
WB/L	105	44	106
WB/T	---	<25	<25
WB/T	225	<25	<25
WB/R	---	---	---
MD 108 @ Site Access/Garden Center			
NB/R	---	---	---
EB/L	---	---	---
WB/R	---	---	---

BACKGROUND TRAFFIC CONDITIONS

Design Year(s)

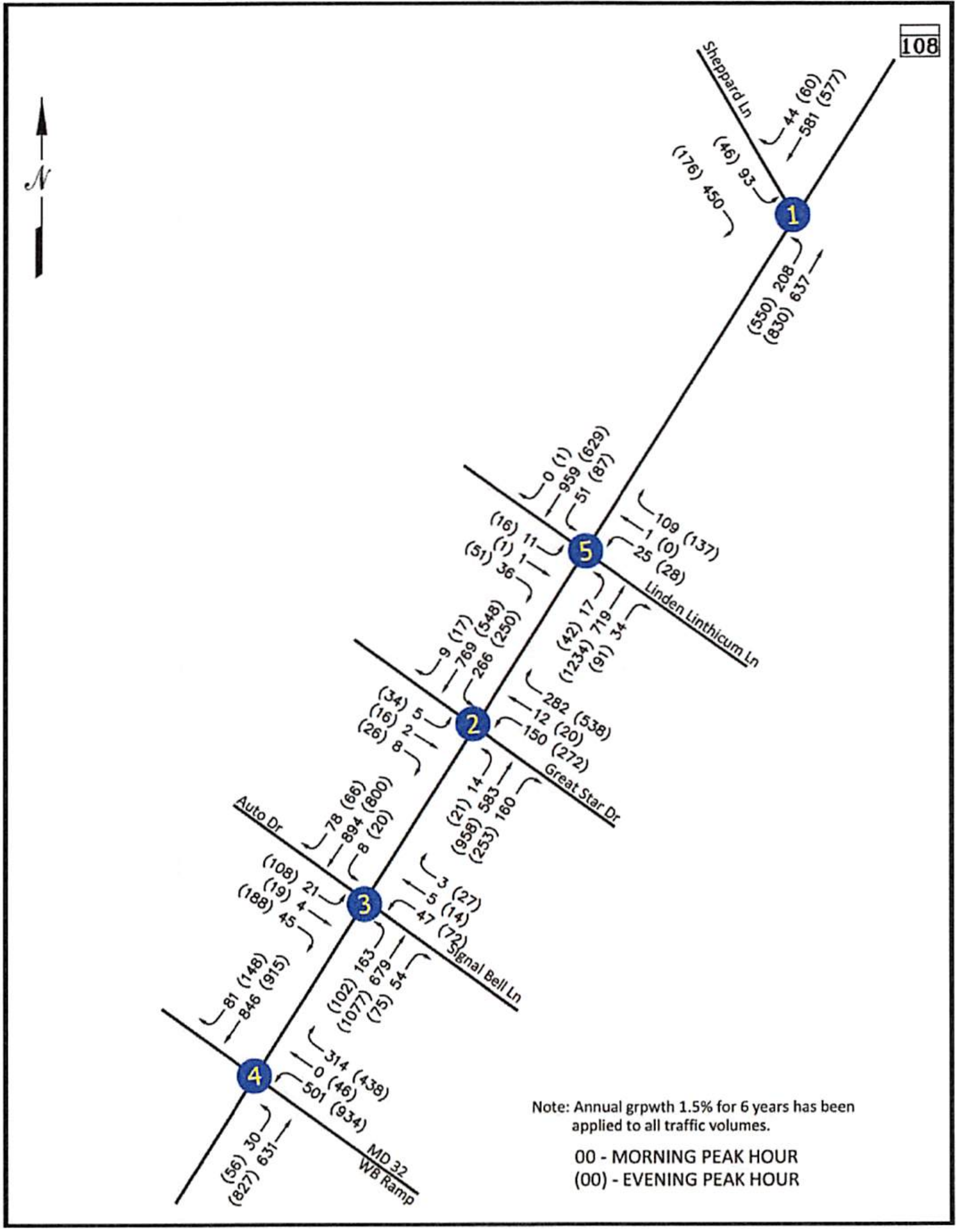
Based on the anticipated completion of the Erickson Living at Limestone Valley community, a six year horizon is considered for the Adequate Road Facilities Test Evaluation. Historic traffic volumes in the MD 108 corridor were reviewed to quantify the most accurate growth rate. As shown in Appendix D, traffic volumes have remained consistent, with even a slight decrease. To account for potential regional growth, present a conservative analysis and remain consistent the growth rate utilized by Sabra, Wang & Associates in their document titled ***Multimodal Traffic Study and Conceptual Improvements: Clarksville Pike (MD 108)*** dated April 2015 a 1.5% annual growth rate was considered for 6 years. The growth rate was utilized based on models prepared by Baltimore Metropolitan Council (BMC). Figure 3.1 shows the 2023 base peak hour traffic volumes.

For Chapter 5 purposes, a 2037 Traffic Analysis is also accounted for. Figure 3.2 details the 2037 base peak hour traffic volumes which increase the existing traffic at 6% per year from 2023 to 2037.

Background Traffic

Howard County's Department of Planning and Zoning website was consulted to determine the approved but unbuilt projects in the vicinity of the subject site. As shown in Figure 3.3, a total of seven developments have been approved but remain unbuilt. Table 3.1 includes a list of those developments.

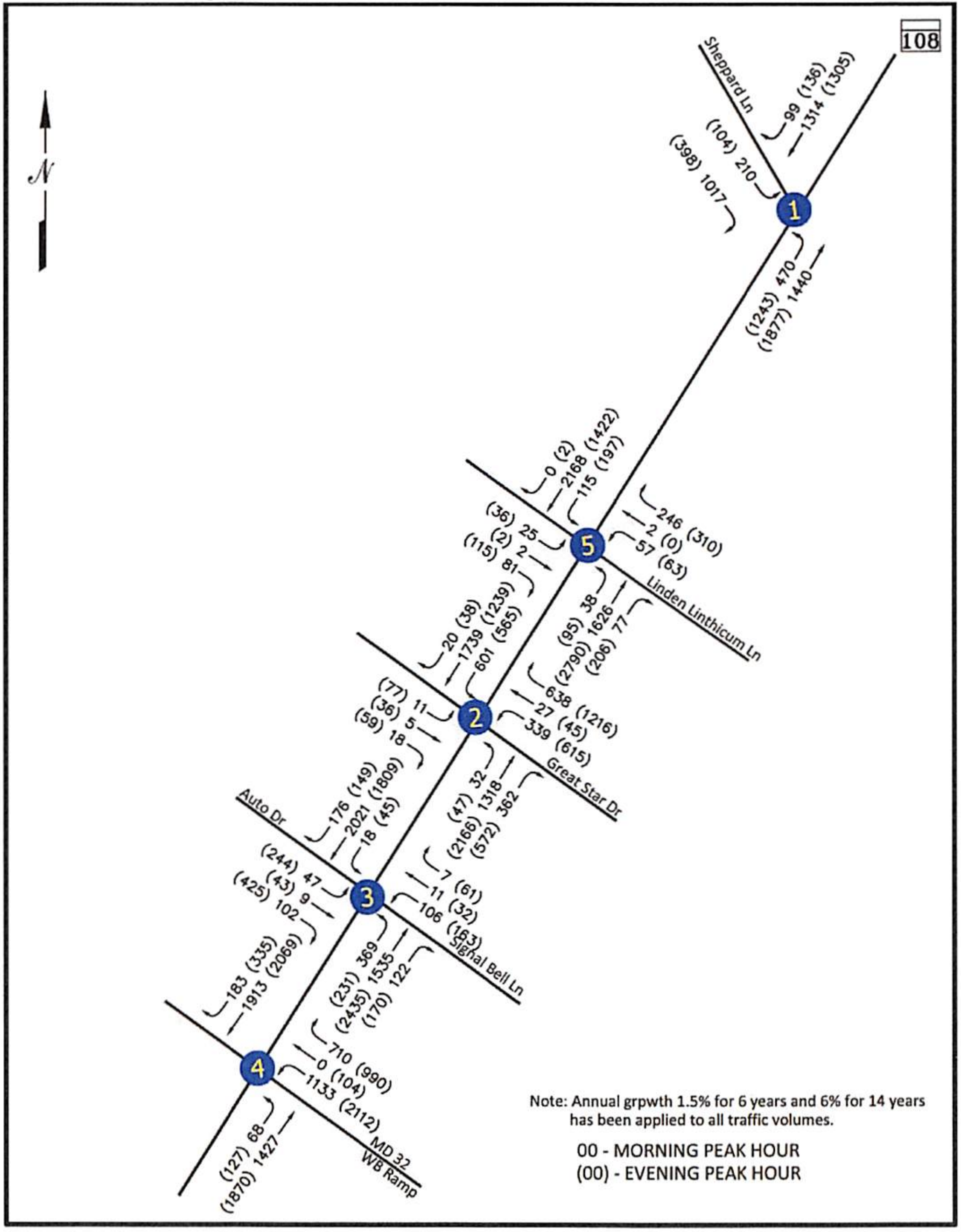
Figure 3.1 – 2023 Base Peak Hour Traffic Volumes



Note: Annual grpwth 1.5% for 6 years has been applied to all traffic volumes.

00 - MORNING PEAK HOUR
(00) - EVENING PEAK HOUR

Figure 3.2 – 2037 Base Peak Hour Traffic Volumes



Note: Annual grpwth 1.5% for 6 years and 6% for 14 years has been applied to all traffic volumes.

00 - MORNING PEAK HOUR
(00) - EVENING PEAK HOUR

Figure 3.3 – Background Development Map

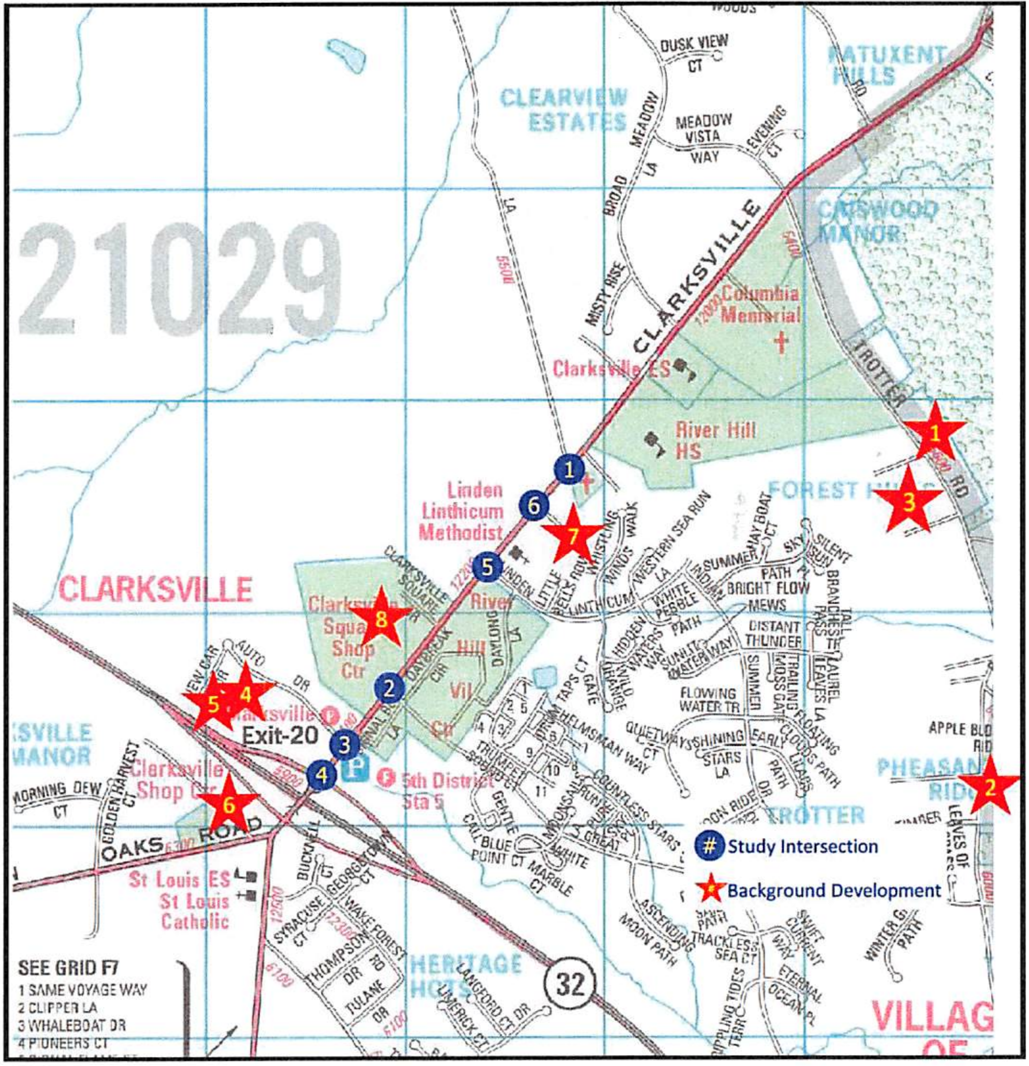


Table 3.1 – Background Development Listing

No.	Development
1.	Criswood Manor Sec 4 Lot 22 (SDP-15-038)
2.	Trotter Woods, Lot 24 (SDP-15-062)
3.	TAJ Property (SDP-15-026)
4.	Antwerpen Hyundai (SDP-14-061)
5.	Coleman Fiat (SDP-15-004)
6.	Antwerpen Properties (SDP-16-021)
7.	River Hill Garden Center
8.	Clarksville Commons (SDP-13-079)

It is important to recognize the redevelopment of River Hill Garden Center was incorporated within this analysis. While the development is not yet approved, it will have a direct impact on study intersections. Therefore, its inclusion represents a conservative analysis for this report.

The Institute of Transportation Engineers (ITE) *Trip Generation* (9th Edition) was consulted to quantify trips projected to be generated by each of the background developments. Based on current traffic patterns and anticipated future demand, the trips associated with each of the background developments were distributed and assigned to the road network. Details on the trip generation and distribution for background developments can be found in Appendix D. Figure 3.4 details the combined trips generated by all approved developments.

Combining the trips projected to be generated by the approved developments with the base peak hour traffic volumes results in the 2023 and 2037 background peak hour traffic volumes as shown in Figures 3.5 and 3.6, respectively.

Figure 3.4 – Combined Trips Generated by Background Developments

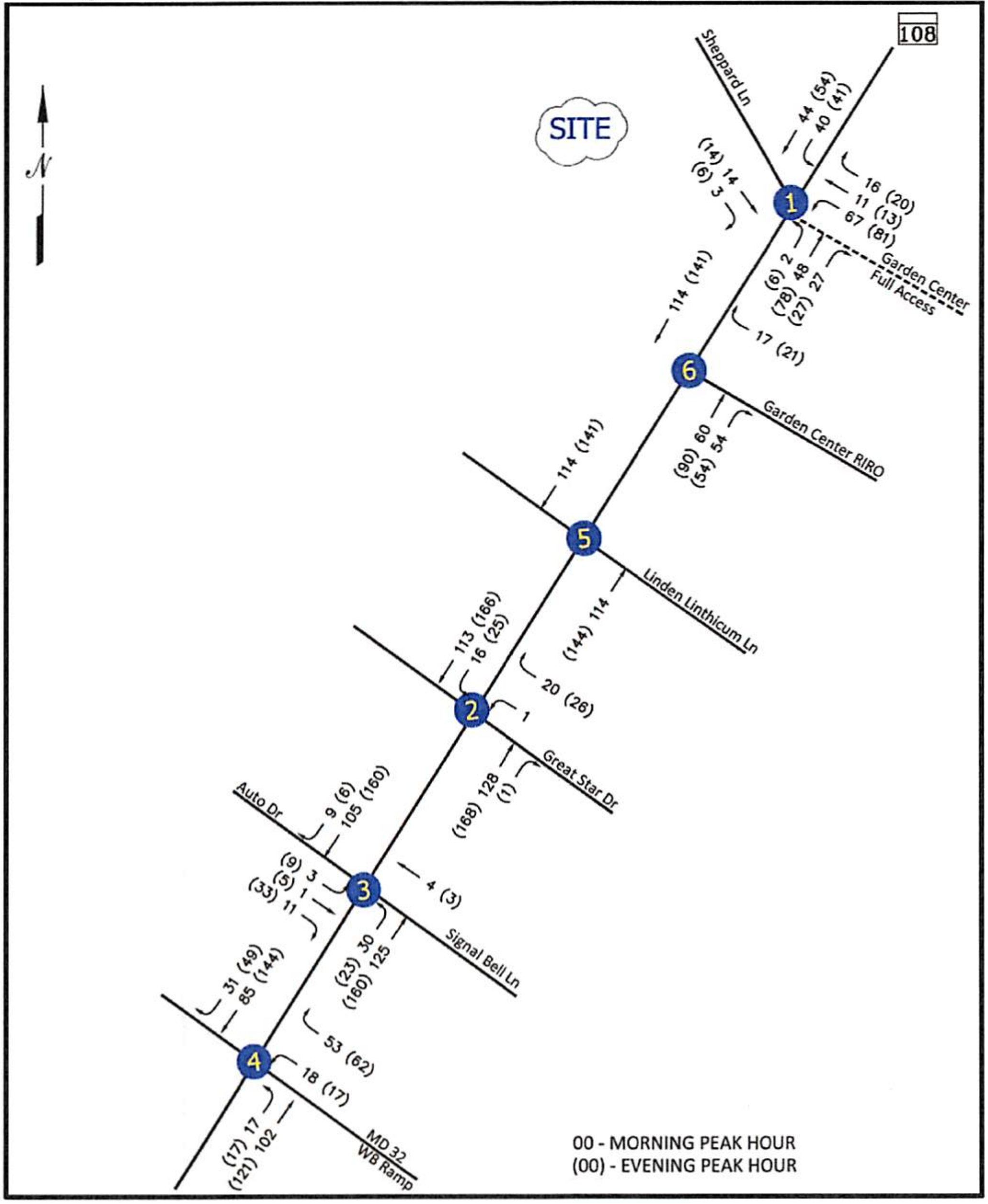


Figure 3.5 – 2023 Background Peak Hour Traffic Volumes

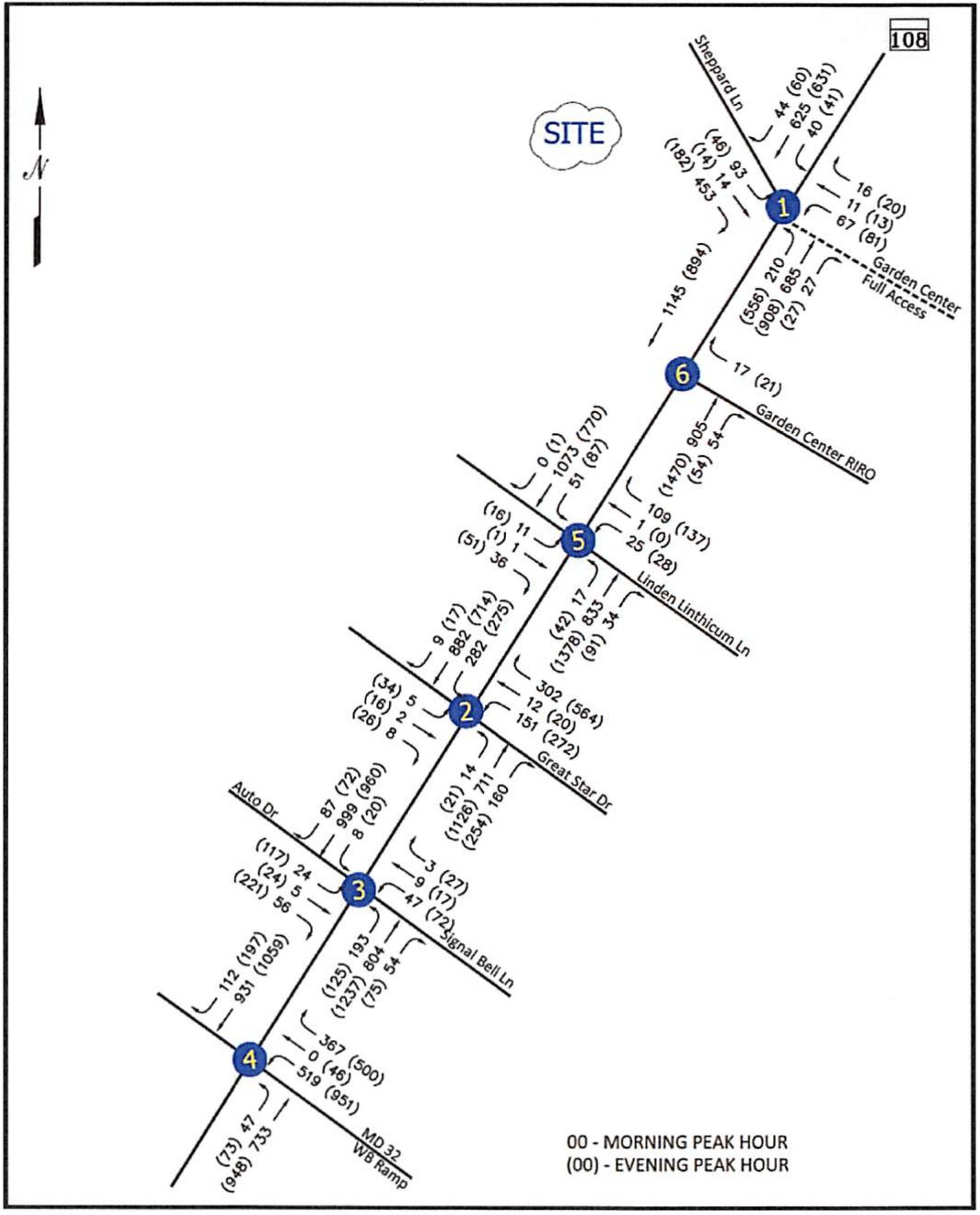
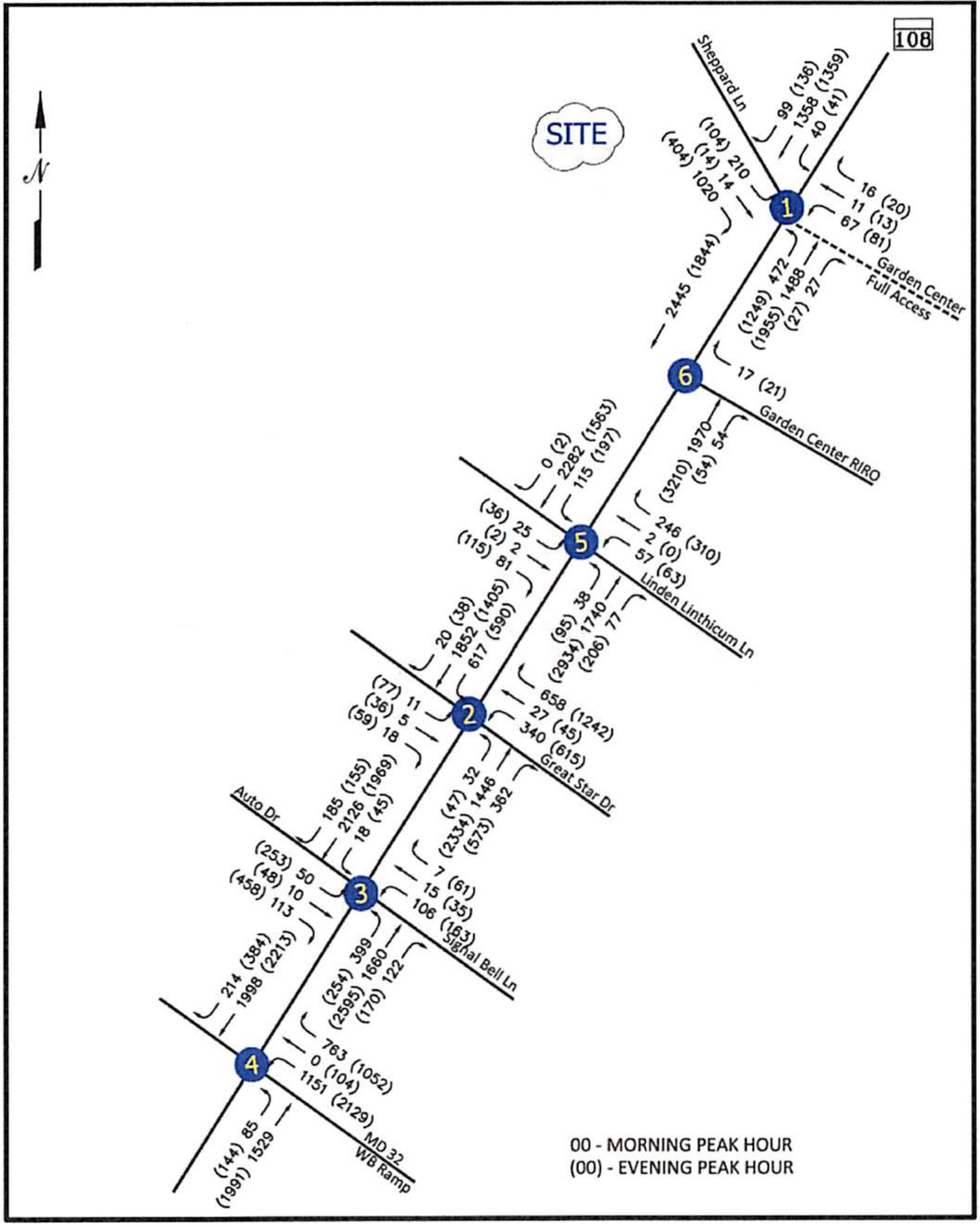


Figure 3.6 – 2037 Background Peak Hour Traffic Volumes



Analysis of Background Traffic Conditions

Critical Lane Volume Analysis was again undertaken for each of the study intersections, this time with consideration given to the development of all background developments. Complete capacity worksheets can be found in Appendix C. As shown in Table 3.2, all intersections are projected to maintain acceptable levels of service, with the exception of MD 108 at Sheppard Lane.

During both the morning and peak periods, this intersection will exhibit Level of Service "F" conditions. Improvements to provide acceptable operations will be detailed later in this document.

Table 3.2 – Summary of Background CLV

AM Peak Hour	Existing LOS / CLV	2023 Back'd LOS / CLV	2037 Back'd LOS / CLV
MD 108 @ Sheppard Lane	C/1218	F/1609	F/3368
w/improvements	---	---	---
MD 108 @ Great Star Dr	A/719	A/874	F/1865
MD 108 @ Auto Dr/Signal Bell Ln	A/712	A/878	F/1859
MD 108 @ MD 32 WB Ramps	A/780	A/988	F/2065
MD 108 @ Linden Linthicum Ln	A/773	A/958	F/2045
w/improvements	---	---	---
MD 108 @ Site Access/Garden Center	---	---	---
PM Peak Hour	**Existing LOS / CLV**	**2023 Back'd LOS / CLV**	**2037 Back'd LOS / CLV**
MD 108 @ Sheppard Lane	C/1234	F/1707	F/3449
w/improvements	---	---	---
MD 108 @ Great Star Dr	C/1171	D/1399	F/3013
MD 108 @ Auto Dr/Signal Bell Ln	A/808	B/1047	F/2241
MD 108 @ MD 32 WB Ramps	B/1124	D/1362	F/2912
MD 108 @ Linden Linthicum Ln	C/1300	E/1563	F/3383
w/improvements	---	---	---
MD 108 @ Site Access/Garden Center	---	---	---

The Synchro model was also updated to incorporate the regional growth and impact from background developments. Table 3.3 summarizes the HCM levels of service associated with the intersection operations. As shown in the analysis, the intersection of MD 108 at Linden Linthicum Lane has a high level of delay on the minor approach. This is a result of the lack of signalization at this location. Improvements will be detailed to enhance the overall level of service at this location.

In addition, LOS 'E' conditions are projected at the intersection of MD 108 at Sheppard Lane. Proposed improvements at this location which are discussed in later sections of this document would mitigate the noted deficiency.

Table 3.3 – Summary of Background Delay (HCM – in seconds)

Intersection	Control Type	Existing LOS / Delay		2023 Back'd LOS / Delay	
		AM	PM	AM	PM
MD 108 @ Sheppard Lane	Signal	C/33.0	C/20.3	E/58.7	D/44.0
SB		D/41.7	C/34.0	F/87.5	E/57.6
NB		---	---	C/33.8	D/53.4
EB		C/22.1	B/15.9	D/43.1	C/32.7
WB		D/40.7	C/26.2	E/59.2	E/63.5
MD 108 @ Great Star Dr	Signal	B/12.1	C/27.4	B/15.0	D/44.2
SB		B/16.5	C/22.8	B/19.9	C/27.2
NB		B/19.9	D/46.2	C/27.4	F/102
EB		B/12.8	C/24.0	B/15.3	C/29.3
WB		A/8.2	B/14.0	A/9.8	B/17.2
MD 108 @ Auto Dr/Signal Bell Ln	Signal	A/8.1	B/10.7	A/8.6	B/14.6
SB		C/20.1	C/24.8	C/24.5	C/34.1
NB		C/20.5	C/26.1	C/24.9	D/38.0
EB		A/5.4	A/7.6	A/5.7	B/10.5
WB		A/8.9	A/8.2	A/9.2	B/10.8
MD 108 @ MD 32 WB Ramps	Signal	C/21.7	C/32.4	C/23.6	D/36.7
NB		D/43.0	D/47.8	D/39.1	D/47.4
EB		A/5.5	B/15.7	B/10.3	C/20.9
WB		B/14.5	C/25.8	C/20.3	D/36.8
MD 108 @ Linden Linthicum Ln	Stop				
SB/LTR		F/365	F/>999	F/>999	F/>999
NB/LT		E/46.5	F/384.0	F/142.0	F/>999
EB/L		B/11.4	A/9.6	B/13.2	B/10.9
WB/L		B/10.2	C/16.9	B/11.7	C/24.5
w/Signal & Improvement	Signal	---	---	---	---
SB		---	---	---	---
NB		---	---	---	---
EB		---	---	---	---
WB		---	---	---	---
MD 108 @ Site Access/Garden Center	Stop				
NB/R, FR for Total		---	---	C/17.7	E/38.2
EB/L		---	---	---	---

The queuing for all study intersections is shown in Table 3.4 and output can be found in Appendix E.

Table 3.4 – Summary of Background Queuing (in feet)

Intersection	Available Storage	Existing		2023 Back'd	
		AM	PM	AM	PM
MD 108 @ Sheppard Lane					
SB/LR, LTR FOR BACK'D	---	403	164	968	482
SB/LT	---	---	---	---	---
SB/R	---	---	---	---	---
EB/L	---	---	---	166	142
EB/TR	---	---	---	<25	29
EB/L	150 Exist./>1200 Total	223	233	257	268
EB/T	---	400	603	499	630
EB/R	---	---	---	131	101
WB/L	---	---	---	94	88
WB/T	445	451	381	573	546
WB/T	---	---	---	---	---
WB/R	265	165	92	360	425
MD 108 @ Great Star Dr					
SB/LTR	---	38	99	43	168
NB/L	200	80	147	68	218
NB/LT	200	88	302	210	414
NB/R	200	103	240	172	255
EB/L	---	40	149	97	167
EB/T	580	217	593	418	633
EB/TR	580	156	554	373	642
WB/L	200	128	205	180	245
WB/T	>1200'	135	177	137	244
WB/TR	>1200'	107	161	171	241
MD 108 @ Auto Dr/Signal Bell Ln					
SB/LT	---	45	118	56	384
SB/R	250	53	115	58	338
NB/LTR	---	75	119	84	244
EB/L	190	84	114	127	358
EB/T	360	109	241	202	383
EB/TR	360	81	221	176	383
WB/L	180	27	68	22	70
WB/T	580	203	223	201	453
WB/TR	580	140	230	233	478

Table 3.4 con't– Summary of Background Queuing (in feet)

Intersection	Available Storage	Existing		2023 Back'd	
		AM	PM	AM	PM
MD 108 @ MD 32 WB Ramps					
NB/L	430	259	478	298	619
NB/LT	>1800	230	565	396	568
NB/R	350	283	440	346	391
EB/L	400	39	90	91	573
EB/T	440	179	300	331	537
EB/T	440	149	290	271	555
WB/T	350	321	420	341	470
WB/TR	350	202	411	362	479
MD 108 @ Linden Linthicum Ln					
SB/LTR	---	91	189	174	214
SB/L	---	---	---	---	---
SB/TR	---	---	---	---	---
NB/LT	>400	66	373	284	631
NB/R	200	79	473	364	644
EB/L	190'	28	35	32	38
EB/T	>1200	26	109	150	247
EB/TR	---	---	---	---	---
EB/R	>500	<25	<25	<25	<25
WB/L	105	44	106	61	178
WB/T	---	<25	<25	56	80
WB/T	225	<25	<25	26	41
WB/R	---	---	---	---	---
MD 108 @ Site Access/Garden Center					
NB/R	---	---	---	75	165
EB/L	---	---	---	---	---
WB/R	---	---	---	---	---

TOTAL TRAFFIC CONDITIONS

Site Information

The proposed Erickson Living at Limestone Valley community is situated on the north side of MD 108, west of Sheppard Lane in Howard County, Maryland. A Continuing Care Retirement Community (CCRC) with up to 1200 units is proposed. In addition, a 240 bed Assisted Living Facility (ALF) will also be constructed on-site.

Access to the property is proposed via one point along MD 108 and a secondary point along an extension of Linden Linthicum Lane (Proposed Public Access Road). In order for Proposed Public Access Road to be constructed the existing Freestate gasoline station situated on the north side of MD 108 would have to be relocated. The relocation of the gas station is being considered in conjunction with this application.

The MD 108 access will operate under stop control and left turns out of the facility will be restricted. The access point along Proposed Public Access Road will operate under stop control. Traffic signalization is proposed at the intersection of MD 108 and Linden Linthicum Lane/Proposed Public Access in order to safely and efficiently accommodate site traffic destined to points east along MD 108.

Trip Generation/Distribution

ITE's *Trip Generation* (9th Edition) was again utilized to quantify the trips projected to be generated by the development of the Erickson Living at Limestone Valley Community. Table 4.1 details the trip generation rates for the different uses on-site. The associated trip generation for the project is shown in Table 4.2.

Table 4.1 – Trip Generation Rates

Continuing Care Retirement Community (ITE-255, Units)	***In/Out %***
Morning Trips = 0.14 x Units	65/35
Evening Trips = 0.16 x Units	39/61
Assisted Living (ITE-254, Beds)	
Morning Trips = 0.14 x Beds	65/35
Evening Trips = 0.22 x Beds	44/56

Table 4.2 – Trip Generation Totals

Land Use	Size		AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
CCRC	1,200	Units	109	59	168	75	117	192
ALF	240	Beds	22	12	34	23	30	53
Total Trips			***131***	***71***	***202***	***98***	***147***	***245***

Based on current traffic counts and anticipated future demand, the trips projected to be generated by the Erickson Living at Limestone Valley Community were distributed and assigned to the road network as shown in Figure 4.1. As previously stated, left turns directly to MD 108 will be restricted from the site by the use of physical channelization. Therefore, all left turn traffic is routed via Proposed Public Access Road.

Erickson intends to control access to its facility and therefore route employees and deliveries to the site via Proposed Public Access Road. While trip generation does not differentiate the different types of peak hour trips at a CCRC, it is estimated that 70% of peak hour traffic is related to staff and is therefore assigned to Proposed Public Access Road.

Adding the trips projected to be generated by the subject site to the background peak hour traffic volumes results in the total peak hour traffic volumes as shown in Figure 4.2 for Design Year 2023 and Figure 4.3 for Design Year 2037.

An adjustment was made to the background minor street volumes at the intersection of MD 108 at Linden Linthicum Lane because of the implementation of signalization at this location. It is projected that during the peak periods, 25% of left turn traffic along Great Star Drive approaching MD 108 would be diverted to Linden Linthicum Lane. In addition, the development of Proposed Public Access Road would allow property owners on the north side of MD 108 west of the roadway signalized access to the corridor, if they construct driveways to it. The introduction of access to the new roadway would give drivers the opportunity to access MD 108 via a signalized intersection. Figure 4.4 shows the adjustment and the adjusted total peak hour traffic volumes can be found in Figure 4.5.

Figure 4.1 – Trip Distribution and Assignment

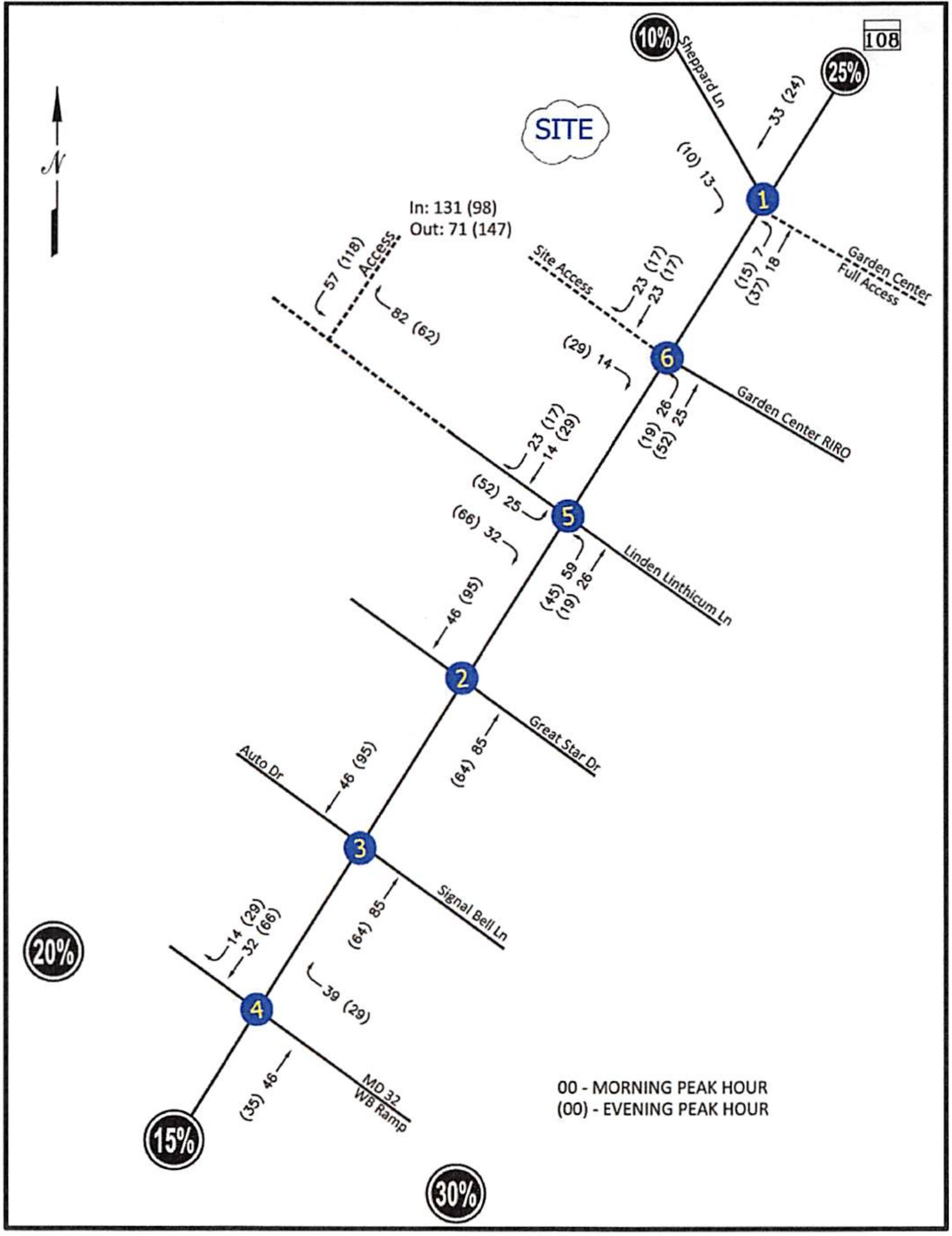


Figure 4.2 – 2023 Total Peak Hour Traffic Volumes

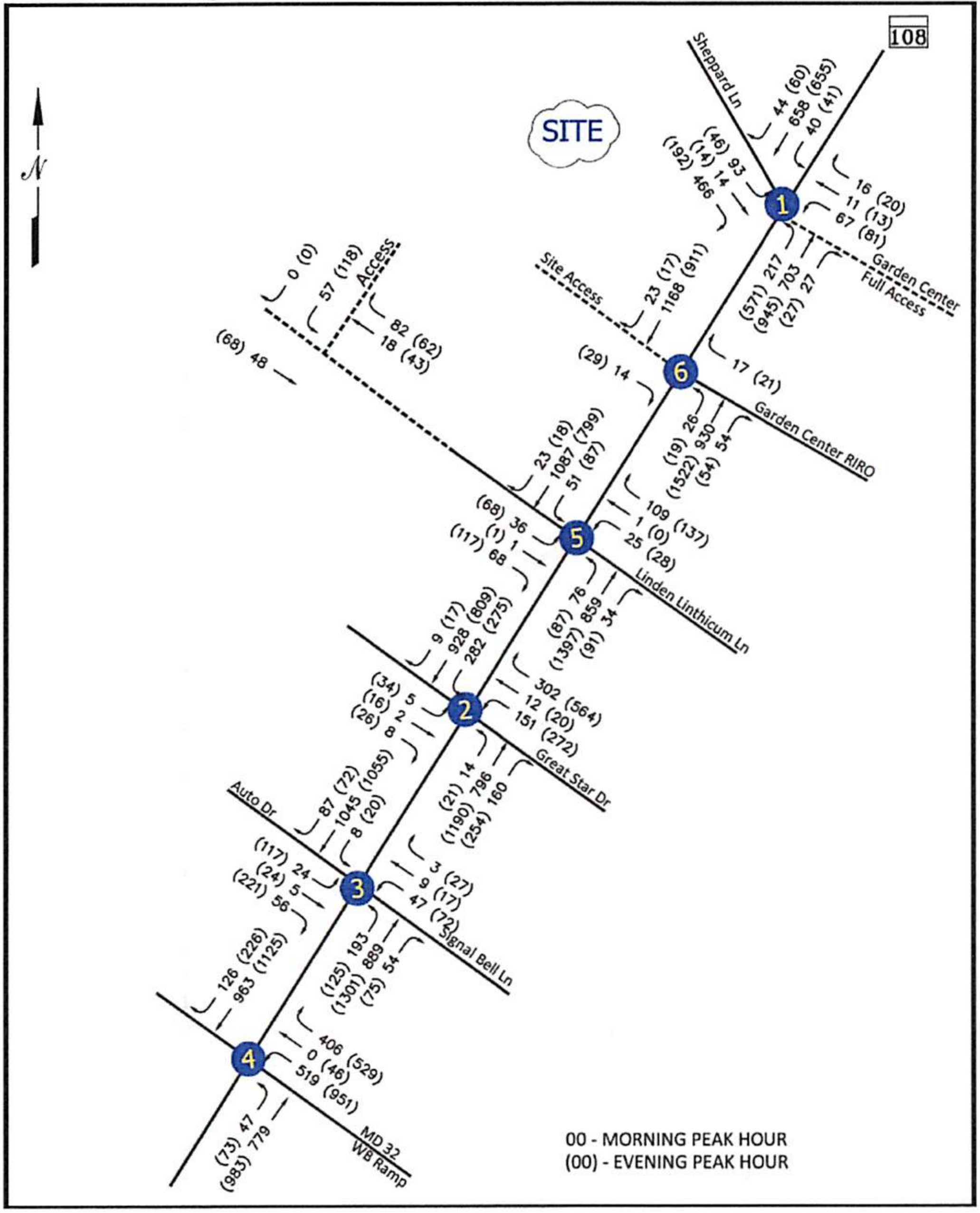


Figure 4.3 – 2037 Total Peak Hour Traffic Volumes

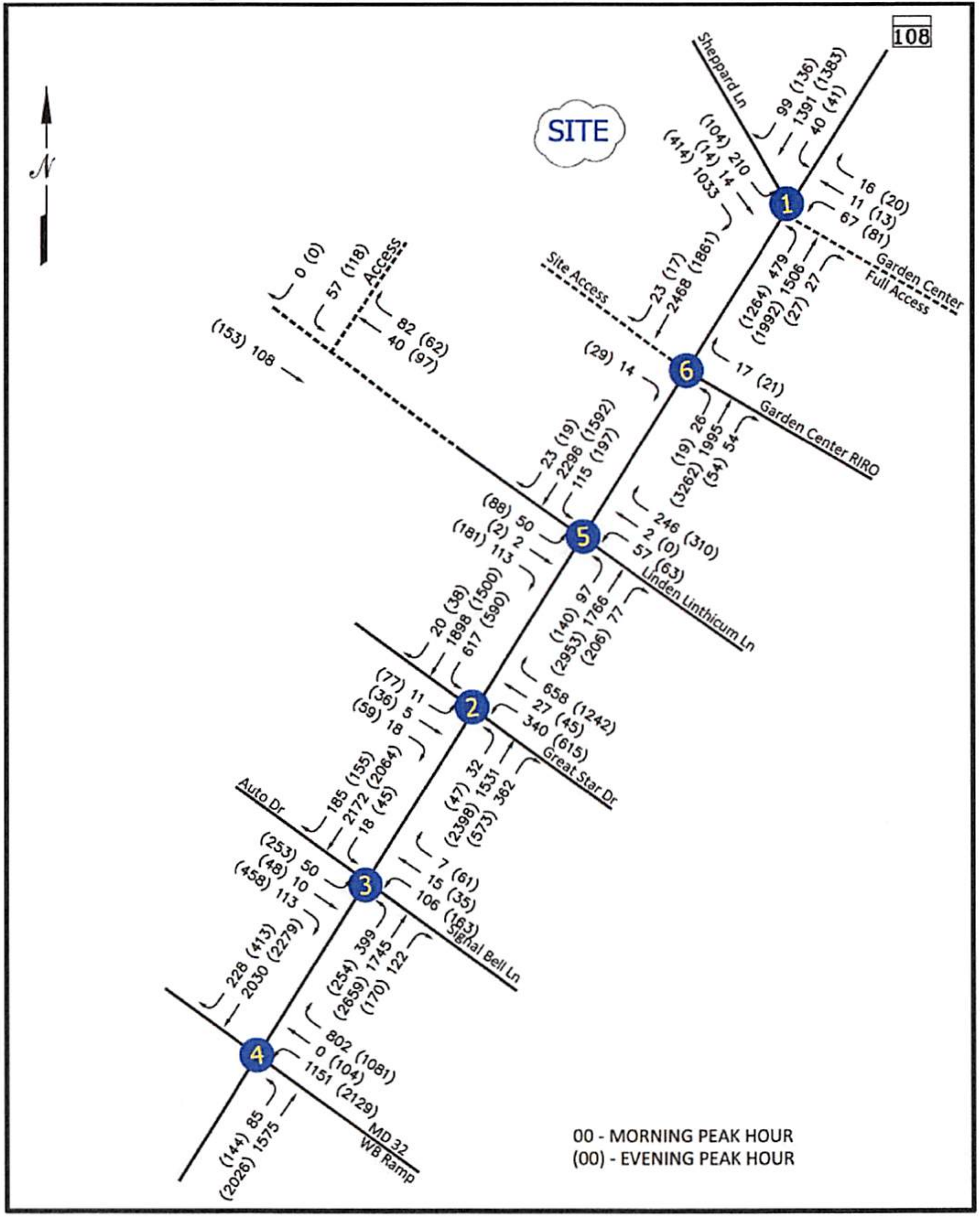
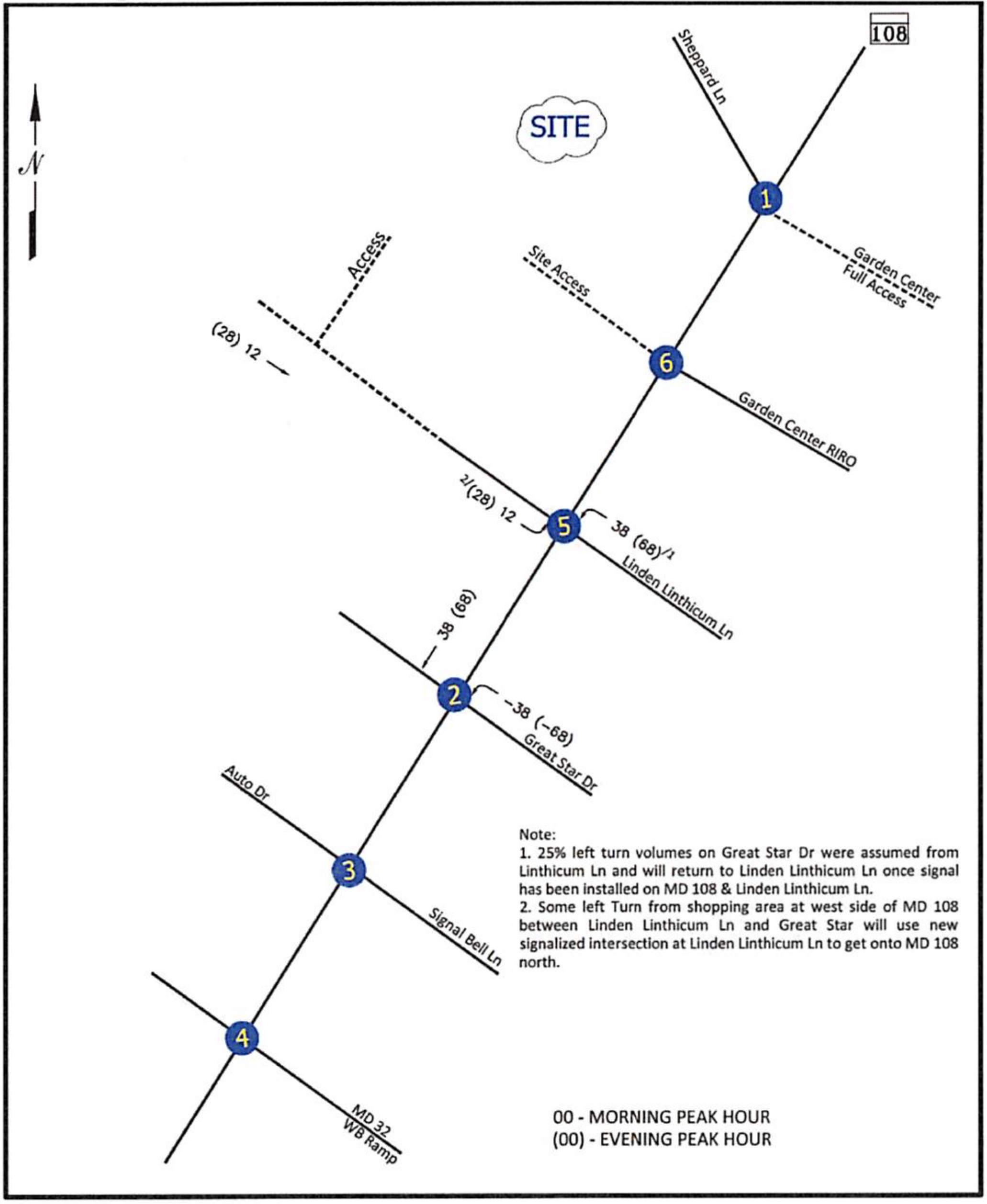


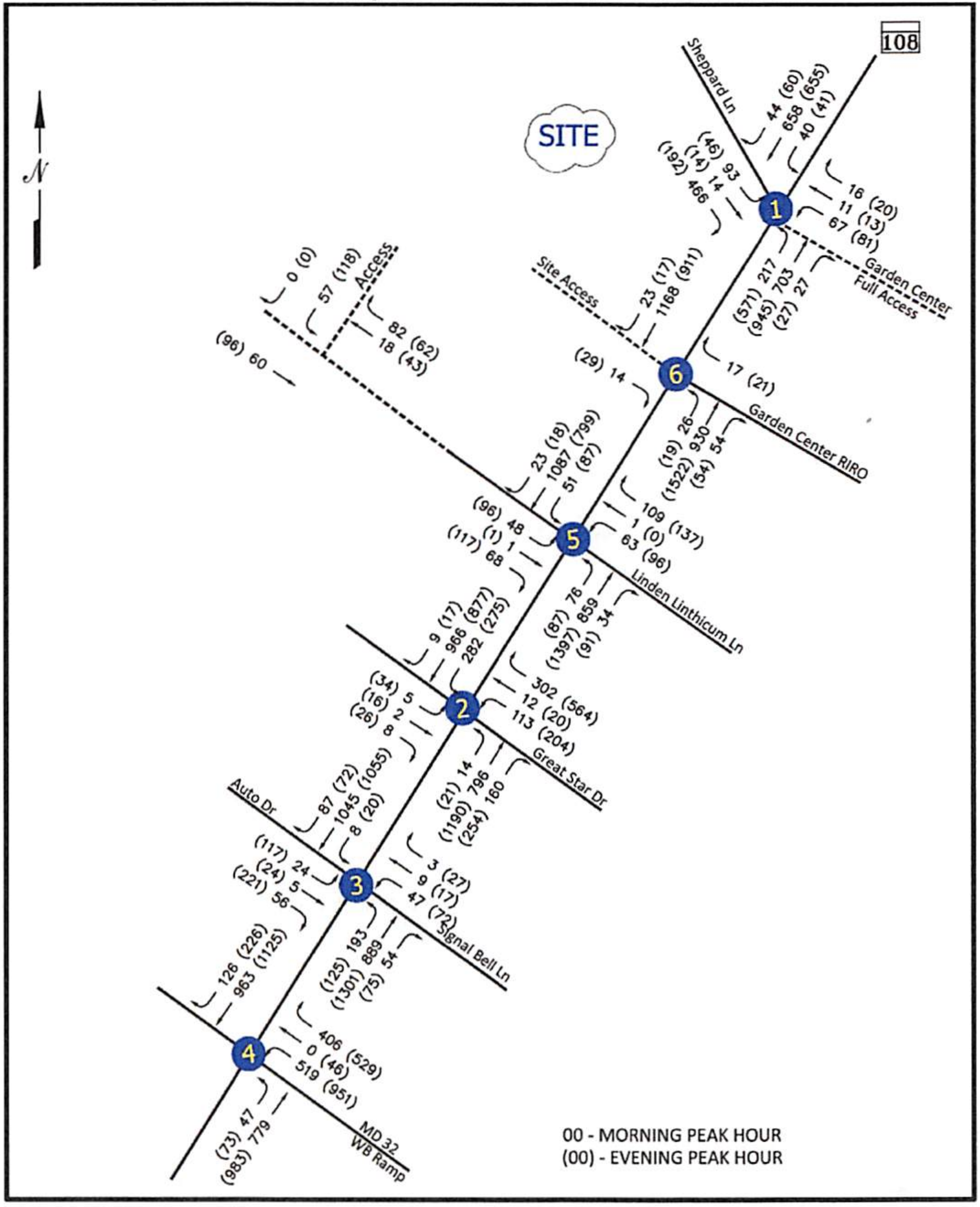
Figure 4.4 – 2023 Adjustment to Total Peak Hour Traffic Volumes



Note:
1. 25% left turn volumes on Great Star Dr were assumed from Linthicum Ln and will return to Linden Linthicum Ln once signal has been installed on MD 108 & Linden Linthicum Ln.
2. Some left Turn from shopping area at west side of MD 108 between Linden Linthicum Ln and Great Star will use new signalized intersection at Linden Linthicum Ln to get onto MD 108 north.

00 - MORNING PEAK HOUR
(00) - EVENING PEAK HOUR

Figure 4.5 – 2023 Adjusted Total Peak Hour Traffic Volumes



Analysis of Total Traffic Conditions

Intersection Capacity Analysis was again undertaken, this time with consideration given to the full buildout of the Erickson Living at Limestone Valley Community.

The CLV results are summarized in Table 4.3. Complete capacity worksheets can be found in Appendix C. As shown, all intersections are projected to exhibit acceptable levels of service with the exception of MD 108 at Sheppard Lane and MD 108 at Linden Linthicum Lane. Improvements for these locations are detailed below. The 2037 analysis is provided for future planning purposes only. No improvements are required to mitigate 2037 conditions.

Table 4.3 – Summary of Total CLV Analysis

AM Peak Hour	Existing LOS / CLV	2023 Back'd LOS / CLV	2023 Total LOS/CLV	2037 Back'd LOS / CLV	2037 Total LOS/CLV
MD 108 @ Sheppard Lane	C/1218	F/1609	F/1662	F/3368	F/3421
w/improvements	---	---	B/1086	---	F/2194
MD 108 @ Great Star Dr	A/719	A/874	A/921	F/1865	F/1912
w/Adjusted Traffic	---	---	A/898	---	---
MD 108 @ Auto Dr/Signal Bell Ln	A/712	A/878	A/904	F/1859	F/1884
MD 108 @ MD 32 WB Ramps	A/780	A/988	B/1052	F/2065	F/2129
MD 108 @ Linden Linthicum Ln	A/773	A/958	B/1044	F/2045	F/2153
w/Adjustment & improvements	---	---	A/819	---	F/1553
MD 108 @ Site Access/Garden Center	---	---	A/685	---	D/1400
PM Peak Hour					
MD 108 @ Sheppard Lane	C/1234	F/1707	F/1756	F/3449	F/3498
w/improvements	---	---	C/1160	---	F/2265
MD 108 @ Great Star Dr	C/1171	D/1399	D/1434	F/3013	F/3048
w/Adjusted Traffic	---	---	D/1434	---	---
MD 108 @ Auto Dr/Signal Bell Ln	A/808	B/1047	B/1082	F/2241	F/2276
MD 108 @ MD 32 WB Ramps	B/1124	D/1362	D/1414	F/2912	F/2965
MD 108 @ Linden Linthicum Ln	C/1300	E/1563	F/1705	F/3383	F/3572
w/Adjustment & improvements	---	---	B/1119	---	F/2180
MD 108 @ Site Access/Garden Center	---	---	A/858	---	F/1815

The Synchro model was again modified to reflect the impact associated with the full buildout of the site and the associated road improvements. The results are shown in Table 4.4 for the HCM analysis, which demonstrates that with improvements described below, all study intersections will operate with an acceptable level of service and most will exhibit less delay under the total condition than they do under background conditions.

Table 4.5 details the queuing associated with the improvements. As shown within the table, the site will have minimal impacts at all locations. Queue lengths at unimproved intersections are typically changed by less than one vehicle length during both peak periods, with the exception of some of the residual thru queues associated with road widening. All projected turn bays are able to accommodate future demand. At improved intersections, queuing is significantly reduced in most cases. Appendix E contains Synchro/Simtraffic output.

Table 4.4 – Summary of Total Delay (HCM – in seconds)

Intersection	Control Type	Existing LOS / Delay		2023 Back'd LOS / Delay		2023 Total w/Imp LOS/Delay	
		AM	PM	AM	PM	AM	PM
MD 108 @ Sheppard Lane	Signal	C/33.0	C/20.3	E/58.7	D/44.0	C/30.8	C/30.7
SB		D/41.7	C/34.0	F/87.5	E/57.6	D/40.5	D/49.5
NB		---	---	C/33.8	D/53.4	D/52.6	D/53.2
EB		C/22.1	B/15.9	D/43.1	C/32.7	C/29.0	C/28.5
WB		D/40.7	C/26.2	E/59.2	E/63.5	C/24.8	C/27.1
MD 108 @ Great Star Dr	Signal	B/12.1	C/27.4	B/15.0	D/44.2	B/17.3	D/51.7
SB		B/16.5	C/22.8	B/19.9	C/27.2	D/41.6	E/77.9
NB		B/19.9	D/46.2	C/27.4	F/102	C/33.1	E/75.8
EB		B/12.8	C/24.0	B/15.3	C/29.3	B/18.2	D/54.9
WB		A/8.2	B/14.0	A/9.8	B/17.2	B/12.2	C/33.4
MD 108 @ Auto Dr/Signal Bell Ln	Signal	A/8.1	B/10.7	A/8.6	B/14.6	A/8.3	B/15.2
SB		C/20.1	C/24.8	C/24.5	C/34.1	C/28.1	D/36.2
NB		C/20.5	C/26.1	C/24.9	D/38.0	C/28.7	D/42.5
EB		A/5.4	A/7.6	A/5.7	B/10.5	A/5.5	B/11.6
WB		A/8.9	A/8.2	A/9.2	B/10.8	A/8.5	B/11.8
MD 108 @ MD 32 WB Ramps	Signal	C/21.7	C/32.4	C/23.6	D/36.7	C/22.0	C/32.7
NB		D/43.0	D/47.8	D/39.1	D/47.4	C/27.7	D/42.6
EB		A/5.5	B/15.7	B/10.3	C/20.9	B/13.6	B/18.4
WB		B/14.5	C/25.8	C/20.3	D/36.8	C/23.7	C/32.8
MD 108 @ Linden Linthicum Ln	Stop						
SB/LTR		F/365	F/>999	F/>999	F/>999	---	---
NB/LT		E/46.5	F/384.0	F/142.0	F/>999	---	---
EB/L		B/11.4	A/9.6	B/13.2	B/10.9	---	---
WB/L		B/10.2	C/16.9	B/11.7	C/24.5	---	---
w/Signal & Improvement	Signal	---	---	---	---	B/11.8	B/18.2
SB		---	---	---	---	B/19.0	C/32.2
NB		---	---	---	---	B/18.8	C/29.1
EB		---	---	---	---	A/9.7	B/17.8
WB		---	---	---	---	B/11.7	B/12.7
MD 108 @ Site Access/Garden Center	Stop						
NB/R, FR for Total		---	---	C/17.7	E/38.2	---	---
EB/L		---	---	---	---	B/12.2	B/10.4

Table 4.5 – Summary of Total Queuing (in feet)

Intersection	Available Storage	Existing		2023 Back'd		2023 Total Improved	
		AM	PM	AM	PM	AM	PM
MD 108 @ Sheppard Lane							
SB/LR, LTR FOR BACK'D	---	403	164	968	482	---	---
SB/LT	---	---	---	---	---	133	83
SB/R	---	---	---	---	---	192	77
EB/L	---	---	---	166	142	103	115
EB/TR	---	---	---	<25	29	49	65
EB/L	150 Exist./>1200 Total	223	233	257	268	177	386
EB/T	---	400	603	499	630	430	418
EB/R	---	---	---	131	101	103	104
WB/L	---	---	---	94	88	116	128
WB/T	445	451	381	573	546	300	328
WB/T	---	---	---	---	---	254	286
WB/R	265	165	92	360	425	66	100
MD 108 @ Great Star Dr							
SB/LTR	---	38	99	43	168	43	153
NB/L	200	80	147	68	218	65	194
NB/LT	200	88	302	210	414	175	421
NB/R	200	103	240	172	255	185	252
EB/L	---	40	149	97	167	60	132
EB/T	580	217	593	418	633	291	675
EB/TR	580	156	554	373	642	312	676
WB/L	200	128	205	180	245	196	261
WB/T	>1200'	135	177	137	244	233	421
WB/TR	>1200'	107	161	171	241	241	367
MD 108 @ Auto Dr/Signal Bell Ln							
SB/LT	---	45	118	56	384	56	341
SB/R	250	53	115	58	338	60	297
NB/LTR	---	75	119	84	244	84	223
EB/L	190	84	114	127	358	126	299
EB/T	360	109	241	202	383	152	440
EB/TR	360	81	221	176	383	152	445
WB/L	180	27	68	22	70	45	100
WB/T	580	203	223	201	453	253	520
WB/TR	580	140	230	233	478	292	540

Table 4.5 (con't)– Summary of Total Queuing (in feet)

Intersection	Available Storage	Existing		2023 Back'd		2023 Total Improved	
		AM	PM	AM	PM	AM	PM
MD 108 @ MD 32 WB Ramps							
NB/L	430	259	478	298	619	251	556
NB/LT	>1800	230	565	396	568	293	557
NB/R	350	283	440	346	391	213	393
EB/L	400	39	90	91	573	67	338
EB/T	440	179	300	331	537	288	513
EB/T	440	149	290	271	555	239	491
WB/T	350	321	420	341	470	377	443
WB/TR	350	202	411	362	479	396	446
MD 108 @ Linden Linthicum Ln							
SB/LTR	---	91	189	174	214	---	---
SB/L	---	---	---	---	---	61	109
SB/TR	---	---	---	---	---	65	77
NB/LT	>400	66	373	284	631	76	113
NB/R	200	79	473	364	644	82	107
EB/L	190'	28	35	32	38	81	102
EB/T	>1200	26	109	150	247	147	256
EB/TR	---	---	---	---	---	188	279
EB/R	>500	<25	<25	<25	<25	---	---
WB/L	105	44	106	61	178	60	94
WB/T	---	<25	<25	56	80	200	194
WB/TR	225	<25	<25	26	41	210	210
MD 108 @ Site Access/Garden Center							
NB/R	---	---	---	75	165	<25	<25
EB/L	---	---	---	---	---	40	31
WB/R	---	---	---	---	---	<25	<25

Since this project is seeking CEF Zoning, additional road improvements are proposed above are beyond what would typically be required to satisfy Adequate Road Facilities Test Evaluation requirements. Below, the proposed improvements are detailed. The recommended lane use can be found in Figure 4.6. Appendix A contains a full size plan of the proposed improvements.

MD 108 at Sheppard Lane

Sheppard Lane currently intersects MD 108 at a 55 degree angle, which is substandard and has a negative impact on intersection operations. In addition, the Sheppard Lane approach features just a single lane for traffic accessing MD 108. Finally, the existing left turn lane from eastbound MD 108 to Sheppard Lane is only 175 feet long which results in significant queuing that blocks the through lane. The following improvements are proposed at this location:

- Realign Sheppard Lane to the west at an angle of a minimum of 70 degrees as acceptable to SHA.
- Widen the Sheppard Lane approach to provide two lanes onto MD 108, including a separate right turn lane and separate left turn lane.
- Provide a continuous left turn lane along eastbound MD 108, approaching Sheppard Lane.
- Widen the westbound MD 108 approach to provide two thru lanes and a separate right lane.
- Reconstruct the traffic signal and provide pedestrian accommodations as required by SHA.
- Provide interconnection of the traffic signal along MD 108 to MD 32.

Not only do the proposed improvements at MD 108 at Sheppard Lane improve the CLV to an acceptable level, but queuing is significantly reduced on all approaches. This operations issue is existing under current conditions which would provide significant benefits to all roadway users.

MD 108 at Linden Linthicum Lane/Proposed Public Access Road

The existing intersection of MD 108 and Linden Linthicum Lane features stop control for the minor approach. As a result, significant delays are encountered during the peak period for left turning traffic. The following improvements are recommended to mitigate delays and improve operations at this intersection:

- Install traffic signalization once approved by SHA.
- Provide an extension of Linden Linthicum Lane (Proposed Public Access Road) on the north side of MD 108 to provide site access and potential future connections to commercial properties to the west.

- Convert the existing right turn lane along eastbound MD 108 to a shared thru/right lane.

- Convert the westbound MD 108 auxiliary lane to a shared thru/right lane.

The construction of these improvements, including the Proposed Public Access Road on the north side of MD 108, will provide a significant community benefit. The new road will allow property owners on the west side to have signalized access to MD 108. While the elimination of unsignalized access points is not recommended, drivers will have a choice to utilize signalized access to the MD 108 corridor, particularly during peak periods. In addition, the installation of the traffic signal at Linden Linthicum Lane is consistent with elements of the Clarksville Pike Streetscape Plan which was adopted by Howard County in 2016. The implementation of the signal will allow for synchronized traffic signals between Sheppard Lane and MD 32, which will significantly enhance operations providing a community benefit.

MD 108 at Site Access

A limited access point is proposed along MD 108, opposite the existing access point for River Hill Garden Center which is approximately 475 feet west of Sheppard Lane. At this access point, which will operate under stop control, a left-in/right-in/right-out is proposed. A separate left turn lane will be provided into the site. The following enhancements are also proposed in conjunction with the access point:

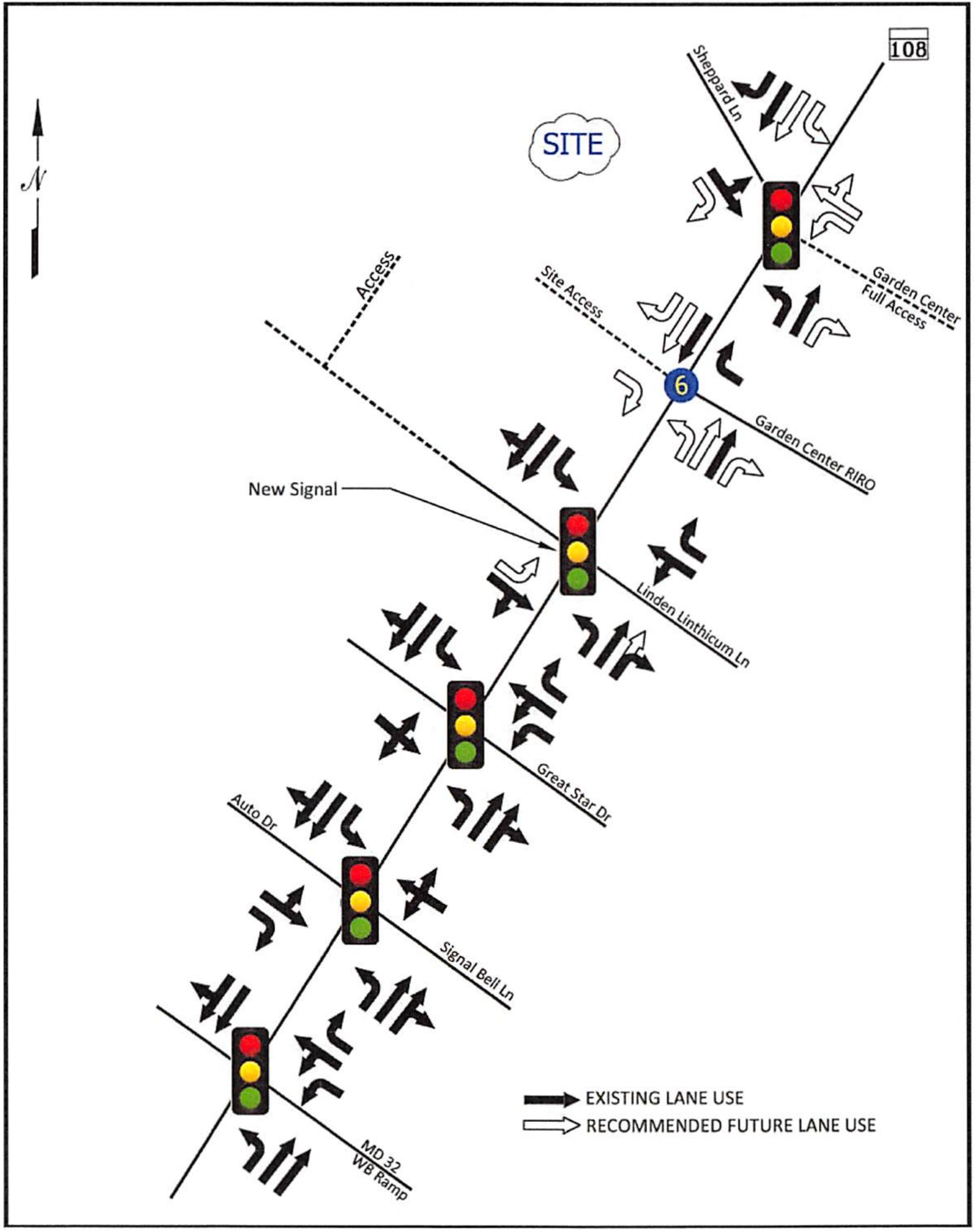
- Construct a five lane section along MD 108 in between Linden Linthicum Lane and Sheppard Lane, covering a distance of approximately 1,300 feet.

- Provide separate acceleration and deceleration lanes into the subject site, based on SHA requirements.

- Provide appropriate channelization to restrict left turns out of the subject site.

The construction of the five lane section along MD 108 is consistent with the Clarksville Pike Streetscape Plan and will match the section of MD 108 to the west of Linden Linthicum Lane. This construction will provide a significant benefit to roadway users, as queuing for Sheppard Lane will no longer block thru traffic along MD 108. A full size version of the plan is included in Appendix A.

Figure 4.6 – Future Recommended Lane Use



RESULTS, RECOMMENDATIONS, AND CONCLUSIONS

Study Purpose

The Traffic Group, Inc. has prepared this Adequate Road Facilities Test Evaluation and Traffic Study to quantify the impact the proposed development of Erickson Living at Limestone will have on the surrounding road network in Howard County, Maryland. The subject site is situated on the north side of MD 108, west of Sheppard Lane. A total of 1,200 units within a continuing care retirement community are proposed. In addition, 240 beds within an assisted living facility will also be constructed on-site.

Access to the property is proposed via one access point along MD 108 and a secondary point of access along an extension of Linden Linthicum Lane. The MD 108 access will operate under stop control and left turns out of the facility will be restricted. The access point along the new public road will operate under stop control. Traffic signalization is proposed at the intersection of MD 108 and Linden Linthicum Lane. Full buildout of the project is expected within three years.

Study Criteria/Methodology

This study was conducted in accordance with Chapter 4 of the *Howard County Design Manual – Volume III (Road and Bridge Design).* Chapter4 details the requirements for the Adequate Road Facilities Test Evaluation. Chapter 4 studies require that the first intersection of a Major Collector or higher classified roadway with another Major Collector or higher classified roadway in all directions from the subject site be reviewed and analyzed.

Since the site will generate more than 100 trips, a Chapter 5 traffic study is also required. For this traffic study, all classified intersections within one-half mile of the subject site must be reviewed. However, improvements are not required at these locations.

All intersections ae reviewed using Critical Lane Volume (CLV) methodology. Intersections that are controlled by Maryland State Highway Administration (SHA) must exhibit Level of Service "E" or better conditions during all study periods.

Because of the complexity of this project, a Synchro model was prepared for the MD 108 corridor.

In addition to traditional road improvements that may be required as part of the Adequate Road Facilities Test Evaluation road improvements that will provide additional community benefit are proposed in conjunction with the CEF (Community Enhanced Floating Zone) requirement for this site. Details on the proposed improvements will be provided in later sections of this document.

Summary of Findings and Recommendations

This analysis will show that all study intersections are currently operating within acceptable level of service when considering CLV under existing conditions. When considering the impact of background traffic, the intersection of MD 108 at Sheppard Lane is projected to operate at Level of Service "F" conditions during both the morning and evening peak periods. All other remaining intersections will feature acceptable operations.

With the additional impact associated with the development of the subject site, the intersection of MD 108 at Sheppard Lane will continue to exhibit Level of Service "F" conditions.

Since this project is seeking CEF Zoning, additional road improvements are proposed above and beyond what would typically be required to satisfy Adequate Road Facilities Test Evaluation requirements. Below, the proposed improvements are detailed.

MD 108 at Sheppard Lane

Sheppard Lane currently intersects MD 108 at a 55 degree angle, which is substandard and has a negative impact on intersection operations. In addition, the Sheppard Lane approach features just a single lane for traffic accessing MD 108. Finally, the existing left turn lane from eastbound MD 108 to Sheppard Lane is only 175 feet long which results in significant queuing that blocks the through lane. The following improvements are proposed at this location:

- Realign Sheppard Lane to the west at an angle of a minimum of 70 degrees as acceptable to SHA.

- Widen the Sheppard Lane approach to provide two lanes onto MD 108, including a separate right turn lane and separate left turn lane.

- Provide a continuous left turn lane along eastbound MD 108, approaching Sheppard Lane.

- Widen the westbound MD 108 approach to provide two thru lanes and a separate right lane.

- Reconstruct the traffic signal and provide pedestrian accommodations as required by SHA.

- Provide interconnection of the traffic signal along MD 108 to MD 32.

Not only do the proposed improvements at MD 108 at Sheppard Lane improve the CLV to an acceptable level, but queuing is significantly reduced on all approaches with the implementation of these improvements. This operations issue is existing under current conditions which would provide significant benefits to all roadway users.

MD 108 at Linden Linthicum Lane

The existing intersection of MD 108 and Linden Linthicum Lane features stop control for the minor approach. As a result, significant delays are encountered during the peak period for left turning traffic. The following improvements are recommended to mitigate delays and improve operations at this intersection:

- Install traffic signalization once approved by SHA.

- Provide an extension of Linden Linthicum Lane (Proposed Public Access Road) on the north side of MD 108 to provide site access and potential future connections to commercial properties to the west.

- Convert the existing right turn lane along eastbound MD 108 to a shared thru/right lane.

- Convert the westbound MD 108 auxiliary lane to a shared thru/right lane.

The construction of these improvements, including the proposed access road on the north side of MD 108, will provide a significant community benefit. The access road will allow property owners on the west side to have signalized access to MD 108. While the elimination of unsignalized access points is not recommended, drivers will have a choice to utilize signalized access to the corridor, particularly during peak periods. In addition, the installation of the traffic signal at Linden Linthicum Lane is consistent with elements of the Clarksville Pike streetscape plan which was adopted by Howard County in 2016. The implementation of the signal will allow for synchronized traffic signals between Sheppard Lane and MD 32, which will significantly enhance operations providing a community benefit.

MD 108 at Site Access

A limited access point is proposed along MD 108, opposite the existing access point for River Hill Garden Center which is approximately 475 feet west of Sheppard Lane. At this access point, which will operate under stop control, a left-in/right-in/right-out is proposed. A separate left turn lane will be provided into the site. The following enhancements are also proposed in conjunction with the access point:

- Construct a five lane section along MD 108 in between Linden Linthicum Lane and Sheppard Lane, which is a distance of approximately 1,300 feet.
- Provide separate acceleration and deceleration lanes into the subject site.
- Provide appropriate channelization to restrict left turns out of the subject site.

The construction of the five lane section along MD 108 is consistent with the Clarksville Pike streetscape plan and will match the section of MD 108 to the west of Linden Linthicum Lane. This construction will provide a significant benefit to roadway users, as queuing for Sheppard Lane will no longer block through traffic along MD 108.

As previously stated, the improvements proposed in conjunction with the development of Erickson Living at Limestone will provide significant community benefits in conjunction with the proposed CEF Zoning for this site.

APPENDIX A

Concept Road Improvement Plan

ILLUSTRATIVE
SITE PLAN

Note: conceptual plan subject to final engineering and architectural refinement.

SITE DATA

NEIGHBORHOOD 1

INDEPENDENT LIVING UNITS	730
CCRC ACCESSORY SPACE[1]	68,000SF +/-
PARKING	
700 GARAGE[2]	
190 SURFACE	

NEIGHBORHOOD 2

INDEPENDENT LIVING UNITS	470
CCRC ACCESSORY SPACE[1]	40,000SF +/-
PARKING	
680 GARAGE[2]	
110 SURFACE	

CARE CENTER

(assisted living, memory care, skilled nursing)

240 UNITS +/-

TOTALS

INDEPENDENT LIVING UNITS	1,200
CARE CENTER UNITS	200 +/-
CCRC ACCESSORY SPACE[1]	108,000SF +/-
PARKING	
1,380 GARAGE[2]	
300 SURFACE	
1,680 TOTAL	

Notes:

1. CCRC Accessory Space consists of building areas allocated for resident amenities, resident services, food service, campus administration, and campus services. CCRC Accessory Spaces are typically located within clubhouse buildings (CB) as well as on the ground/first floor of independent living buildings.
2. Resident parking is provided in garages below independent living buildings

marks thomas

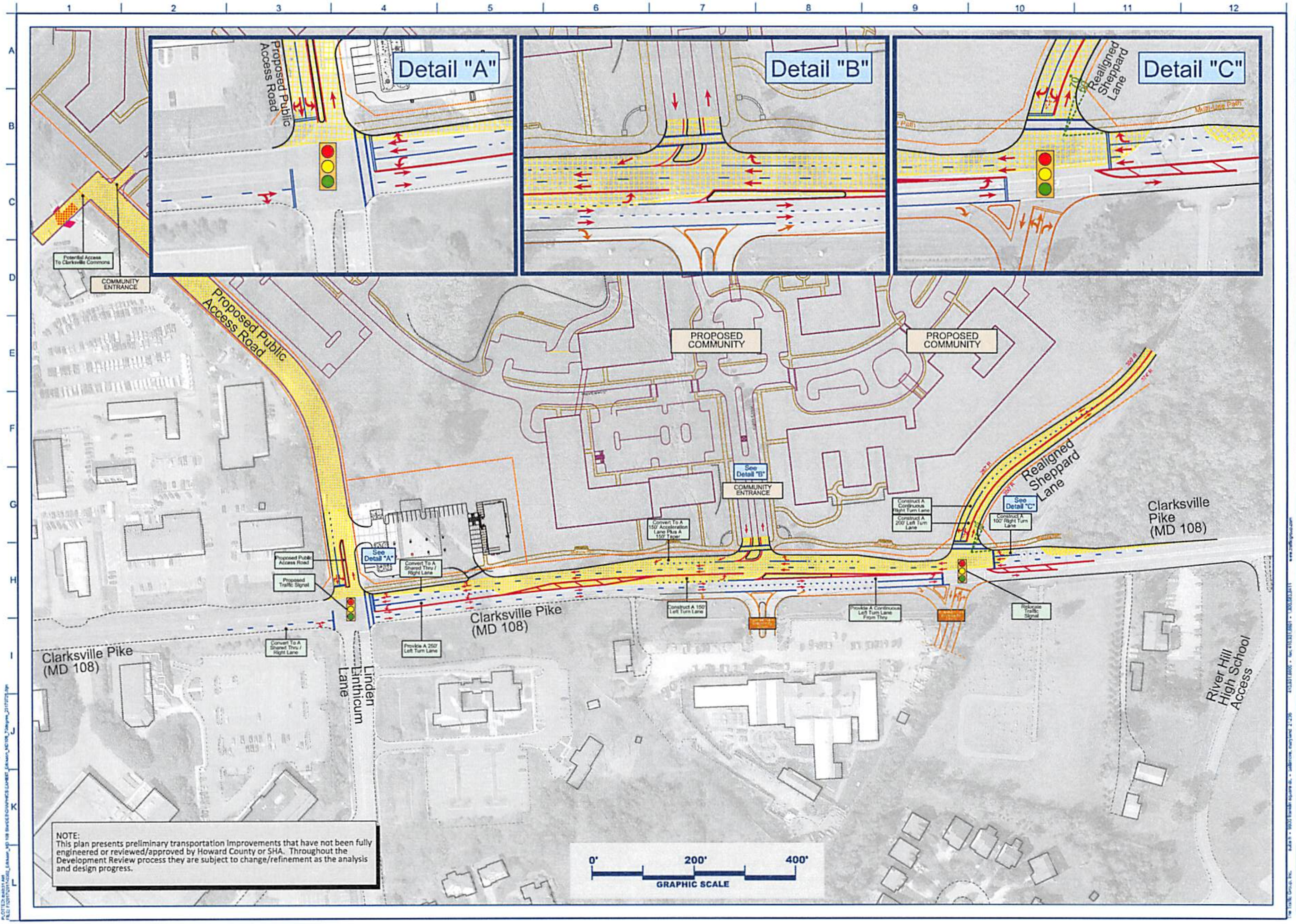
0' 100' 200' 300'

N

ERICKSON LIVING AT LIMESTONE VALLEY
HOWARD COUNTY, MARYLAND
JULY 28, 2017

Erickson LIVING
Add more Living to your Life®

SHEET
DCP-6



NOTE:
This plan presents preliminary transportation improvements that have not been fully engineered or reviewed/approved by Howard County or SHA. Throughout the Development Review process they are subject to change/refinement as the analysis and design progress.

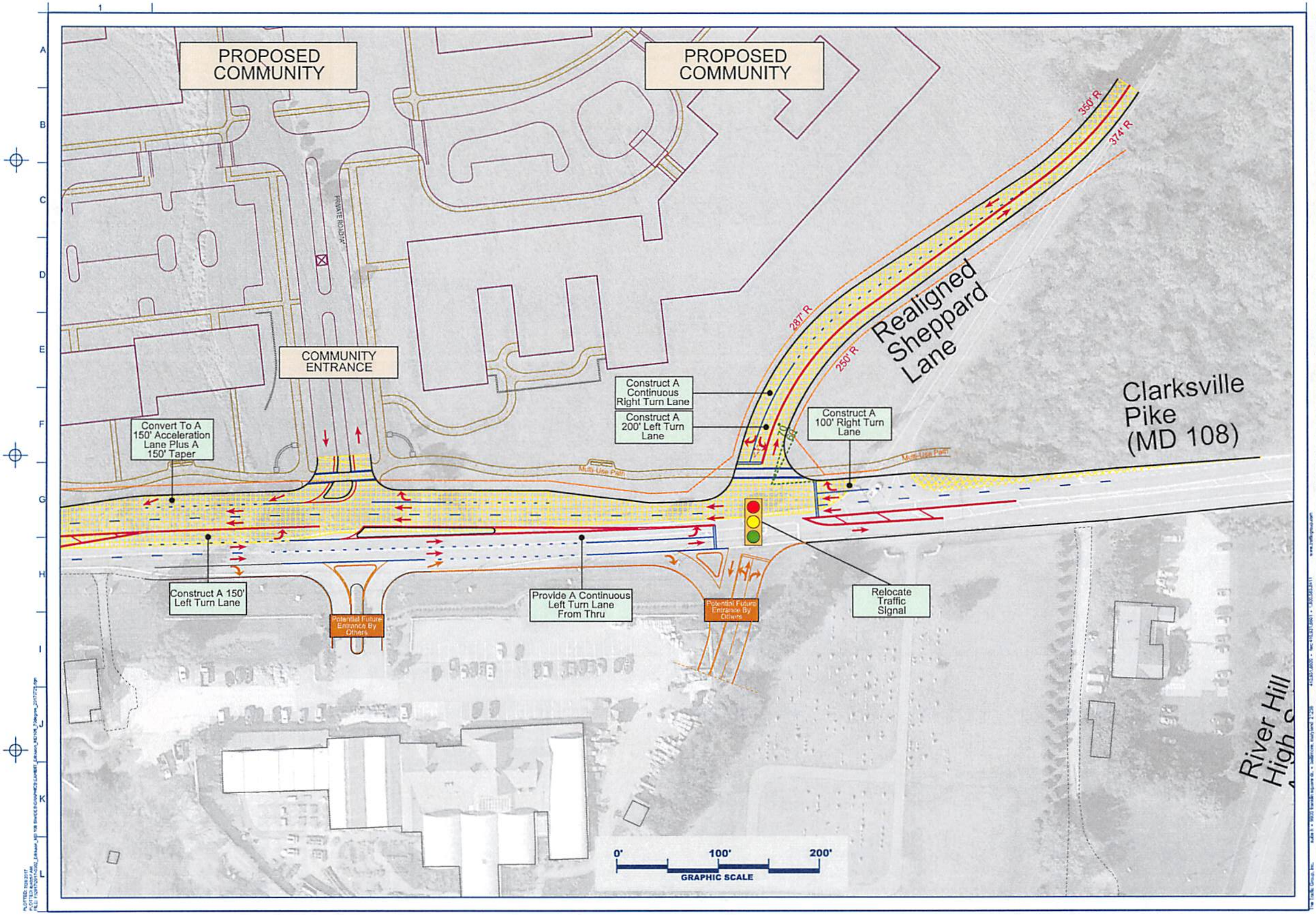
NORTH

Clarksville Pike (MD 108)

Erickson at Limestone

The Traffic Group

Merging Innovation and Excellence



Clarksville Pike (MD 108) Detail Exhibit

Erickson at Limestone

M. Vallell
July 26, 2017

The Traffic Group
Merging Innovation and Excellence®

APPENDIX B

Intersection Turning Movement Counts,

and Photos

TOTALS TURNING MOVEMENT COUNT - SUMMARY

Counted by: VCU

Intersection of: MD 108

and: Sheppard Lane

Location: Howard County, Maryland

Date: April 26, 2017

Weather: Cool, Light Rain

Entered by: BGJ

Wednesday

Star Rating: 3

The Traffic Group

TIME	TRAFFIC FROM NORTH on: MD 108					TRAFFIC FROM SOUTH on: MD 108					TRAFFIC FROM EAST on:					TRAFFIC FROM WEST on: Sheppard Lane					TOTAL N + S + E + W
	RIGHT	THRU	LEFT	U-TN	TOTAL	RIGHT	THRU	LEFT	U-TN	TOTAL	RIGHT	THRU	LEFT	U-TN	TOTAL	RIGHT	THRU	LEFT	U-TN	TOTAL	
AM																					
6:30 - 6:45	0	57	0	0	57	0	59	12	0	71	0	0	0	0	0	63	0	3	0	66	194
6:45 - 7:00	5	94	0	0	99	0	100	20	0	120	0	0	0	0	0	88	0	16	0	104	323
7:00 - 7:15	10	145	0	0	155	0	212	15	0	227	0	0	0	0	0	69	0	45	0	114	496
7:15 - 7:30	24	175	0	0	199	0	175	42	0	217	0	0	0	0	0	80	0	33	0	113	529
7:30 - 7:45	4	118	0	0	122	0	92	57	0	149	0	0	0	0	0	130	0	6	0	136	407
7:45 - 8:00	2	93	0	0	95	0	104	76	0	180	0	0	0	0	0	133	0	1	0	134	409
8:00 - 8:15	3	122	0	0	125	0	80	38	0	118	0	0	0	0	0	112	0	6	0	118	361
8:15 - 8:30	3	97	0	0	100	0	89	23	0	112	0	0	0	0	0	127	0	5	0	132	344
8:30 - 8:45	1	100	0	0	101	0	82	26	0	108	0	0	0	0	0	123	0	7	0	130	339
8:45 - 9:00	3	129	0	0	132	0	94	25	0	119	0	0	0	0	0	94	0	2	0	96	347
3 Hr Totals	55	1130	0	0	1185	0	1087	334	0	1421	0	0	0	0	0	1019	0	124	0	1143	3749
1 Hr Totals																					
6:30 - 7:30	39	471	0	0	510	0	546	89	0	635	0	0	0	0	0	300	0	97	0	397	1542
6:45 - 7:45	43	532	0	0	575	0	579	134	0	713	0	0	0	0	0	367	0	100	0	467	1755
7:00 - 8:00	40	531	0	0	571	0	583	190	0	773	0	0	0	0	0	412	0	85	0	497	1841
7:15 - 8:15	33	508	0	0	541	0	451	213	0	664	0	0	0	0	0	455	0	46	0	501	1706
7:30 - 8:30	12	430	0	0	442	0	365	194	0	559	0	0	0	0	0	502	0	18	0	520	1521
7:45 - 8:45	9	412	0	0	421	0	355	163	0	518	0	0	0	0	0	495	0	19	0	514	1453
8:00 - 9:00	10	448	0	0	458	0	345	112	0	457	0	0	0	0	0	456	0	20	0	476	1391
PEAK HOUR																					
7:00 - 8:00	40	531	0	0	571	0	583	190	0	773	0	0	0	0	0	412	0	85	0	497	1841
PM																					
2:30 - 2:45	12	111	0	0	123	0	95	40	0	135	0	0	0	0	0	24	0	6	0	30	288
2:45 - 3:00	15	114	0	0	129	0	95	56	0	151	0	0	0	0	0	25	0	8	0	33	313
3:00 - 3:15	14	110	0	0	124	0	105	68	0	173	0	0	0	0	0	31	0	6	0	37	334
3:15 - 3:30	7	113	0	0	120	0	122	76	0	198	0	0	0	0	0	32	0	4	0	36	354
3:30 - 3:45	10	121	0	0	131	0	135	89	0	224	0	0	0	0	0	56	0	8	0	64	419
3:45 - 4:00	8	171	0	0	179	0	175	66	0	241	0	0	0	0	0	49	0	13	0	62	482
4:00 - 4:15	17	153	0	0	170	0	193	92	0	285	0	0	0	0	0	52	0	11	0	63	518
4:15 - 4:30	9	136	0	0	145	0	157	124	0	281	0	0	0	0	0	34	0	6	0	40	466
4:30 - 4:45	9	166	0	0	175	0	142	99	0	241	0	0	0	0	0	34	0	12	0	46	462
4:45 - 5:00	10	126	0	0	136	0	200	140	0	340	0	0	0	0	0	38	0	5	0	43	519
5:00 - 5:15	12	119	0	0	131	0	199	116	0	315	0	0	0	0	0	48	0	10	0	58	504
5:15 - 5:30	21	140	0	0	161	0	172	122	0	294	0	0	0	0	0	28	0	11	0	39	494
5:30 - 5:45	14	129	0	0	143	0	179	141	0	320	0	0	0	0	0	42	0	9	0	51	514
5:45 - 6:00	8	140	0	0	148	0	209	124	0	333	0	0	0	0	0	43	0	12	0	55	536
6:00 - 6:15	9	126	0	0	135	0	171	82	0	253	0	0	0	0	0	58	0	3	0	61	449
6:15 - 6:30	20	155	0	0	175	0	201	75	0	276	0	0	0	0	0	38	0	23	0	61	512
4 Hr Totals	195	2130	0	0	2325	0	2550	1510	0	4060	0	0	0	0	0	632	0	147	0	779	7164
1 Hr Totals																					
2:30 - 3:30	48	448	0	0	496	0	417	240	0	657	0	0	0	0	0	112	0	24	0	136	1289
2:45 - 3:45	46	458	0	0	504	0	457	289	0	746	0	0	0	0	0	144	0	26	0	170	1420
3:00 - 4:00	39	515	0	0	554	0	537	299	0	836	0	0	0	0	0	168	0	31	0	199	1589
3:15 - 4:15	42	558	0	0	600	0	625	323	0	948	0	0	0	0	0	189	0	36	0	225	1773
3:30 - 4:30	44	581	0	0	625	0	660	371	0	1031	0	0	0	0	0	191	0	38	0	229	1885
3:45 - 4:45	43	626	0	0	669	0	667	381	0	1048	0	0	0	0	0	169	0	42	0	211	1928
4:00 - 5:00	45	581	0	0	626	0	692	455	0	1147	0	0	0	0	0	158	0	34	0	192	1965
4:15 - 5:15	40	547	0	0	587	0	698	479	0	1177	0	0	0	0	0	154	0	33	0	187	1951
4:30 - 5:30	52	551	0	0	603	0	713	477	0	1190	0	0	0	0	0	148	0	38	0	186	1979
4:45 - 5:45	57	514	0	0	571	0	750	519	0	1269	0	0	0	0	0	156	0	35	0	191	2031
5:00 - 6:00	55	528	0	0	583	0	759	503	0	1262	0	0	0	0	0	161	0	42	0	203	2048
5:15 - 6:15	52	535	0	0	587	0	731	469	0	1200	0	0	0	0	0	171	0	35	0	206	1993
5:30 - 6:30	51	550	0	0	601	0	760	422	0	1182	0	0	0	0	0	181	0	47	0	228	2011
PEAK HOUR																					
5:00 - 6:00	55	528	0	0	583	0	759	503	0	1262	0	0	0	0	0	161	0	42	0	203	2048

PEDESTRIAN AND BICYCLE OBSERVATIONS - SUMMARY

Counted by: VCU

Intersection of: MD 108
and: Sheppard Lane
Location: Howard County, Maryland

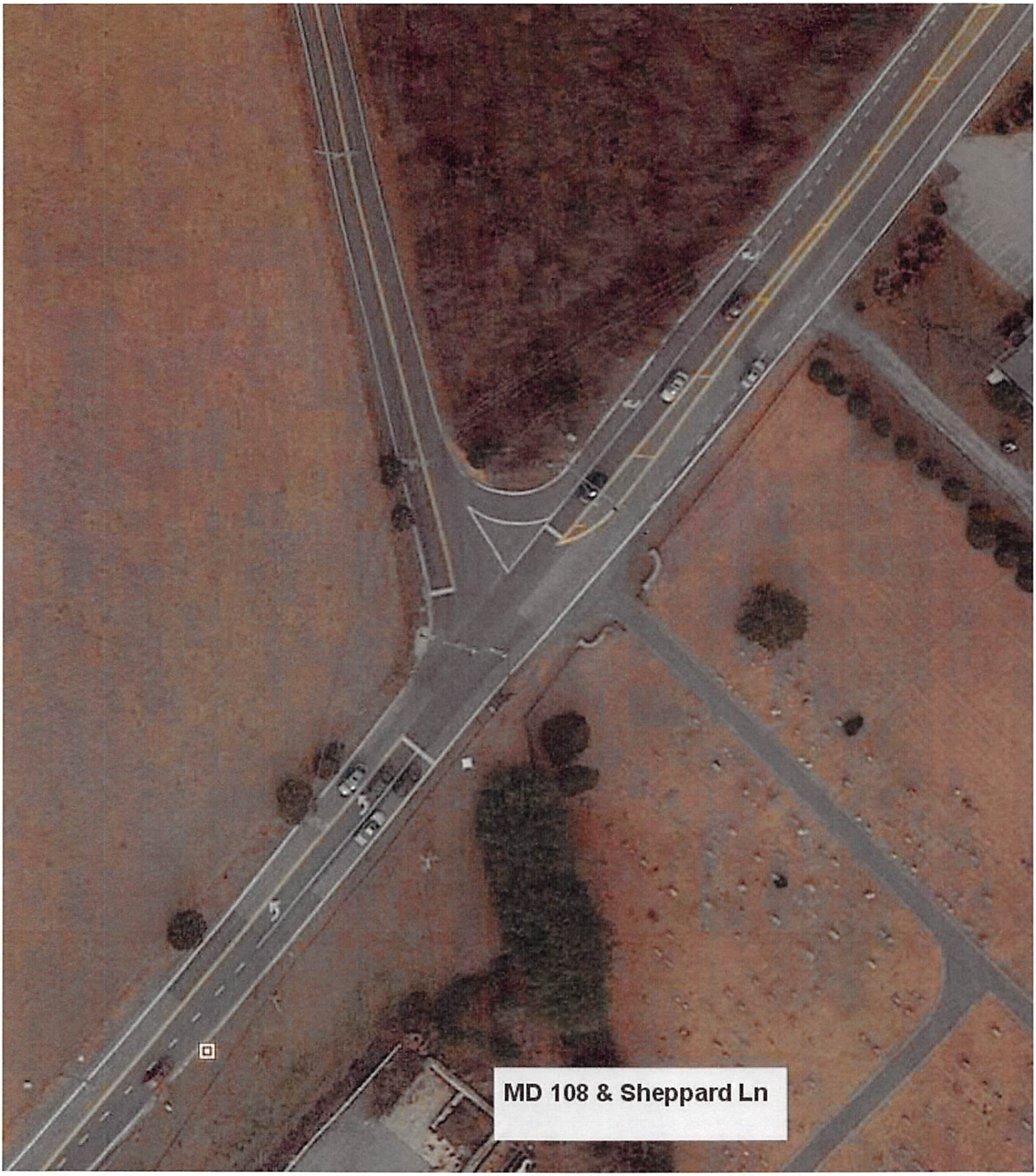
Date: April 26, 2017
Weather: Cool, Light Rain
Entered by: BGJ

Wednesday

Star Rating: 3

TIME	NORTH LEG MD 108		SOUTH LEG MD 108	
	Pedestrians	Bicycles	Pedestrians	Bicycles
AM				
6:30 - 6:45	0	0	0	0
6:45 - 7:00	0	0	0	0
7:00 - 7:15	0	0	0	0
7:15 - 7:30	0	0	0	0
7:30 - 7:45	0	0	0	0
7:45 - 8:00	0	0	0	0
8:00 - 8:15	1	0	0	0
8:15 - 8:30	0	0	0	0
8:30 - 8:45	0	0	0	0
8:45 - 9:00	0	0	0	0
TOTALS	1	0	0	0
PM				
2:30 - 2:45	0	0	0	0
2:45 - 3:00	0	0	0	0
3:00 - 3:15	0	0	0	0
3:15 - 3:30	0	0	0	0
3:30 - 3:45	0	0	0	0
3:45 - 4:00	0	0	0	0
4:00 - 4:15	0	0	0	0
4:15 - 4:30	0	0	0	0
4:30 - 4:45	0	0	0	0
4:45 - 5:00	0	0	0	0
5:00 - 5:15	0	0	0	0
5:15 - 5:30	0	0	0	0
5:30 - 5:45	0	0	0	0
5:45 - 6:00	0	0	0	0
6:00 - 6:15	0	0	0	0
6:15 -6:30	0	0	0	0
TOTALS	0	0	0	0

	EAST LEG		WEST LEG Sheppard Lane	
	Pedestrians	Bicycles	Pedestrians	Bicycles
AM				
6:30 - 6:45			0	0
6:45 - 7:00			0	0
7:00 - 7:15			0	0
7:15 - 7:30			0	0
7:30 - 7:45			0	0
7:45 - 8:00			0	0
8:00 - 8:15			0	0
8:15 - 8:30			0	0
8:30 - 8:45			0	0
8:45 - 9:00			0	0
TOTALS	0	0	0	0
PM				
2:30 - 2:45			0	0
2:45 - 3:00			0	0
3:00 - 3:15			0	0
3:15 - 3:30			0	0
3:30 - 3:45			0	0
3:45 - 4:00			0	0
4:00 - 4:15			0	0
4:15 - 4:30			0	0
4:30 - 4:45			0	0
4:45 - 5:00			0	0
5:00 - 5:15			0	0
5:15 - 5:30			0	0
5:30 - 5:45			0	0
5:45 - 6:00			0	0
6:00 - 6:15			0	0
6:15 -6:30			0	0
TOTALS	0	0	0	0


MD 108 & Sheppard Ln

TOTALS TURNING MOVEMENT COUNT - SUMMARY

Counted by: VCU

Intersection of: MD 108
and: Great Star Drive
Location: Howard County, Maryland

Date: April 26, 2017
Weather: Cool, Light Rain
Entered by: BGJ

Wednesday

Star Rating: 3

TIME	TRAFFIC FROM NORTH on: MD 108					TRAFFIC FROM SOUTH on: MD 108					TRAFFIC FROM EAST on: Great Star Drive					TRAFFIC FROM WEST on: Kendall Hardware Store					TOTAL N + S + E + W
	RIGHT	THRU	LEFT	U-TN	TOTAL	RIGHT	THRU	LEFT	U-TN	TOTAL	RIGHT	THRU	LEFT	U-TN	TOTAL	RIGHT	THRU	LEFT	U-TN	TOTAL	
AM																					
6:30 - 6:45	1	92	35	0	128	19	61	0	0	80	20	0	17	0	37	0	0	0	0	0	245
6:45 - 7:00	3	136	47	0	186	35	96	2	0	133	36	5	21	0	62	0	0	1	0	1	382
7:00 - 7:15	3	146	57	0	206	37	156	4	0	197	87	2	25	0	114	2	0	0	0	2	519
7:15 - 7:30	0	180	58	0	238	44	118	2	0	164	47	8	41	0	96	4	0	1	0	5	503
7:30 - 7:45	3	183	68	0	254	35	110	3	0	148	55	1	40	0	96	1	2	2	0	5	503
7:45 - 8:00	2	194	60	0	256	30	149	4	0	183	69	0	31	0	100	0	0	2	0	2	541
8:00 - 8:15	4	180	79	0	263	28	98	1	0	127	43	0	35	0	78	0	1	2	0	3	471
8:15 - 8:30	1	182	64	0	247	42	99	2	0	143	44	0	42	0	86	2	2	3	0	7	483
8:30 - 8:45	1	178	53	0	232	37	97	1	0	135	35	1	56	0	92	4	3	0	0	7	466
8:45 - 9:00	5	175	45	0	225	41	116	8	0	165	43	4	39	0	86	3	2	1	0	6	482
9:00 - 9:15	1	138	53	0	192	51	101	2	0	154	53	2	60	0	115	4	5	2	0	11	472
9:15 - 9:30	3	146	45	0	194	49	107	2	0	158	52	3	43	0	98	0	1	3	0	4	454
9:30 - 9:45	2	102	40	0	144	34	95	1	0	130	41	2	42	0	85	2	1	3	0	6	365
9:45 - 10:00	4	97	36	0	137	40	95	6	0	141	43	9	40	0	92	2	1	2	0	5	375
10:00 - 10:15	1	84	44	0	129	24	79	4	0	107	34	5	34	0	73	1	4	3	0	8	317
10:15 - 10:30	4	87	34	0	125	44	78	3	0	125	40	2	49	0	91	5	4	4	0	13	354
10:30 - 10:45	3	100	40	0	143	47	89	3	0	139	44	2	38	0	84	2	2	1	0	5	371
10:45 - 11:00	7	110	37	0	154	47	105	5	0	157	44	0	33	0	77	1	3	2	0	6	394
11:00 - 11:15	4	94	34	0	132	46	79	2	0	127	36	5	51	0	92	3	2	6	0	11	362
11:15 - 11:30	4	111	25	0	140	52	85	5	0	142	44	5	47	1	97	5	1	4	0	10	389
11:30 - 11:45	6	109	40	0	155	31	86	3	0	120	50	6	43	0	99	5	5	2	0	12	386
11:45 - 12:00	7	87	45	0	139	41	106	5	0	152	43	1	56	0	100	5	4	5	0	14	405
12:00 - 12:15	12	99	47	0	158	50	101	4	0	155	60	4	49	1	114	2	4	3	0	9	436
12:15 - 12:30	6	100	44	0	150	75	99	8	0	182	52	5	56	0	113	3	7	11	0	21	466
12:30 - 12:45	5	123	42	0	170	54	140	6	0	200	64	8	59	0	131	3	9	4	0	16	517
12:45 - 1:00	4	114	45	0	163	49	98	4	0	151	44	2	55	0	101	3	5	3	0	11	426
1:00 - 1:15	13	99	48	0	160	56	96	2	0	154	39	5	47	0	91	3	6	1	0	10	415
1:15 - 1:30	4	85	45	0	134	44	84	6	0	134	50	5	49	0	104	4	3	7	0	14	386
1:30 - 1:45	4	120	44	0	168	60	91	3	0	154	60	1	67	0	128	8	3	6	0	17	467
1:45 - 2:00	1	95	35	0	131	61	95	7	0	163	43	6	45	0	94	5	2	0	0	7	395
2:00 - 2:15	3	105	39	0	147	41	119	2	0	162	55	3	57	1	116	2	4	6	0	12	437
2:15 - 2:30	5	152	64	0	221	57	109	5	0	171	74	2	47	0	123	1	2	4	0	7	522
2:30 - 2:45	4	122	49	0	175	44	98	10	0	152	59	2	73	1	135	2	4	6	0	12	474
2:45 - 3:00	4	120	43	0	167	48	114	6	0	168	68	5	60	0	133	4	1	2	0	7	475
3:00 - 3:15	2	128	35	0	165	56	124	3	0	183	58	2	56	0	116	1	3	4	0	8	472
3:15 - 3:30	3	115	31	0	149	46	140	3	0	189	83	2	53	0	138	1	1	4	0	6	482
3:30 - 3:45	3	154	51	0	208	59	166	8	0	233	89	5	61	0	155	1	6	5	0	12	608
3:45 - 4:00	4	134	61	0	199	55	170	3	0	228	82	6	63	0	151	3	4	6	0	13	591
4:00 - 4:15	3	152	65	0	220	71	192	4	0	267	93	6	62	0	161	2	4	10	0	16	664
4:15 - 4:30	2	138	52	0	192	35	194	5	0	234	83	7	66	0	156	5	2	2	0	9	591
4:30 - 4:45	3	138	70	0	211	44	219	4	0	267	97	3	64	0	164	1	5	7	0	13	655
4:45 - 5:00	5	118	58	0	181	62	207	1	0	270	117	5	61	0	183	4	2	6	0	12	646
5:00 - 5:15	3	127	55	0	185	56	226	4	0	286	120	4	71	0	195	9	6	9	0	24	690
5:15 - 5:30	7	103	59	0	169	60	209	8	0	277	136	3	58	0	197	6	3	6	0	15	658
5:30 - 5:45	5	136	54	0	195	52	209	4	0	265	128	6	54	0	188	5	2	6	0	13	661
5:45 - 6:00	1	135	61	0	197	63	232	3	0	298	108	5	66	0	179	4	4	10	0	18	692
6:00 - 6:15	3	134	64	0	201	64	189	2	0	255	82	4	60	0	146	1	5	1	0	7	609
6:15 - 6:30	4	147	62	0	213	37	194	2	0	233	92	3	52	0	147	2	6	6	0	14	607
6:30 - 6:45	3	130	66	0	199	47	169	0	0	216	84	3	52	0	139	1	3	5	0	9	563
6:45 - 7:00	4	131	49	0	184	48	120	5	0	173	70	5	60	0	135	2	5	3	0	10	502
13 Hr Totals	189	6365	2477	0	9031	2348	6409	190	0	8947	3193	180	2506	4	5883	139	154	192	0	485	24346

TOTALS TURNING MOVEMENT COUNT - SUMMARY

The Traffic Group

Counted by: VCU
Intersection of: MD 108
and: Great Star Drive
Location: Howard County, Maryland
Date: April 26, 2017
Weather: Cool, Light Rain
Entered by: BGJ
Wednesday
Star Rating: 3

TIME	TRAFFIC FROM NORTH					TRAFFIC FROM SOUTH					TRAFFIC FROM EAST					TRAFFIC FROM WEST					TOTAL
	on:	MD 108				on:	MD 108				on:	Great Star Drive				on:	Kendall Hardware Store				N + S + E + W
	RIGHT	THRU	LEFT	U-TN	TOTAL	RIGHT	THRU	LEFT	U-TN	TOTAL	RIGHT	THRU	LEFT	U-TN	TOTAL	RIGHT	THRU	LEFT	U-TN	TOTAL	
1 Hr Totals																					
6:30 - 7:30	7	554	197	0	758	135	431	8	0	574	190	15	104	0	309	6	0	2	0	8	1649
6:45 - 7:45	9	645	230	0	884	151	480	11	0	642	225	16	127	0	368	7	2	4	0	13	1907
7:00 - 8:00	8	703	243	0	954	146	533	13	0	692	258	11	137	0	406	7	2	5	0	14	2066
7:15 - 8:15	9	737	265	0	1011	137	475	10	0	622	214	9	147	0	370	5	3	7	0	15	2018
7:30 - 8:30	10	739	271	0	1020	135	456	10	0	601	211	1	148	0	360	3	5	9	0	17	1998
7:45 - 8:45	8	734	256	0	998	137	443	8	0	588	191	1	164	0	356	6	6	7	0	19	1961
8:00 - 9:00	11	715	241	0	967	148	410	12	0	570	165	5	172	0	342	9	8	6	0	23	1902
8:15 - 9:15	8	673	215	0	896	171	413	13	0	597	175	7	197	0	379	13	12	6	0	31	1903
8:30 - 9:30	10	637	196	0	843	178	421	13	0	612	183	10	198	0	391	11	11	6	0	28	1874
8:45 - 9:45	11	561	183	0	755	175	419	13	0	607	189	11	184	0	384	9	9	9	0	27	1773
9:00 - 10:00	10	483	174	0	667	174	398	11	0	583	189	16	185	0	390	8	8	10	0	26	1666
9:15 - 10:15	10	429	165	0	604	147	376	13	0	536	170	19	159	0	348	5	7	11	0	23	1511
9:30 - 10:30	11	370	154	0	535	142	347	14	0	503	158	18	165	0	341	10	10	12	0	32	1411
9:45 - 10:45	12	368	154	0	534	155	341	16	0	512	161	18	161	0	340	10	11	10	0	31	1417
10:00 - 11:00	15	381	155	0	551	162	351	15	0	528	162	9	154	0	325	9	13	10	0	32	1436
10:15 - 11:15	18	391	145	0	554	184	351	13	0	548	164	9	171	0	344	11	11	13	0	35	1481
10:30 - 11:30	18	415	136	0	569	192	358	15	0	565	168	12	169	1	350	11	8	13	0	32	1516
10:45 - 11:45	21	424	136	0	581	176	355	15	0	546	174	16	174	1	365	14	11	14	0	39	1531
11:00 - 12:00	21	401	144	0	566	170	356	15	0	541	173	17	197	1	388	18	12	17	0	47	1542
11:15 - 12:15	29	406	157	0	592	174	378	17	0	569	197	16	195	2	410	17	14	14	0	45	1616
11:30 - 12:30	31	395	176	0	602	197	392	20	0	609	205	16	204	1	426	15	20	21	0	56	1693
11:45 - 12:45	30	409	178	0	617	220	446	23	0	689	219	18	220	1	458	13	24	23	0	60	1824
12:00 - 1:00	27	436	178	0	641	228	438	22	0	688	220	19	219	1	459	11	25	21	0	57	1845
12:15 - 1:15	28	436	179	0	643	234	433	20	0	687	199	20	217	0	436	12	27	19	0	58	1824
12:30 - 1:30	26	421	180	0	627	203	418	18	0	639	197	20	210	0	427	13	23	15	0	51	1744
12:45 - 1:45	25	418	182	0	625	209	369	15	0	593	193	13	218	0	424	18	17	17	0	52	1694
1:00 - 2:00	22	399	172	0	593	221	366	18	0	605	192	17	208	0	417	20	14	14	0	48	1663
1:15 - 2:15	12	405	163	0	580	206	389	18	0	613	208	15	218	1	442	19	12	19	0	50	1685
1:30 - 2:30	13	472	182	0	667	219	414	17	0	650	232	12	216	1	461	16	11	16	0	43	1821
1:45 - 2:45	13	474	187	0	674	203	421	24	0	648	231	13	222	2	468	10	12	16	0	38	1828
2:00 - 3:00	16	499	195	0	710	190	440	23	0	653	256	12	237	2	507	9	11	18	0	38	1908
2:15 - 3:15	15	522	191	0	728	205	445	24	0	674	259	11	236	1	507	8	10	16	0	34	1943
2:30 - 3:30	13	485	158	0	656	194	476	22	0	692	268	11	242	1	522	8	9	16	0	33	1903
2:45 - 3:45	12	517	160	0	689	209	544	20	0	773	298	14	230	0	542	7	11	15	0	33	2037
3:00 - 4:00	12	531	178	0	721	216	600	17	0	833	312	15	233	0	560	6	14	19	0	39	2153
3:15 - 4:15	13	555	208	0	776	231	668	18	0	917	347	19	239	0	605	7	15	25	0	47	2345
3:30 - 4:30	12	578	229	0	819	220	722	20	0	962	347	24	252	0	623	11	16	23	0	50	2454
3:45 - 4:45	12	562	248	0	822	205	775	16	0	996	355	22	255	0	632	11	15	25	0	51	2501
4:00 - 5:00	13	546	245	0	804	212	812	14	0	1038	390	21	253	0	664	12	13	25	0	50	2556
4:15 - 5:15	13	521	235	0	769	197	846	14	0	1057	417	19	262	0	698	19	15	24	0	58	2582
4:30 - 5:30	18	486	242	0	746	222	861	17	0	1100	470	15	254	0	739	20	16	28	0	64	2649
4:45 - 5:45	20	484	226	0	730	230	851	17	0	1098	501	18	244	0	763	24	13	27	0	64	2655
5:00 - 6:00	16	501	229	0	746	231	876	19	0	1126	492	18	249	0	759	24	15	31	0	70	2701
5:15 - 6:15	16	508	238	0	762	239	839	17	0	1095	454	18	238	0	710	16	14	23	0	53	2620
5:30 - 6:30	13	552	241	0	806	216	824	11	0	1051	410	18	232	0	660	12	17	23	0	52	2569
5:45 - 6:45	11	546	253	0	810	211	784	7	0	1002	366	15	230	0	611	8	18	22	0	48	2471
6:00 - 7:00	14	542	241	0	797	196	672	9	0	877	328	15	224	0	567	6	19	15	0	40	2281
PEAK HOUR																					
7:00 - 8:00	8	703	243	0	954	146	533	13	0	692	258	11	137	0	406	7	2	5	0	14	2066
5:00 - 6:00	16	501	229	0	746	231	876	19	0	1126	492	18	249	0	759	24	15	31	0	70	2701

PEDESTRIAN AND BICYCLE OBSERVATIONS - SUMMARY

Counted by: VCU

Intersection of: MD 108
and: Great Star Drive
Location: Howard County, Maryland

Date: April 26, 2017 Wednesday
Weather: Cool, Light Rain
Entered by: BGJ

Star Rating: 3

TIME	NORTH LEG MD 108		SOUTH LEG MD 108	
	Pedestrians	Bicycles	Pedestrians	Bicycles
AM				
6:30 - 6:45	0	0	0	0
6:45 - 7:00	0	0	0	0
7:00 - 7:15	0	0	0	0
7:15 - 7:30	0	0	0	0
7:30 - 7:45	0	0	0	0
7:45 - 8:00	0	0	0	0
8:00 - 8:15	0	0	0	0
8:15 - 8:30	0	0	0	0
8:30 - 8:45	0	0	0	0
8:45 - 9:00	0	0	0	0
9:00 - 9:15	0	0	0	0
9:15 - 9:30	0	0	0	0
9:30 - 9:45	0	0	0	0
9:45 - 10:00	0	0	0	0
10:00 - 10:15	0	0	0	0
10:15 - 10:30	0	0	0	0
10:30 - 10:45	0	0	0	0
10:45 - 11:00	2	0	0	0
11:00 - 11:15	0	0	0	0
11:15 - 11:30	0	0	0	0
11:30 - 11:45	1	0	0	0
11:45 - 12:00	0	0	0	0
12:00 - 12:15	0	0	1	0
12:15 - 12:30	1	0	0	0
12:30 - 12:45	1	0	0	0
12:45 - 1:00	0	0	0	0
1:00 - 1:15	0	0	0	0
1:15 - 1:30	0	0	0	0
1:30 - 1:45	0	0	1	0
1:45 - 2:00	0	0	0	0
2:00 - 2:15	0	0	1	0
2:15 - 2:30	0	0	0	0
2:30 - 2:45	0	0	0	0
2:45 - 3:00	1	0	0	0
3:00 - 3:15	1	0	0	0
3:15 - 3:30	1	0	0	0
3:30 - 3:45	0	0	0	0
3:45 - 4:00	0	0	0	0
4:00 - 4:15	0	0	0	0
4:15 - 4:30	0	0	0	0
4:30 - 4:45	0	0	0	0
4:45 - 5:00	0	0	0	0
5:00 - 5:15	0	0	0	0
5:15 - 5:30	0	0	0	0
5:30 - 5:45	0	0	0	0
5:45 - 6:00	0	0	0	0
6:00 - 6:15	0	0	0	0
6:15 - 6:30	0	0	0	0
6:30 - 6:45	0	0	0	0
6:45 - 7:00	0	0	0	0
TOTALS	8	0	3	0

PEDESTRIAN AND BICYCLE OBSERVATIONS - SUMMARY

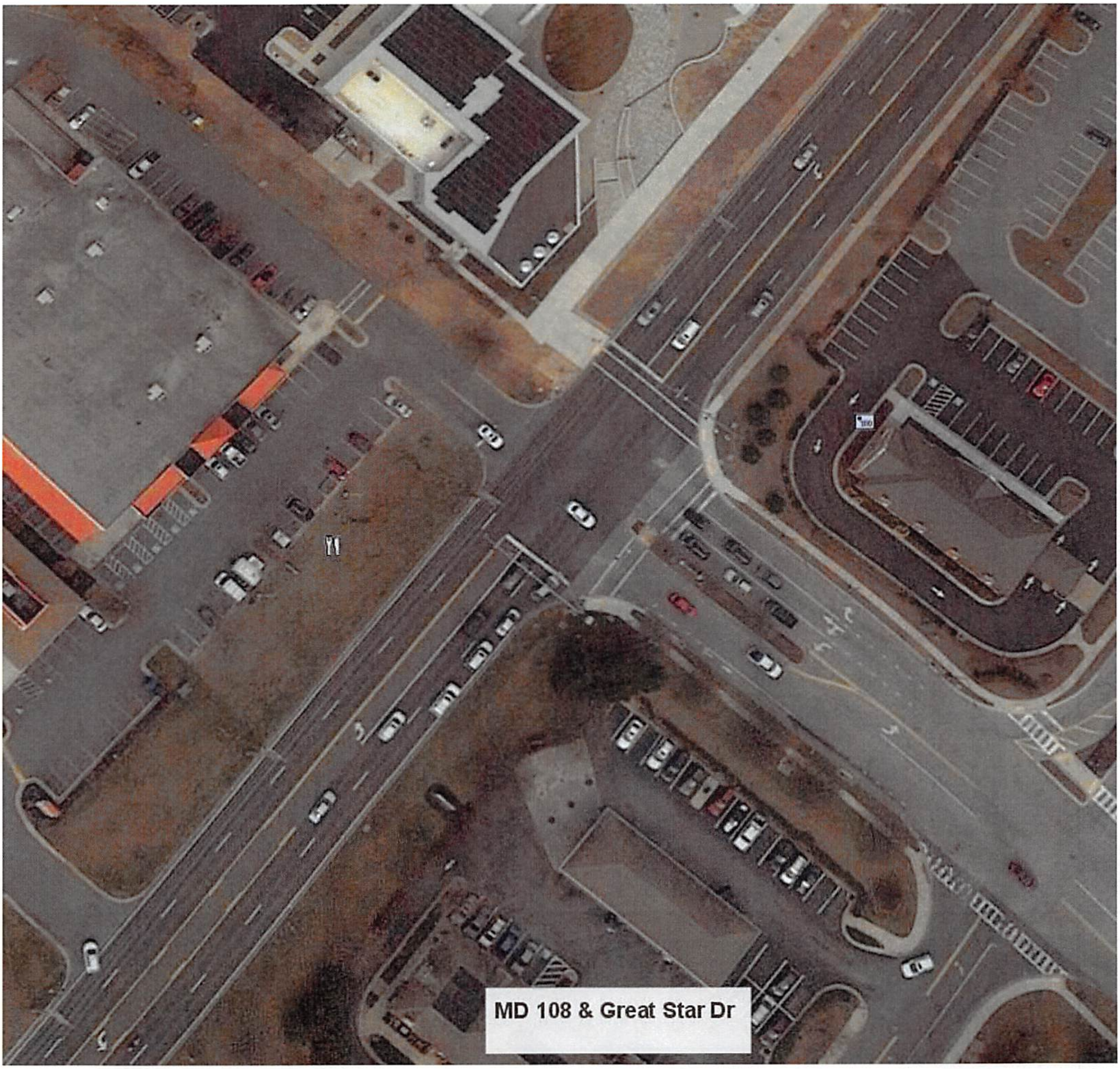
Counted by: VCU

Intersection of: MD 108 **Date:** April 26, 2017 Wednesday

and: Great Star Drive **Weather:** Cool, Light Rain

Location: Howard County, Maryland **Entered by:** BGJ **Star Rating:** 3

	EAST LEG Great Star Drive		WEST LEG Kendall Hardware Store	
	Pedestrians	Bicycles	Pedestrians	Bicycles
AM				
6:30 - 6:45	0	0	0	0
6:45 - 7:00	0	0	0	0
7:00 - 7:15	0	0	0	0
7:15 - 7:30	0	0	0	0
7:30 - 7:45	0	0	0	0
7:45 - 8:00	0	0	0	0
8:00 - 8:15	0	0	0	0
8:15 - 8:30	0	0	0	0
8:30 - 8:45	0	0	0	0
8:45 - 9:00	0	0	0	0
9:00 - 9:15	0	0	0	0
9:15 - 9:30	0	0	0	0
9:30 - 9:45	0	0	0	0
9:45 - 10:00	0	0	0	0
10:00 - 10:15	0	0	0	0
10:15 - 10:30	0	0	0	0
10:30 - 10:45	0	0	0	0
10:45 - 11:00	2	0	0	0
11:00 - 11:15	0	0	0	0
11:15 - 11:30	1	0	0	0
11:30 - 11:45	0	0	0	0
11:45 - 12:00	0	0	0	0
12:00 - 12:15	0	0	0	0
12:15 - 12:30	0	0	0	0
12:30 - 12:45	0	0	0	0
12:45 - 1:00	0	0	0	0
1:00 - 1:15	0	0	0	0
1:15 - 1:30	0	0	0	0
1:30 - 1:45	0	0	0	0
1:45 - 2:00	0	0	0	0
2:00 - 2:15	0	0	0	0
2:15 - 2:30	0	0	0	0
2:30 - 2:45	0	0	1	0
2:45 - 3:00	0	0	1	0
3:00 - 3:15	0	0	0	0
3:15 - 3:30	0	0	0	0
3:30 - 3:45	0	0	0	0
3:45 - 4:00	0	0	0	0
4:00 - 4:15	0	0	0	0
4:15 - 4:30	0	0	0	0
4:30 - 4:45	0	0	0	0
4:45 - 5:00	0	0	0	0
5:00 - 5:15	0	0	0	0
5:15 - 5:30	0	0	0	0
5:30 - 5:45	0	0	0	0
5:45 - 6:00	0	0	0	0
6:00 - 6:15	0	0	0	0
6:15 - 6:30	0	0	0	0
6:30 - 6:45	0	0	0	0
6:45 - 7:00	0	0	0	0
TOTALS	3	0	2	0



MD 108 & Great Star Dr

CARS TURNING MOVEMENT COUNT - SUMMARY

Counted by: VCU
Intersection of: MD 108
and: Auto Drive
Location: Howard County, Maryland
Date: April 26, 2017
Weather: Cool, Light Rain
Entered by: BGJ
Wednesday
Star Rating: 5

TIME	TRAFFIC FROM NORTH on: MD 108					TRAFFIC FROM SOUTH on: MD 108					TRAFFIC FROM EAST on: Signal Bell Lane					TRAFFIC FROM WEST on: Auto Drive					TOTAL N + S + E + W
	RIGHT	THRU	LEFT	U-TN	TOTAL	RIGHT	THRU	LEFT	U-TN	TOTAL	RIGHT	THRU	LEFT	U-TN	TOTAL	RIGHT	THRU	LEFT	U-TN	TOTAL	
AM																					
6:30 - 6:45	9	100	1	0	110	9	82	22	0	113	1	0	11	0	12	1	1	1	0	3	238
6:45 - 7:00	11	141	4	0	156	13	137	19	0	169	0	3	18	0	21	2	1	1	0	4	350
7:00 - 7:15	14	160	4	0	178	13	216	16	0	245	4	3	18	0	25	1	0	2	0	3	451
7:15 - 7:30	15	203	4	0	222	9	149	29	0	187	0	0	10	0	10	5	2	0	0	7	426
7:30 - 7:45	24	204	3	0	231	11	174	39	0	224	0	0	11	0	11	10	1	5	0	16	482
7:45 - 8:00	16	191	2	0	209	12	164	40	0	216	2	2	11	0	15	12	1	6	0	19	459
8:00 - 8:15	19	217	2	0	238	12	143	27	0	182	0	1	12	0	13	5	0	5	0	10	443
8:15 - 8:30	12	206	0	0	218	14	140	43	0	197	1	2	9	0	12	14	2	3	0	19	446
8:30 - 8:45	24	223	1	0	248	10	142	28	0	180	1	3	9	0	13	12	2	12	0	26	467
8:45 - 9:00	23	187	2	0	212	9	159	45	0	213	3	4	8	0	15	10	6	7	0	23	463
3 Hr Totals	167	1832	23	0	2022	112	1506	308	0	1926	12	18	117	0	147	72	16	42	0	130	4225
1 Hr Totals																					
6:30 - 7:30	49	604	13	0	666	44	584	86	0	714	5	6	57	0	68	9	4	4	0	17	1465
6:45 - 7:45	64	708	15	0	787	46	676	103	0	825	4	6	57	0	67	18	4	8	0	30	1709
7:00 - 8:00	69	758	13	0	840	45	703	124	0	872	6	5	50	0	61	28	4	13	0	45	1818
7:15 - 8:15	74	815	11	0	900	44	630	135	0	809	2	3	44	0	49	32	4	16	0	52	1810
7:30 - 8:30	71	818	7	0	896	49	621	149	0	819	3	5	43	0	51	41	4	19	0	64	1830
7:45 - 8:45	71	837	5	0	913	48	589	138	0	775	4	8	41	0	53	43	5	26	0	74	1815
8:00 - 9:00	78	833	5	0	916	45	584	143	0	772	5	10	38	0	53	41	10	27	0	78	1819
PEAK HOUR																					
7:30 - 8:30	71	818	7	0	896	49	621	149	0	819	3	5	43	0	51	41	4	19	0	64	1830
PM																					
2:30 - 2:45	21	187	3	0	211	13	137	21	0	171	1	5	12	0	18	36	5	12	0	53	453
2:45 - 3:00	12	170	1	0	183	10	143	28	0	181	0	2	18	0	20	23	4	18	0	45	429
3:00 - 3:15	7	172	3	0	182	9	155	18	0	182	5	2	7	0	14	37	7	19	0	63	441
3:15 - 3:30	25	156	3	0	184	11	181	22	0	214	2	3	12	0	17	25	3	16	0	44	459
3:30 - 3:45	17	189	2	0	208	8	210	17	0	235	3	2	11	0	16	35	7	25	0	67	526
3:45 - 4:00	20	185	3	0	208	11	246	25	0	282	2	1	10	0	13	38	8	15	0	61	564
4:00 - 4:15	17	198	1	0	216	13	242	22	0	277	2	4	19	0	25	38	2	28	0	68	586
4:15 - 4:30	12	187	3	0	202	10	227	29	0	266	4	4	4	0	12	35	7	19	0	61	541
4:30 - 4:45	20	174	2	0	196	8	228	30	0	266	5	7	14	0	26	47	4	32	0	83	571
4:45 - 5:00	14	167	3	0	184	8	259	23	0	290	0	4	19	0	23	30	4	25	0	59	556
5:00 - 5:15	12	189	2	0	203	19	219	30	0	268	12	1	16	0	29	53	2	32	0	87	587
5:15 - 5:30	10	176	5	0	191	14	263	26	0	303	6	6	17	0	29	43	8	25	0	76	599
5:30 - 5:45	17	173	5	0	195	17	244	17	0	278	6	5	19	0	30	41	5	18	0	64	567
5:45 - 6:00	21	194	6	0	221	19	259	20	0	298	1	1	14	0	16	35	2	24	0	61	596
6:00 - 6:15	11	176	8	0	195	23	257	14	0	294	6	4	20	0	30	31	5	27	0	63	582
6:15 - 6:30	13	198	8	0	219					0	8	2	20	0	30	34	3	12	0	49	298
4 Hr Totals	249	2891	58	0	3198	193	3270	342	0	3805	63	53	232	0	348	581	76	347	0	1004	8355
1 Hr Totals																					
2:30 - 3:30	65	685	10	0	760	43	616	89	0	748	8	12	49	0	69	121	19	65	0	205	1782
2:45 - 3:45	61	687	9	0	757	38	689	85	0	812	10	9	48	0	67	120	21	78	0	219	1855
3:00 - 4:00	69	702	11	0	782	39	792	82	0	913	12	8	40	0	60	135	25	75	0	235	1990
3:15 - 4:15	79	728	9	0	816	43	879	86	0	1008	9	10	52	0	71	136	20	84	0	240	2135
3:30 - 4:30	66	759	9	0	834	42	925	93	0	1060	11	11	44	0	66	146	24	87	0	257	2217
3:45 - 4:45	69	744	9	0	822	42	943	106	0	1091	13	16	47	0	76	158	21	94	0	273	2262
4:00 - 5:00	63	726	9	0	798	39	956	104	0	1099	11	19	56	0	86	150	17	104	0	271	2254
4:15 - 5:15	58	717	10	0	785	45	933	112	0	1090	21	16	53	0	90	165	17	108	0	290	2255
4:30 - 5:30	56	706	12	0	774	49	969	109	0	1127	23	18	66	0	107	173	18	114	0	305	2313
4:45 - 5:45	53	705	15	0	773	58	985	96	0	1139	24	16	71	0	111	167	19	100	0	286	2309
5:00 - 6:00	60	732	18	0	810	69	985	93	0	1147	25	13	66	0	104	172	17	99	0	288	2349
5:15 - 6:15	59	719	24	0	802	73	1023	77	0	1173	19	16	70	0	105	150	20	94	0	264	2344
5:30 - 6:30	62	741	27	0	830	59	760	51	0	870	21	12	73	0	106	141	15	81	0	237	2043
PEAK HOUR																					
5:00 - 6:00	60	732	18	0	810	69	985	93	0	1147	25	13	66	0	104	172	17	99	0	288	2349

PEDESTRIAN AND BICYCLE OBSERVATIONS - SUMMARY

	Counted by: VCU	
Intersection of: MD 108	Date: April 26, 2017	Wednesday
and: Auto Drive	Weather: Cool, Light Rain	
Location: Howard County, Maryland	Entered by: BGJ	Star Rating: 5

	NORTH LEG MD 108		SOUTH LEG MD 108	
TIME	Pedestrians	Bicycles	Pedestrians	Bicycles
AM				
6:30 - 6:45	0	0	0	0
6:45 - 7:00	0	0	0	0
7:00 - 7:15	0	0	0	0
7:15 - 7:30	0	0	0	0
7:30 - 7:45	0	0	0	0
7:45 - 8:00	0	0	0	0
8:00 - 8:15	1	0	0	0
8:15 - 8:30	0	0	1	0
8:30 - 8:45	1	0	0	0
8:45 - 9:00	0	0	2	0
TOTALS	2	0	3	0
PM				
2:30 - 2:45	0	0	0	0
2:45 - 3:00	0	0	0	0
3:00 - 3:15	0	0	0	0
3:15 - 3:30	0	0	0	0
3:30 - 3:45	0	0	0	0
3:45 - 4:00	0	0	0	0
4:00 - 4:15	0	0	1	0
4:15 - 4:30	0	0	0	0
4:30 - 4:45	0	0	0	0
4:45 - 5:00	0	0	0	0
5:00 - 5:15	0	0	0	0
5:15 - 5:30	0	0	0	0
5:30 - 5:45	0	0	0	0
5:45 - 6:00	0	0	2	0
6:00 - 6:15	0	0	1	0
6:15 -6:30	0	0	0	0
TOTALS	0	0	4	0

	EAST LEG Signal Bell Lane		WEST LEG Auto Drive	
	Pedestrians	Bicycles	Pedestrians	Bicycles
AM				
6:30 - 6:45	0	0	0	0
6:45 - 7:00	0	0	0	0
7:00 - 7:15	0	0	0	0
7:15 - 7:30	0	0	0	0
7:30 - 7:45	0	0	0	0
7:45 - 8:00	0	0	0	0
8:00 - 8:15	0	0	0	0
8:15 - 8:30	0	0	1	0
8:30 - 8:45	0	0	0	0
8:45 - 9:00	0	0	1	0
TOTALS	0	0	2	0
PM				
2:30 - 2:45	0	0	0	0
2:45 - 3:00	0	0	0	0
3:00 - 3:15	0	0	0	0
3:15 - 3:30	0	0	0	0
3:30 - 3:45	0	0	0	0
3:45 - 4:00	0	0	0	0
4:00 - 4:15	0	0	0	0
4:15 - 4:30	0	0	0	0
4:30 - 4:45	0	0	0	0
4:45 - 5:00	0	0	0	0
5:00 - 5:15	0	0	0	0
5:15 - 5:30	0	0	0	0
5:30 - 5:45	0	0	0	0
5:45 - 6:00	0	0	0	0
6:00 - 6:15	0	0	0	0
6:15 -6:30	0	0	0	0
TOTALS	0	0	0	0

MD 108 & Signal Bell Ln/ Auto Dr

TOTALS TURNING MOVEMENT COUNT - SUMMARY

Counted by: VCU
Intersection of: MD 108
and: MD 32 WB Ramps
Location: Howard County, Maryland
Date: April 26, 2017
Weather: Cool, Light Rain
Entered by: BGJ
Wednesday
Star Rating: 5

TIME	TRAFFIC FROM NORTH on: MD 108					TRAFFIC FROM SOUTH on: MD 108					TRAFFIC FROM EAST on: MD 32 WB Off Ramp					TRAFFIC FROM WEST on: MD 32 WB On Ramp					TOTAL N + S + E + W
	RIGHT	THRU	LEFT	U-TN	TOTAL	RIGHT	THRU	LEFT	U-TN	TOTAL	RIGHT	THRU	LEFT	U-TN	TOTAL	RIGHT	THRU	LEFT	U-TN	TOTAL	
AM																					
6:30 - 6:45	10	103	0	0	113	0	76	3	0	79	38	0	76	0	114	0	0	0	0	0	306
6:45 - 7:00	12	149	0	0	161	0	125	3	0	128	51	0	96	0	147	0	0	0	0	0	436
7:00 - 7:15	16	171	0	0	187	0	198	3	0	201	45	0	95	0	140	0	0	0	0	0	528
7:15 - 7:30	19	196	0	0	215	0	118	6	0	124	73	0	136	0	209	0	0	0	0	0	548
7:30 - 7:45	20	206	0	0	226	0	149	15	0	164	65	0	108	0	173	0	0	0	0	0	563
7:45 - 8:00	19	201	0	0	220	0	112	3	0	115	104	0	119	0	223	0	0	0	0	0	558
8:00 - 8:15	24	195	0	0	219	0	127	13	0	140	58	0	93	0	151	0	0	0	0	0	510
8:15 - 8:30	23	199	0	0	222	0	124	13	0	137	78	1	127	0	206	0	0	0	0	0	565
8:30 - 8:45	18	229	0	0	247	0	118	13	0	131	57	0	92	0	149	0	0	0	0	0	527
8:45 - 9:00	18	186	0	0	204	0	127	11	0	138	96	0	117	0	213	0	0	0	0	0	555
3 Hr Totals	179	1835	0	0	2014	0	1274	83	0	1357	665	1	1059	0	1725	0	0	0	0	0	5096
1 Hr Totals																					
6:30 - 7:30	57	619	0	0	676	0	517	15	0	532	207	0	403	0	610	0	0	0	0	0	1818
6:45 - 7:45	67	722	0	0	789	0	590	27	0	617	234	0	435	0	669	0	0	0	0	0	2075
7:00 - 8:00	74	774	0	0	848	0	577	27	0	604	287	0	458	0	745	0	0	0	0	0	2197
7:15 - 8:15	82	798	0	0	880	0	506	37	0	543	300	0	456	0	756	0	0	0	0	0	2179
7:30 - 8:30	86	801	0	0	887	0	512	44	0	556	305	1	447	0	753	0	0	0	0	0	2196
7:45 - 8:45	84	824	0	0	908	0	481	42	0	523	297	1	431	0	729	0	0	0	0	0	2160
8:00 - 9:00	83	809	0	0	892	0	496	50	0	546	289	1	429	0	719	0	0	0	0	0	2157
PEAK HOUR																					
7:00 - 8:00	74	774	0	0	848	0	577	27	0	604	287	0	458	0	745	0	0	0	0	0	2197
PM																					
2:30 - 2:45	40	193	0	0	233	0	113	19	0	132	48	2	118	0	168	0	0	0	0	0	533
2:45 - 3:00	27	178	0	0	205	0	106	15	0	121	87	0	145	0	232	0	0	0	0	0	558
3:00 - 3:15	36	189	0	0	225	0	114	7	0	121	58	0	141	0	199	0	0	0	0	0	545
3:15 - 3:30	24	167	0	0	191	0	134	8	0	142	91	0	203	0	294	0	0	0	0	0	627
3:30 - 3:45	25	222	0	0	247	0	138	12	0	150	88	2	192	0	282	0	0	0	0	0	679
3:45 - 4:00	32	193	0	0	225	0	188	11	0	199	93	16	205	0	314	0	0	0	0	0	738
4:00 - 4:15	37	215	0	0	252	0	183	2	0	185	97	34	197	0	328	0	0	0	0	0	765
4:15 - 4:30	24	211	0	0	235	0	161	11	0	172	100	32	233	0	365	0	0	0	0	0	772
4:30 - 4:45	37	212	0	0	249	0	170	13	0	183	106	18	207	0	331	0	0	0	0	0	763
4:45 - 5:00	28	185	0	0	213	0	203	10	0	213	85	10	231	0	326	0	0	0	0	0	752
5:00 - 5:15	34	229	0	0	263	0	179	15	0	194	89	9	190	0	288	0	0	0	0	0	745
5:15 - 5:30	30	202	0	0	232	0	192	12	0	204	114	6	236	0	356	0	0	0	0	0	792
5:30 - 5:45	32	204	0	0	236	0	186	10	0	196	94	16	211	0	321	0	0	0	0	0	753
5:45 - 6:00	39	202	0	0	241	0	199	14	0	213	104	11	217	0	332	0	0	0	0	0	786
6:00 - 6:15	36	191	0	0	227	0	191	4	0	195	106	7	193	0	306	0	0	0	0	0	728
6:15 - 6:30	47	204	0	0	251	0	188	6	0	194	107	2	176	0	285	0	0	0	0	0	730
4 Hr Totals	528	3197	0	0	3725	0	2645	169	0	2814	1467	165	3095	0	4727	0	0	0	0	0	11266
1 Hr Totals																					
2:30 - 3:30	127	727	0	0	854	0	467	49	0	516	284	2	607	0	893	0	0	0	0	0	2263
2:45 - 3:45	112	756	0	0	868	0	492	42	0	534	324	2	681	0	1007	0	0	0	0	0	2409
3:00 - 4:00	117	771	0	0	888	0	574	38	0	612	330	18	741	0	1089	0	0	0	0	0	2589
3:15 - 4:15	118	797	0	0	915	0	643	33	0	676	369	52	797	0	1218	0	0	0	0	0	2809
3:30 - 4:30	118	841	0	0	959	0	670	36	0	706	378	84	827	0	1289	0	0	0	0	0	2954
3:45 - 4:45	130	831	0	0	961	0	702	37	0	739	396	100	842	0	1338	0	0	0	0	0	3038
4:00 - 5:00	126	823	0	0	949	0	717	36	0	753	388	94	868	0	1350	0	0	0	0	0	3052
4:15 - 5:15	123	837	0	0	960	0	713	49	0	762	380	69	861	0	1310	0	0	0	0	0	3032
4:30 - 5:30	129	828	0	0	957	0	744	50	0	794	394	43	864	0	1301	0	0	0	0	0	3052
4:45 - 5:45	124	820	0	0	944	0	760	47	0	807	382	41	868	0	1291	0	0	0	0	0	3042
5:00 - 6:00	135	837	0	0	972	0	756	51	0	807	401	42	854	0	1297	0	0	0	0	0	3076
5:15 - 6:15	137	799	0	0	936	0	768	40	0	808	418	40	857	0	1315	0	0	0	0	0	3059
5:30 - 6:30	154	801	0	0	955	0	764	34	0	798	411	36	797	0	1244	0	0	0	0	0	2997
PEAK HOUR																					
5:00 - 6:00	135	837	0	0	972	0	756	51	0	807	401	42	854	0	1297	0	0	0	0	0	3076

PEDESTRIAN AND BICYCLE OBSERVATIONS - SUMMARY

Counted by: VCU

Intersection of: MD 108
and: MD 32 WB Ramps
Location: Howard County, Maryland

Date: April 26, 2017 Wednesday
Weather: Cool, Light Rain
Entered by: BGJ
Star Rating: 5

	NORTH LEG MD 108		SOUTH LEG MD 108	
TIME	Pedestrians	Bicycles	Pedestrians	Bicycles
AM				
6:30 - 6:45	0	0	0	0
6:45 - 7:00	0	0	0	0
7:00 - 7:15	0	0	0	0
7:15 - 7:30	0	0	0	0
7:30 - 7:45	0	0	0	0
7:45 - 8:00	0	0	0	0
8:00 - 8:15	0	0	0	0
8:15 - 8:30	0	0	0	0
8:30 - 8:45	0	0	0	0
8:45 - 9:00	0	0	0	0
TOTALS	0	0	0	0
PM				
2:30 - 2:45	0	0	0	0
2:45 - 3:00	0	0	0	0
3:00 - 3:15	0	0	0	0
3:15 - 3:30	0	0	0	0
3:30 - 3:45	0	0	0	0
3:45 - 4:00	0	0	0	0
4:00 - 4:15	0	0	0	0
4:15 - 4:30	0	0	0	0
4:30 - 4:45	0	0	0	0
4:45 - 5:00	0	0	0	0
5:00 - 5:15	0	0	0	0
5:15 - 5:30	0	0	0	0
5:30 - 5:45	0	0	0	0
5:45 - 6:00	0	0	0	0
6:00 - 6:15	0	0	0	0
6:15 -6:30	0	0	0	0
TOTALS	0	0	0	0

	EAST LEG MD 32 WB Off Ramp		WEST LEG MD 32 WB ON Ramp	
	Pedestrians	Bicycles	Pedestrians	Bicycles
AM				
6:30 - 6:45	1	0	0	0
6:45 - 7:00	0	0	0	0
7:00 - 7:15	0	0	0	0
7:15 - 7:30	0	0	0	0
7:30 - 7:45	0	0	0	0
7:45 - 8:00	0	0	0	0
8:00 - 8:15	0	0	0	0
8:15 - 8:30	0	0	0	0
8:30 - 8:45	0	0	0	0
8:45 - 9:00	0	0	0	0
TOTALS	1	0	0	0
PM				
2:30 - 2:45	0	0	0	0
2:45 - 3:00	0	0	0	0
3:00 - 3:15	6	0	0	0
3:15 - 3:30	0	0	0	0
3:30 - 3:45	0	0	0	0
3:45 - 4:00	0	0	0	0
4:00 - 4:15	0	0	0	0
4:15 - 4:30	0	0	0	0
4:30 - 4:45	2	0	0	0
4:45 - 5:00	4	0	0	0
5:00 - 5:15	0	0	0	0
5:15 - 5:30	1	0	0	0
5:30 - 5:45	0	0	0	0
5:45 - 6:00	0	0	0	0
6:00 - 6:15	0	0	0	0
6:15 -6:30	1	0	0	0
TOTALS	14	0	0	0


MD 108 & MD 32 WB Ramps

TOTALS TURNING MOVEMENT COUNT - SUMMARY

Counted by: VCU

Intersection of: MD 108
and: Linden Lithincum Lane
Location: Howard County, Maryland

Date: April 26, 2017
Weather: Cool, Light Rain
Entered by: BGJ

Wednesday

Star Rating: 4

TIME	TRAFFIC FROM NORTH on: MD 108					TRAFFIC FROM SOUTH on: MD 108					TRAFFIC FROM EAST on: Linden Lithincum Lane					TRAFFIC FROM WEST on: Freestate Gas Station					TOTAL N + S + E + W
	RIGHT	THRU	LEFT	U-TN	TOTAL	RIGHT	THRU	LEFT	U-TN	TOTAL	RIGHT	THRU	LEFT	U-TN	TOTAL	RIGHT	THRU	LEFT	U-TN	TOTAL	
AM																					
6:30 - 6:45	0	117	2	0	119	2	67	2	0	71	12	0	6	0	18	6	1	0	0	7	215
6:45 - 7:00	0	171	5	0	176	4	122	2	0	128	14	0	3	0	17	5	1	2	0	8	329
7:00 - 7:15	0	206	18	0	224	11	198	1	0	210	43	0	6	0	49	2	0	1	0	3	486
7:15 - 7:30	0	229	12	0	241	7	154	5	0	166	34	1	4	0	39	7	1	2	0	10	456
7:30 - 7:45	0	226	10	0	236	10	141	6	0	157	9	0	5	0	14	10	0	5	0	15	422
7:45 - 8:00	0	216	7	0	223	3	165	4	0	172	14	0	8	0	22	14	0	2	0	16	433
8:00 - 8:15	0	218	9	0	227	10	110	6	0	126	10	0	6	0	16	10	0	1	0	11	380
8:15 - 8:30	0	203	10	0	213	4	99	9	0	112	11	0	5	0	16	12	0	1	0	13	354
8:30 - 8:45	0	190	19	0	209	8	102	3	0	113	5	0	7	0	12	10	0	2	0	12	346
8:45 - 9:00	0	198	19	0	217	8	102	7	0	117	11	0	4	0	15	14	0	3	0	17	366
9:00 - 9:15	0	167	32	0	199	15	137	4	0	156	45	0	4	0	49	12	1	1	0	14	418
9:15 - 9:30	1	159	44	0	204	11	110	9	2	132	29	0	7	0	36	8	0	4	0	12	384
9:30 - 9:45	0	113	9	0	122	9	102	4	0	115	10	0	5	0	15	12	0	4	0	16	268
9:45 - 10:00	2	99	12	0	113	8	107	5	1	121	7	0	5	0	12	10	0	3	0	13	259
10:00 - 10:15	0	93	10	0	103	5	83	6	0	94	8	1	8	0	17	13	3	6	0	22	236
10:15 - 10:30	0	104	5	0	109	12	86	5	1	104	18	0	6	0	24	11	0	1	0	12	249
10:30 - 10:45	0	112	16	0	128	12	104	16	0	132	17	0	8	0	25	16	0	4	0	20	305
10:45 - 11:00	0	111	15	0	126	13	100	11	0	124	20	0	10	0	30	16	0	4	0	20	300
11:00 - 11:15	0	101	5	0	106	5	80	8	0	93	6	2	8	0	16	12	0	9	0	21	236
11:15 - 11:30	0	115	8	0	123	8	104	8	0	120	17	1	8	0	26	10	1	5	0	16	285
11:30 - 11:45	0	110	8	0	118	9	91	8	0	108	9	0	5	0	14	15	0	7	0	22	262
11:45 - 12:00	1	114	6	0	121	10	95	7	0	112	12	1	8	0	21	15	0	4	0	19	273
12:00 - 12:15	0	113	10	0	123	7	109	14	0	130	20	1	5	0	26	20	0	7	0	27	306
12:15 - 12:30	0	107	8	0	115	7	106	12	0	125	18	2	11	0	31	12	2	5	0	19	290
12:30 - 12:45	0	105	8	0	113	7	149	12	0	168	15	0	11	0	26	15	0	5	0	20	327
12:45 - 1:00	0	122	3	0	125	7	102	10	0	119	10	1	4	0	15	15	1	5	0	21	280
1:00 - 1:15	0	102	6	0	108	3	98	6	1	108	8	2	1	0	11	11	1	11	0	23	250
1:15 - 1:30	0	97	8	0	105	3	99	7	0	109	9	0	3	0	12	9	0	5	0	14	240
1:30 - 1:45	0	103	8	0	111	10	126	12	0	148	13	0	6	0	19	10	0	7	0	17	295
1:45 - 2:00	1	95	10	0	106	10	101	6	0	117	14	0	6	0	20	11	0	4	0	15	258
2:00 - 2:15	0	116	15	0	131	10	149	8	0	167	13	1	5	1	20	9	0	7	0	16	334
2:15 - 2:30	1	181	31	0	213	10	138	11	0	159	17	2	0	0	19	17	1	8	0	26	417
2:30 - 2:45	0	117	14	0	131	6	124	12	0	142	9	1	3	0	13	19	1	12	0	32	318
2:45 - 3:00	0	123	15	0	138	6	140	10	0	156	8	0	4	1	13	8	1	2	0	11	318
3:00 - 3:15	0	114	13	0	127	3	158	7	0	168	15	2	6	0	23	13	0	6	0	19	337
3:15 - 3:30	0	115	16	0	131	8	189	8	1	206	9	0	3	0	12	15	1	5	0	21	370
3:30 - 3:45	0	141	16	0	157	15	203	8	0	226	31	0	5	0	36	18	0	5	0	23	442
3:45 - 4:00	2	163	41	0	206	16	213	7	0	236	37	0	2	0	39	14	0	4	0	18	499
4:00 - 4:15	0	168	33	0	201	22	245	12	0	279	21	0	3	0	24	14	1	5	0	20	524
4:15 - 4:30	0	141	18	0	159	21	240	10	0	271	19	0	5	0	24	16	0	5	0	21	475
4:30 - 4:45	0	164	28	0	192	22	248	11	0	281	20	0	5	0	25	18	0	5	0	23	521
4:45 - 5:00	0	133	18	0	151	19	296	13	0	328	28	0	3	0	31	19	1	4	0	24	534
5:00 - 5:15	0	142	18	0	160	23	288	9	0	320	26	0	8	0	34	9	1	7	0	17	531
5:15 - 5:30	0	145	17	0	162	20	261	7	0	288	36	0	8	0	44	10	0	2	0	12	506
5:30 - 5:45	1	140	17	0	158	24	279	9	0	312	25	0	4	0	29	11	0	3	0	14	513
5:45 - 6:00	0	148	28	0	176	16	301	13	0	330	38	0	6	0	44	17	0	3	0	20	570
6:00 - 6:15	0	156	16	0	172	17	220	9	0	246	26	0	9	1	36	19	1	3	0	23	477
6:15 - 6:30	1	164	20	0	185	22	248	9	0	279	27	1	7	0	35	17	1	6	0	24	523
6:30 - 6:45	0	152	30	0	182	14	203	14	0	231	15	1	10	0	26	11	0	5	0	16	455
6:45 - 7:00	0	128	20	0	148	10	145	10	0	165	21	2	5	0	28	13	1	7	0	21	362
13 Hr Totals	10	7067	766	0	7843	542	7637	412	6	8597	909	22	284	3	1218	630	22	224	0	876	18534

TOTALS TURNING MOVEMENT COUNT - SUMMARY

Counted by: VCU
Intersection of: MD 108 Date: April 26, 2017 Wednesday
and: Linden Lithincum Lane Weather: Cool, Light Rain
Location: Howard County, Maryland Entered by: BGJ Star Rating: 4

TIME	TRAFFIC FROM NORTH on: MD 108					TRAFFIC FROM SOUTH on: MD 108					TRAFFIC FROM EAST on: Linden Lithincum Lane					TRAFFIC FROM WEST on: Freestate Gas Station					TOTAL N + S + E + W
	RIGHT	THRU	LEFT	U-TN	TOTAL	RIGHT	THRU	LEFT	U-TN	TOTAL	RIGHT	THRU	LEFT	U-TN	TOTAL	RIGHT	THRU	LEFT	U-TN	TOTAL	
1 Hr Totals																					
6:30 - 7:30	0	723	37	0	760	24	541	10	0	575	103	1	19	0	123	20	3	5	0	28	1486
6:45 - 7:45	0	832	45	0	877	32	615	14	0	661	100	1	18	0	119	24	2	10	0	36	1693
7:00 - 8:00	0	877	47	0	924	31	658	16	0	705	100	1	23	0	124	33	1	10	0	44	1797
7:15 - 8:15	0	889	38	0	927	30	570	21	0	621	67	1	23	0	91	41	1	10	0	52	1691
7:30 - 8:30	0	863	36	0	899	27	515	25	0	567	44	0	24	0	68	46	0	9	0	55	1589
7:45 - 8:45	0	827	45	0	872	25	476	22	0	523	40	0	26	0	66	46	0	6	0	52	1513
8:00 - 9:00	0	809	57	0	866	30	413	25	0	468	37	0	22	0	59	46	0	7	0	53	1446
8:15 - 9:15	0	758	80	0	838	35	440	23	0	498	72	0	20	0	92	48	1	7	0	56	1484
8:30 - 9:30	1	714	114	0	829	42	451	23	2	518	90	0	22	0	112	44	1	10	0	55	1514
8:45 - 9:45	1	637	104	0	742	43	451	24	2	520	95	0	20	0	115	46	1	12	0	59	1436
9:00 - 10:00	3	538	97	0	638	43	456	22	3	524	91	0	21	0	112	42	1	12	0	55	1329
9:15 - 10:15	3	464	75	0	542	33	402	24	3	462	54	1	25	0	80	43	3	17	0	63	1147
9:30 - 10:30	2	409	36	0	447	34	378	20	2	434	43	1	24	0	68	46	3	14	0	63	1012
9:45 - 10:45	2	408	43	0	453	37	380	32	2	451	50	1	27	0	78	50	3	14	0	67	1049
10:00 - 11:00	0	420	46	0	466	42	373	38	1	454	63	1	32	0	96	56	3	15	0	74	1090
10:15 - 11:15	0	428	41	0	469	42	370	40	1	453	61	2	32	0	95	55	0	18	0	73	1090
10:30 - 11:30	0	439	44	0	483	38	388	43	0	469	60	3	34	0	97	54	1	22	0	77	1126
10:45 - 11:45	0	437	36	0	473	35	375	35	0	445	52	3	31	0	86	53	1	25	0	79	1083
11:00 - 12:00	1	440	27	0	468	32	370	31	0	433	44	4	29	0	77	52	1	25	0	78	1056
11:15 - 12:15	1	452	32	0	485	34	399	37	0	470	58	3	26	0	87	60	1	23	0	84	1126
11:30 - 12:30	1	444	32	0	477	33	401	41	0	475	59	4	29	0	92	62	2	23	0	87	1131
11:45 - 12:45	1	439	32	0	472	31	459	45	0	535	65	4	35	0	104	62	2	21	0	85	1196
12:00 - 1:00	0	447	29	0	476	28	466	48	0	542	63	4	31	0	98	62	3	22	0	87	1203
12:15 - 1:15	0	436	25	0	461	24	455	40	1	520	51	5	27	0	83	53	4	26	0	83	1147
12:30 - 1:30	0	426	25	0	451	20	448	35	1	504	42	3	19	0	64	50	2	26	0	78	1097
12:45 - 1:45	0	424	25	0	449	23	425	35	1	484	40	3	14	0	57	45	2	28	0	75	1065
1:00 - 2:00	1	397	32	0	430	26	424	31	1	482	44	2	16	0	62	41	1	27	0	69	1043
1:15 - 2:15	1	411	41	0	453	33	475	33	0	541	49	1	20	1	71	39	0	23	0	62	1127
1:30 - 2:30	2	495	64	0	561	40	514	37	0	591	57	3	17	1	78	47	1	26	0	74	1304
1:45 - 2:45	2	509	70	0	581	36	512	37	0	585	53	4	14	1	72	56	2	31	0	89	1327
2:00 - 3:00	1	537	75	0	613	32	551	41	0	624	47	4	12	2	65	53	3	29	0	85	1387
2:15 - 3:15	1	535	73	0	609	25	560	40	0	625	49	5	13	1	68	57	3	28	0	88	1390
2:30 - 3:30	0	469	58	0	527	23	611	37	1	672	41	3	16	1	61	55	3	25	0	83	1343
2:45 - 3:45	0	493	60	0	553	32	690	33	1	756	63	2	18	1	84	54	2	18	0	74	1467
3:00 - 4:00	2	533	86	0	621	42	763	30	1	836	92	2	16	0	110	60	1	20	0	81	1648
3:15 - 4:15	2	587	106	0	695	61	850	35	1	947	98	0	13	0	111	61	2	19	0	82	1835
3:30 - 4:30	2	613	108	0	723	74	901	37	0	1012	108	0	15	0	123	62	1	19	0	82	1940
3:45 - 4:45	2	636	120	0	758	81	946	40	0	1067	97	0	15	0	112	62	1	19	0	82	2019
4:00 - 5:00	0	606	97	0	703	84	1029	46	0	1159	88	0	16	0	104	67	2	19	0	88	2054
4:15 - 5:15	0	580	82	0	662	85	1072	43	0	1200	93	0	21	0	114	62	2	21	0	85	2061
4:30 - 5:30	0	584	81	0	665	84	1093	40	0	1217	110	0	24	0	134	56	2	18	0	76	2092
4:45 - 5:45	1	560	70	0	631	86	1124	38	0	1248	115	0	23	0	138	49	2	16	0	67	2084
5:00 - 6:00	1	575	80	0	656	83	1129	38	0	1250	125	0	26	0	151	47	1	15	0	63	2120
5:15 - 6:15	1	589	78	0	668	77	1061	38	0	1176	125	0	27	1	153	57	1	11	0	69	2066
5:30 - 6:30	2	608	81	0	691	79	1048	40	0	1167	116	1	26	1	144	64	2	15	0	81	2083
5:45 - 6:45	1	620	94	0	715	69	972	45	0	1086	106	2	32	1	141	64	2	17	0	83	2025
6:00 - 7:00	1	600	86	0	687	63	816	42	0	921	89	4	31	1	125	60	3	21	0	84	1817
PEAK HOUR																					
7:00 - 8:00	0	877	47	0	924	31	658	16	0	705	100	1	23	0	124	33	1	10	0	44	1797
5:00 - 6:00	1	575	80	0	656	83	1129	38	0	1250	125	0	26	0	151	47	1	15	0	63	2120

PEDESTRIAN AND BICYCLE OBSERVATIONS - SUMMARY

Counted by: VCU

Intersection of: MD 108
and: Linden Lithincum Lane
Location: Howard County, Maryland

Date: April 26, 2017
Weather: Cool, Light Rain
Entered by: BGJ

Wednesday

Star Rating: 4

TIME	NORTH LEG MD 108 Pedestrians	NORTH LEG MD 108 Bicycles	SOUTH LEG MD 108 Pedestrians	SOUTH LEG MD 108 Bicycles
AM				
6:30 - 6:45	0	0	0	0
6:45 - 7:00	0	0	0	0
7:00 - 7:15	0	0	0	0
7:15 - 7:30	0	0	0	0
7:30 - 7:45	0	0	0	0
7:45 - 8:00	0	0	0	0
8:00 - 8:15	0	0	0	0
8:15 - 8:30	0	0	0	0
8:30 - 8:45	0	0	0	0
8:45 - 9:00	0	0	0	0
9:00 - 9:15	0	0	0	0
9:15 - 9:30	0	0	0	0
9:30 - 9:45	0	0	0	0
9:45 - 10:00	0	0	0	0
10:00 - 10:15	0	0	0	0
10:15 - 10:30	0	0	1	0
10:30 - 10:45	0	0	0	0
10:45 - 11:00	0	0	0	0
11:00 - 11:15	0	0	0	0
11:15 - 11:30	0	0	0	0
11:30 - 11:45	0	0	0	0
11:45 - 12:00	0	0	0	0
12:00 - 12:15	0	0	0	0
12:15 - 12:30	0	0	0	0
12:30 - 12:45	0	0	0	0
12:45 - 1:00	0	0	0	0
1:00 - 1:15	0	0	0	0
1:15 - 1:30	0	0	0	0
1:30 - 1:45	0	0	0	0
1:45 - 2:00	0	0	0	0
2:00 - 2:15	0	0	0	0
2:15 - 2:30	0	0	0	0
2:30 - 2:45	0	0	1	0
2:45 - 3:00	0	0	0	0
3:00 - 3:15	0	0	0	0
3:15 - 3:30	0	0	0	0
3:30 - 3:45	0	0	0	0
3:45 - 4:00	0	0	0	0
4:00 - 4:15	0	0	0	0
4:15 - 4:30	0	0	0	0
4:30 - 4:45	0	0	0	0
4:45 - 5:00	0	0	0	0
5:00 - 5:15	0	0	0	0
5:15 - 5:30	0	0	0	0
5:30 - 5:45	0	0	0	0
5:45 - 6:00	0	0	0	0
6:00 - 6:15	0	0	0	0
6:15 - 6:30	0	0	0	0
6:30 - 6:45	0	0	0	0
6:45 - 7:00	0	0	0	0
TOTALS	0	0	2	0

PEDESTRIAN AND BICYCLE OBSERVATIONS - SUMMARY

Counted by: VCU

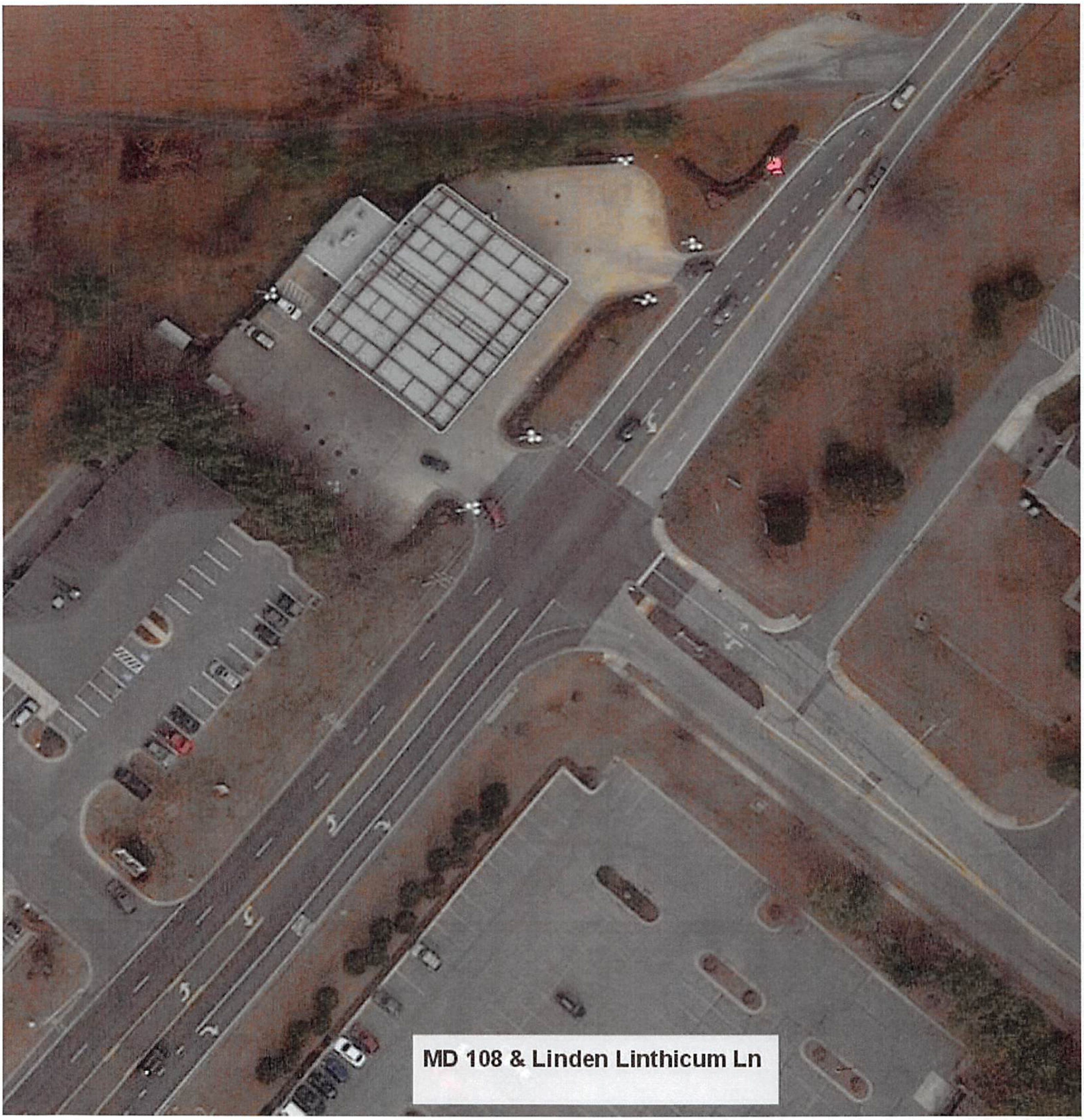
Intersection of: MD 108
and: Linden Lithincum Lane
Location: Howard County, Maryland

Date: April 26, 2017
Weather: Cool, Light Rain
Entered by: BGJ

Wednesday

Star Rating: 4

	EAST LEG Linden Lithincum Lane		WEST LEG Freestate Gas Station	
	Pedestrians	Bicycles	Pedestrians	Bicycles
AM				
6:30 - 6:45	0	0	0	0
6:45 - 7:00	0	0	0	0
7:00 - 7:15	0	0	0	0
7:15 - 7:30	0	0	0	0
7:30 - 7:45	0	0	0	0
7:45 - 8:00	0	0	0	0
8:00 - 8:15	0	0	0	0
8:15 - 8:30	0	0	0	0
8:30 - 8:45	0	0	0	0
8:45 - 9:00	0	0	0	0
9:00 - 9:15	0	0	0	0
9:15 - 9:30	0	0	0	0
9:30 - 9:45	0	0	0	0
9:45 - 10:00	0	0	0	0
10:00 - 10:15	0	0	0	0
10:15 - 10:30	0	0	0	0
10:30 - 10:45	0	0	0	0
10:45 - 11:00	0	0	0	0
11:00 - 11:15	0	0	0	0
11:15 - 11:30	0	0	0	0
11:30 - 11:45	0	0	0	0
11:45 - 12:00	0	0	0	0
12:00 - 12:15	0	0	0	0
12:15 - 12:30	0	0	0	0
12:30 - 12:45	0	0	0	0
12:45 - 1:00	0	0	0	0
1:00 - 1:15	0	0	0	0
1:15 - 1:30	0	0	0	0
1:30 - 1:45	0	0	0	0
1:45 - 2:00	0	0	0	0
2:00 - 2:15	0	0	0	0
2:15 - 2:30	0	0	0	0
2:30 - 2:45	0	0	0	0
2:45 - 3:00	0	0	0	0
3:00 - 3:15	0	0	0	0
3:15 - 3:30	0	0	0	0
3:30 - 3:45	0	0	0	0
3:45 - 4:00	0	0	0	0
4:00 - 4:15	0	0	0	0
4:15 - 4:30	0	0	0	0
4:30 - 4:45	1	0	0	0
4:45 - 5:00	0	0	0	0
5:00 - 5:15	0	0	0	0
5:15 - 5:30	0	0	0	0
5:30 - 5:45	0	0	0	0
5:45 - 6:00	0	0	0	0
6:00 - 6:15	0	0	0	0
6:15 - 6:30	0	0	0	0
6:30 - 6:45	0	0	0	0
6:45 - 7:00	0	0	0	0
TOTALS	1	0	0	0



MD 108 & Linden Linthicum Ln

APPENDIX C

Intersection Capacity Analysis Worksheets

CLV Worksheets

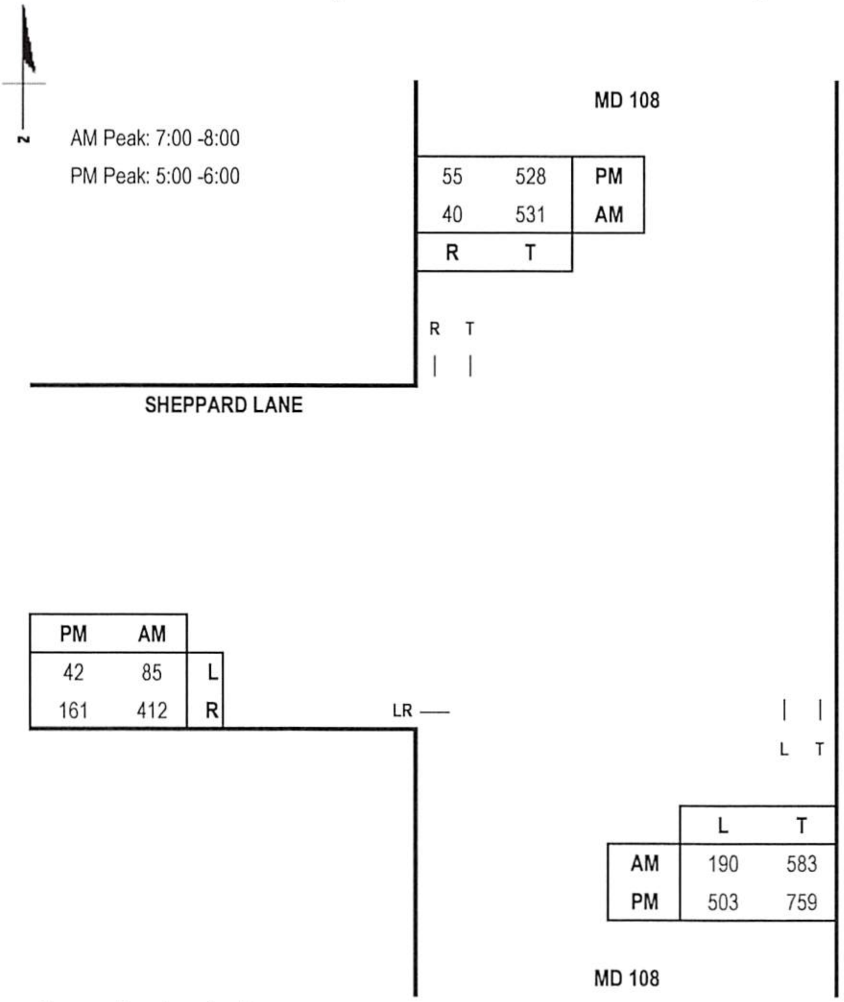
rh, 170302\initial\clv\1.xls-clv, f05/23/17

CRITICAL LANE VOLUME (CLV) METHODOLOGY
for MSHA

E/W Road Name: Sheppard Lane
N/S Road Name: MD 108
Conditions: Existing Traffic

Date of Count: 4/26/2017
Day of Count: Wednesday
Analyst: Richard Huang

AM Peak: 7:00 -8:00
PM Peak: 5:00 -6:00



55	528	**PM**
40	531	**AM**
R	**T**	

PM	**AM**	
42	85	**L**
161	412	**R**

	L	**T**
AM	190	583
PM	503	759

Capacity Analysis

Morning Peak Hour

	Thru Volumes			+ Opposing Lefts			AM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
EB	497	1.00	497				497
NB	583	1.00	583				721
SB	531	1.00	531	190	1.00	190	

CLV TOTAL= **1,218**

Level of Service (LOS)= **C**

CLV V/C =0.76

Evening Peak Hour

	Thru Volumes			+ Opposing Lefts			PM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
EB	203	1.00	203				203
NB	759	1.00	759				1031
SB	528	1.00	528	503	1.00	503	

CLV TOTAL= **1,234**

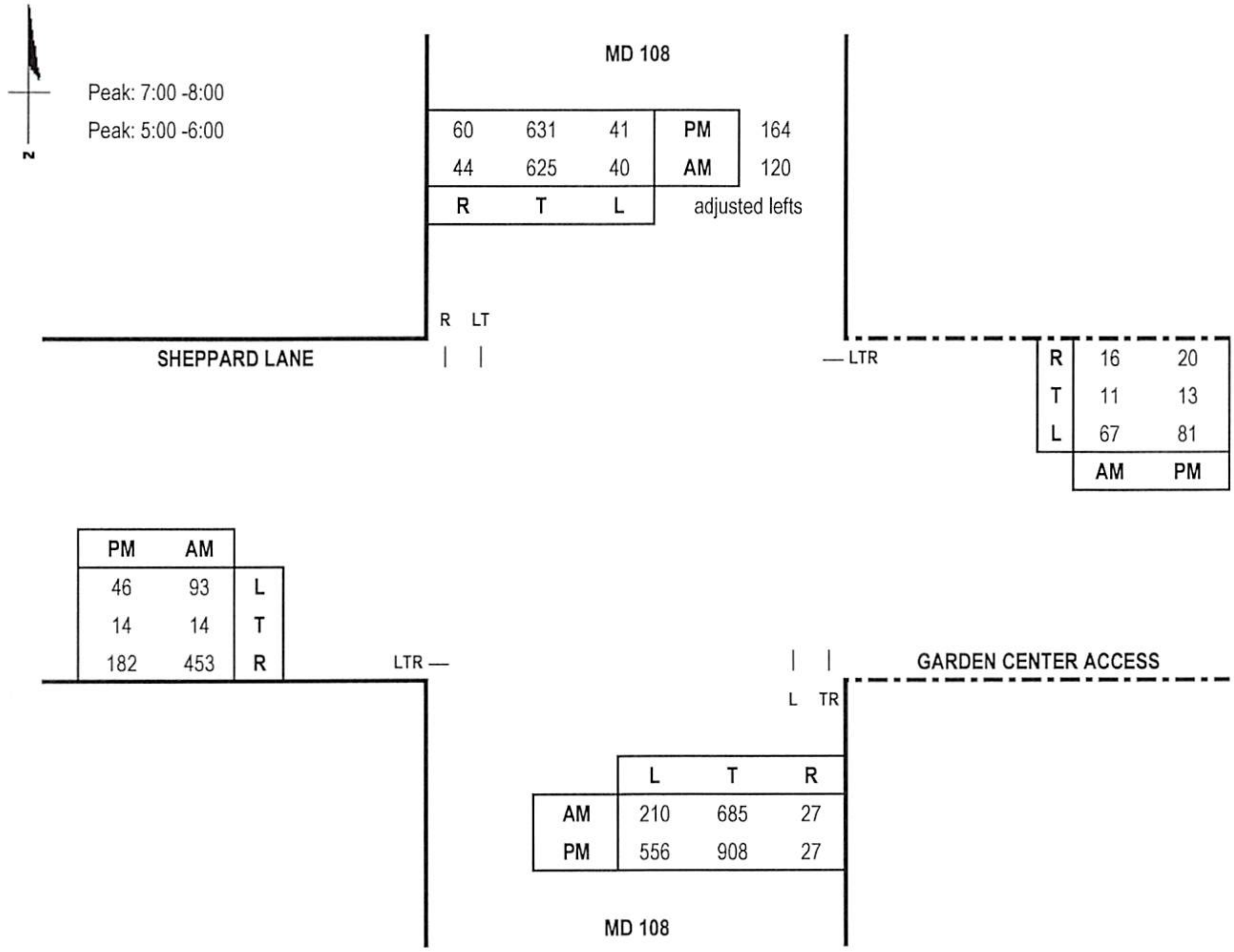
Level of Service (LOS)= **C**

CLV V/C =0.77

Scenario ID - EXIST1

CRITICAL LANE VOLUME (CLV) METHODOLOGY
for MSHA

E/W Road: Garden Center Access/Sheppard Lane **Date of Count:** 4/26/2017
N/S Road: MD 108 **Day of Week:** Wednesday
Conditions: 2023 Background Traffic **Analyst:** Richard Huang



Peak: 7:00 -8:00
Peak: 5:00 -6:00

R	T	L		
60	631	41	PM	164
44	625	40	AM	120
				adjusted lefts

	AM	PM
R	16	20
T	11	13
L	67	81

PM	AM	
46	93	L
14	14	T
182	453	R

	L	T	R
AM	210	685	27
PM	556	908	27

Capacity Analysis - East/West Split

Morning Peak Hour

	Thru Volumes			+ Opposing Lefts			AM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
EB	560	1.00	560				560
WB	94	1.00	94				94
NB	712	1.00	712	40	1.00	40	955
SB	745	1.00	745	210	1.00	210	

CLV TOTAL= **1,609**
Level of Service (LOS)= F

Evening Peak Hour

	Thru Volumes			+ Opposing Lefts			PM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
EB	242	1.00	242				242
WB	114	1.00	114				114
NB	935	1.00	935	41	1.00	41	1351
SB	795	1.00	795	556	1.00	556	

CLV TOTAL= **1,707**
Level of Service (LOS)= F

Scenario ID - BACK11

AM V/C =1.01

PM V/C =1.07

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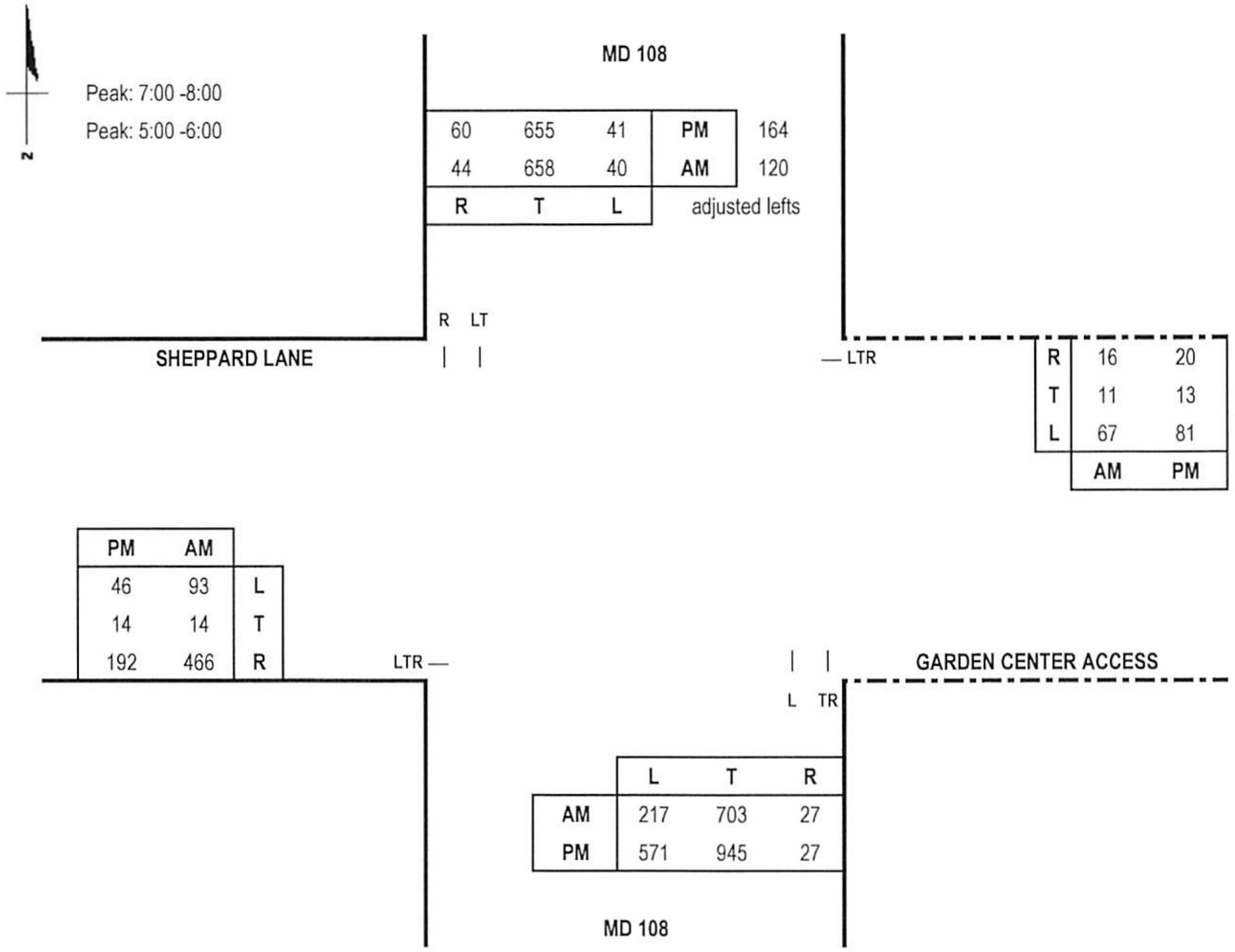
CRITICAL LANE VOLUME (CLV) METHODOLOGY

for MSHA

E/W Road: Garden Center Access/Sheppard Lane
N/S Road: MD 108
Conditions: 2023 Total Traffic

Date of Count: 4/26/2017
Day of Week: Wednesday
Analyst: Richard Huang



Peak: 7:00 -8:00
Peak: 5:00 -6:00

R	T	L		
60	655	41	PM	164
44	658	40	AM	120
				adjusted lefts

	AM	PM
R	16	20
T	11	13
L	67	81

PM	AM	
46	93	L
14	14	T
192	466	R

	L	T	R
AM	217	703	27
PM	571	945	27

Capacity Analysis - East/West Split

Morning Peak Hour

	Thru Volumes			+ Opposing Lefts			AM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
EB	573	1.00	573				573
WB	94	1.00	94				94
NB	730	1.00	730	40	1.00	40	995
SB	778	1.00	778	217	1.00	217	

CLV TOTAL= 1,662
Level of Service (LOS)= F

Evening Peak Hour

	Thru Volumes			+ Opposing Lefts			PM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
EB	252	1.00	252				252
WB	114	1.00	114				114
NB	972	1.00	972	41	1.00	41	1390
SB	819	1.00	819	571	1.00	571	

CLV TOTAL= 1,756
Level of Service (LOS)= F

Scenario ID - TOT11

AM V/C =1.04

PM V/C =1.1

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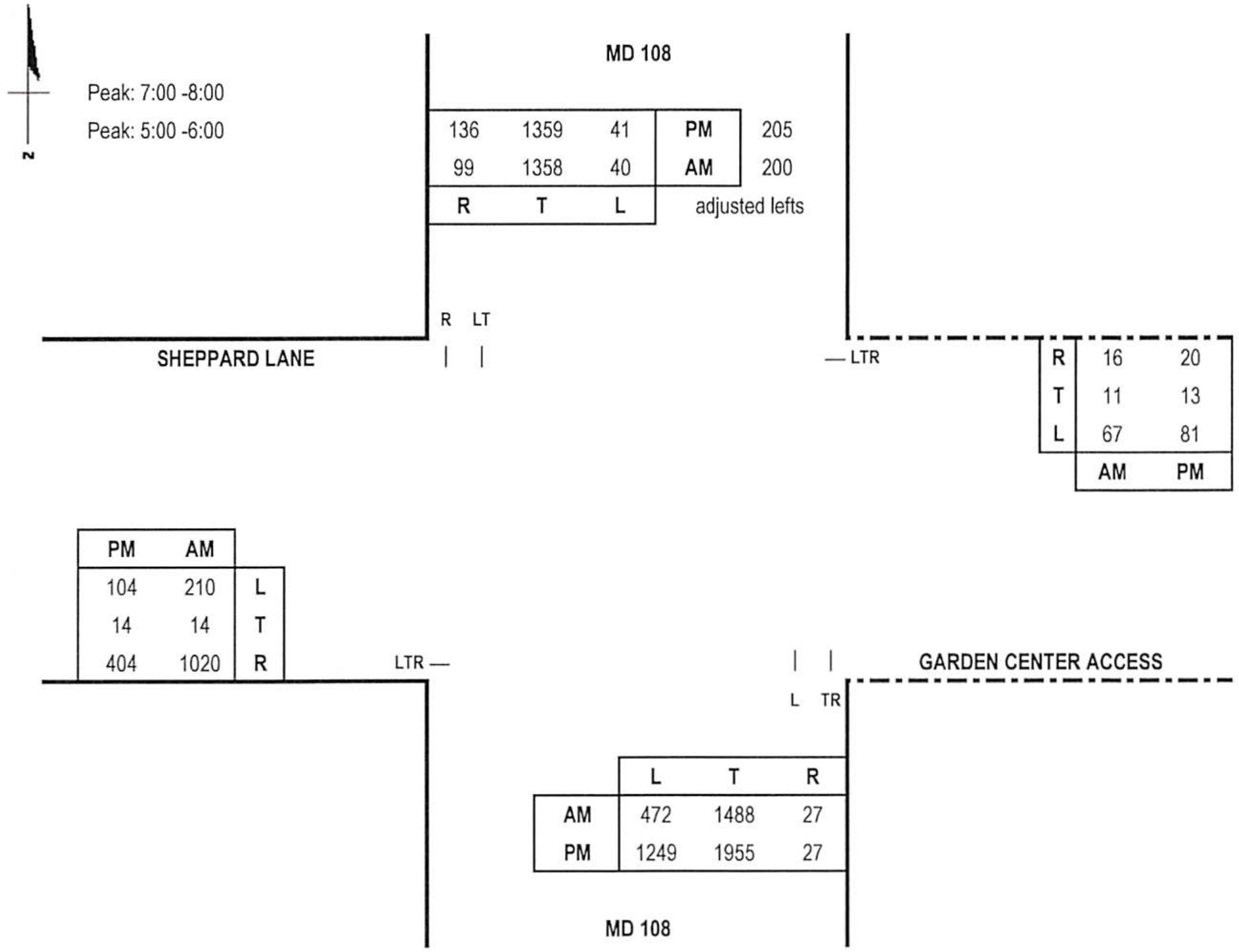
CRITICAL LANE VOLUME (CLV) METHODOLOGY
for MSHA

E/W Road: Garden Center Access/Sheppard Lane **Date of Count:** 4/26/2017
N/S Road: MD 108 **Day of Week:** Wednesday
Conditions: 2037 Background Traffic **Analyst:** Richard Huang



R	T	L		adjusted lefts
136	1359	41	PM	205
99	1358	40	AM	200

	AM	PM
R	16	20
T	11	13
L	67	81

PM	AM	
104	210	L
14	14	T
404	1020	R

	L	T	R
AM	472	1488	27
PM	1249	1955	27

Capacity Analysis - East/West Split

Morning Peak Hour

	Thru Volumes			+ Opposing Lefts			AM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
EB	1244	1.00	1244				1244
WB	94	1.00	94				94
NB	1515	1.00	1515	40	1.00	40	2030
SB	1558	1.00	1558	472	1.00	472	

CLV TOTAL= 3,368
Level of Service (LOS)= F
AM V/C =2.11

Evening Peak Hour

	Thru Volumes			+ Opposing Lefts			PM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
EB	522	1.00	522				522
WB	114	1.00	114				114
NB	1982	1.00	1982	41	1.00	41	2813
SB	1564	1.00	1564	1249	1.00	1249	

CLV TOTAL= 3,449
Level of Service (LOS)= F
PM V/C =2.16

Scenario ID - BACK21

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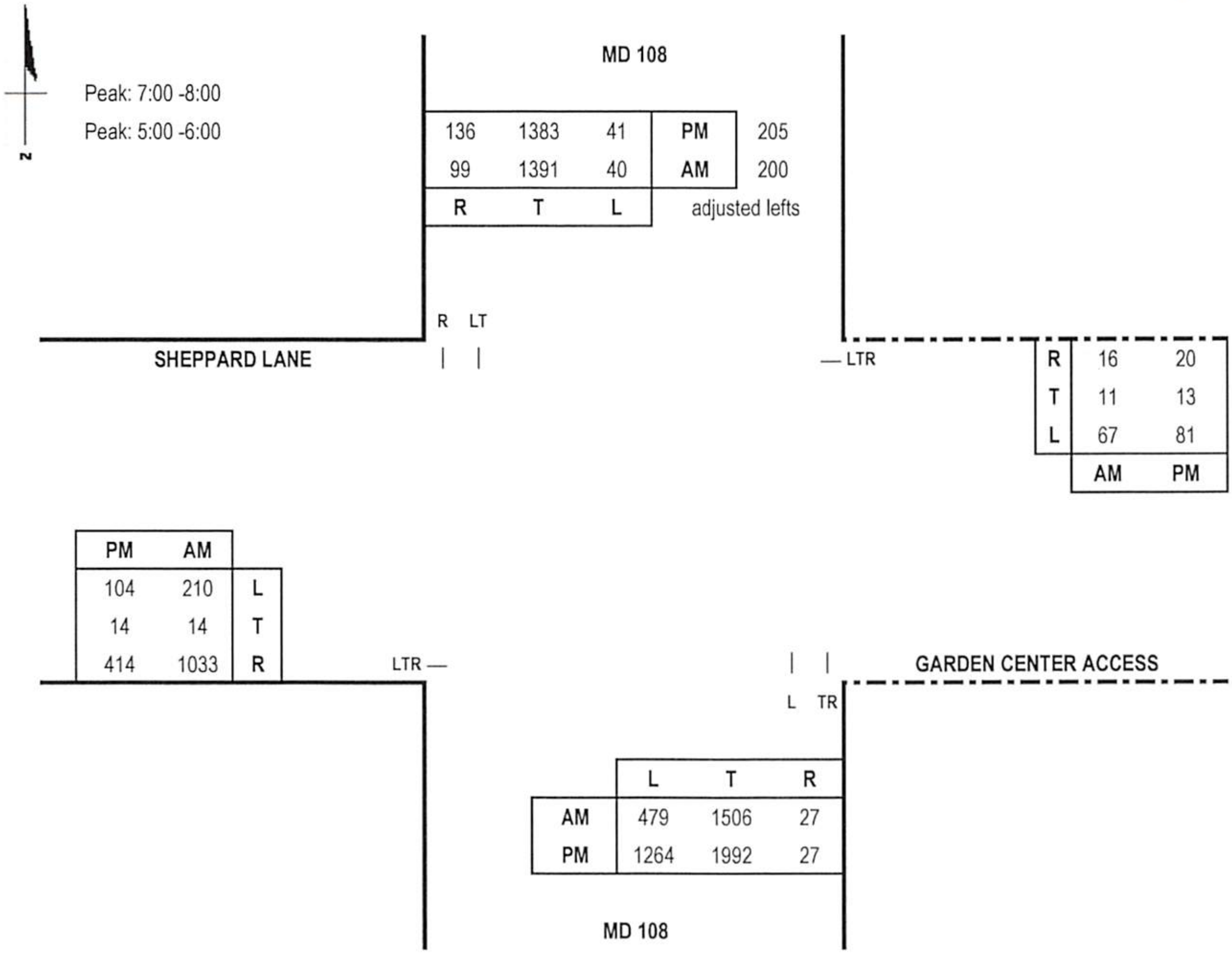
CRITICAL LANE VOLUME (CLV) METHODOLOGY
for MSHA

E/W Road: Garden Center Access/Sheppard Lane **Date of Count:** 4/26/2017
N/S Road: MD 108 **Day of Week:** Wednesday
Conditions: 2037 Total Traffic **Analyst:** Richard Huang



Capacity Analysis - East/West Split

Morning Peak Hour

	Thru Volumes			+ Opposing Lefts			AM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
EB	1257	1.00	1257				1257
WB	94	1.00	94				94
NB	1533	1.00	1533	40	1.00	40	2070
SB	1591	1.00	1591	479	1.00	479	

CLV TOTAL= 3,421

Level of Service (LOS)= F

Evening Peak Hour

	Thru Volumes			+ Opposing Lefts			PM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
EB	532	1.00	532				532
WB	114	1.00	114				114
NB	2019	1.00	2019	41	1.00	41	2852
SB	1588	1.00	1588	1264	1.00	1264	

CLV TOTAL= 3,498

Level of Service (LOS)= F

Scenario ID - TOT21

AM V/C =2.14

PM V/C =2.19

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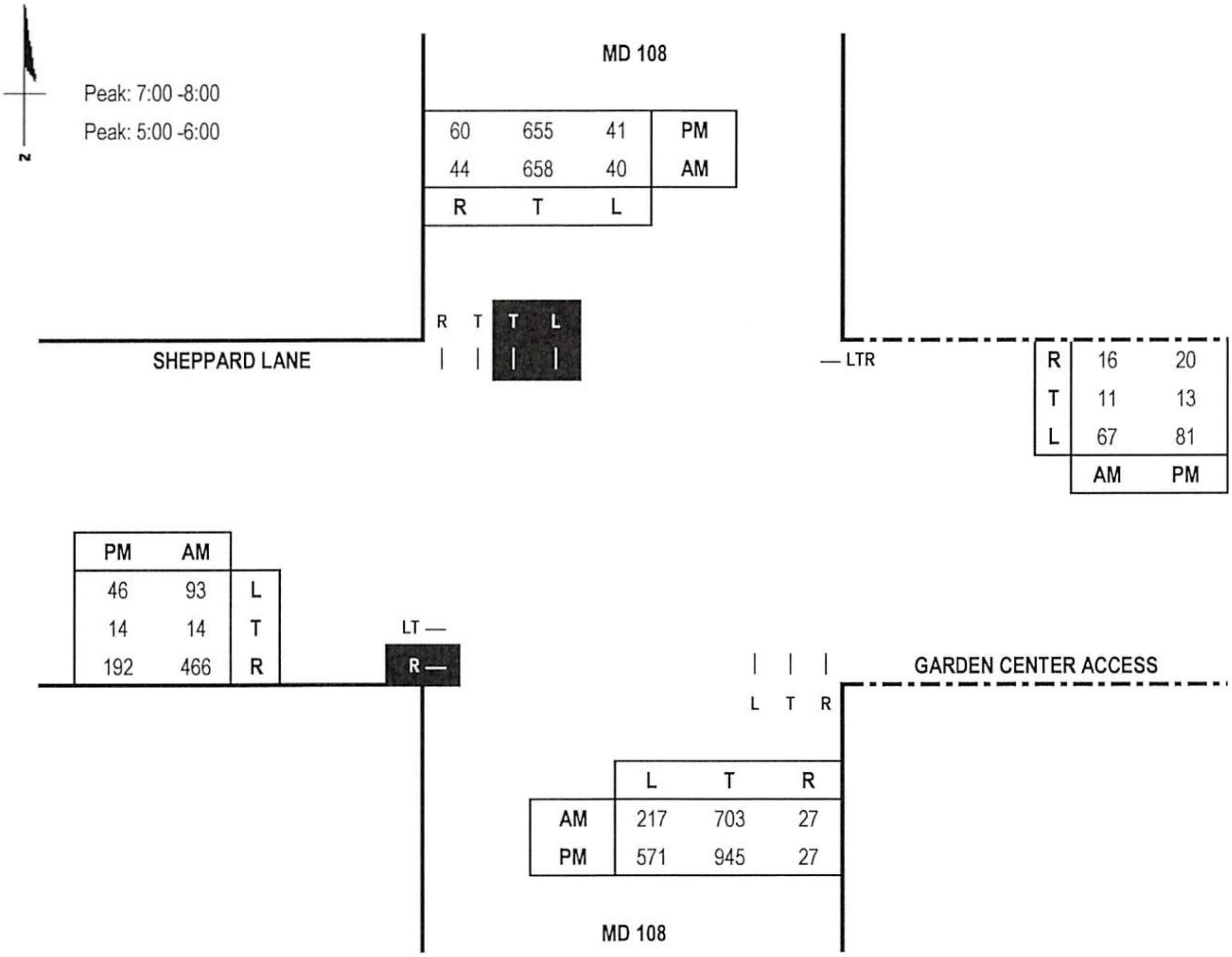
CRITICAL LANE VOLUME (CLV) METHODOLOGY
for MSHA

E/W Road: Sheppard Lane/Garden Center
N/S Road: MD 108
Conditions: 2023 Total Traffic w/imp

Date of Count: 4/26/2017
Day of Week: Wednesday
Analyst: Richard Huang



60	655	41	PM
44	658	40	AM
R	T	L	

R	16	20
T	11	13
L	67	81
	AM	PM

PM	AM	
46	93	L
14	14	T
192	466	R

	L	T	R
AM	217	703	27
PM	571	945	27

Capacity Analysis - East/West Split

Morning Peak Hour

	Thru Volumes			+ Opposing Lefts			AM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
EB	249	1.00	249				249
WB	94	1.00	94				94
NB	703	1.00	703	40	1.00	40	743
SB	658	0.55	362	217	1.00	217	

CLV TOTAL= 1,086
Level of Service (LOS)= B
AM V/C =0.68

Evening Peak Hour

	Thru Volumes			+ Opposing Lefts			PM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
EB	60	1.00	60				60
WB	114	1.00	114				114
NB	945	1.00	945	41	1.00	41	986
SB	655	0.55	360	571	1.00	571	

CLV TOTAL= 1,160
Level of Service (LOS)= C
PM V/C =0.73

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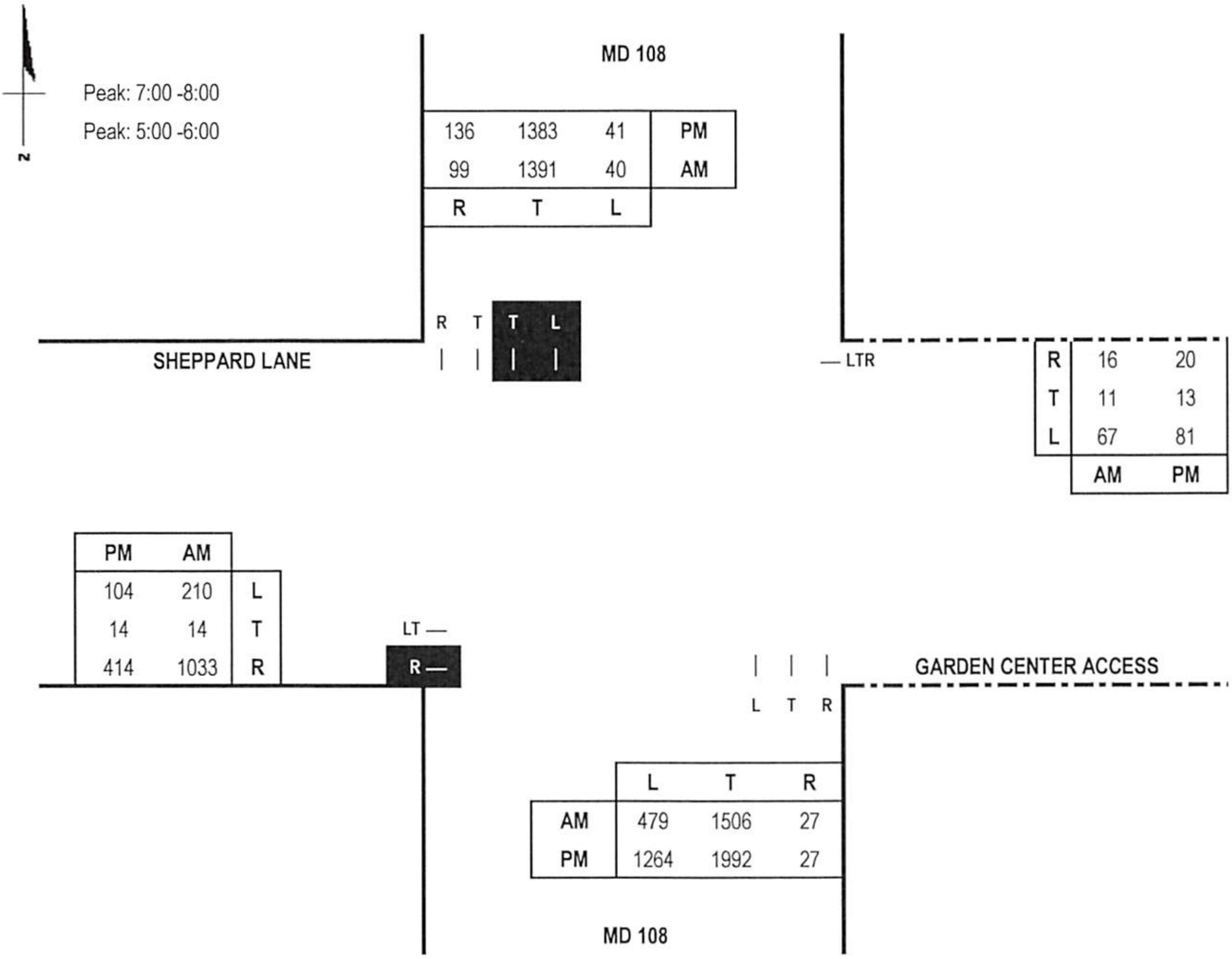
CRITICAL LANE VOLUME (CLV) METHODOLOGY
for MSHA

E/W Road: Sheppard Lane/Garden Center
N/S Road: MD 108
Conditions: 2037 Total Traffic w/imp

Date of Count: 4/26/2017
Day of Week: Wednesday
Analyst: Richard Huang



Peak: 7:00 -8:00
Peak: 5:00 -6:00

R	T	L	
136	1383	41	PM
99	1391	40	AM

	AM	PM
R	16	20
T	11	13
L	67	81

PM	AM	
104	210	L
14	14	T
414	1033	R

	L	T	R
AM	479	1506	27
PM	1264	1992	27

Capacity Analysis - East/West Split

Morning Peak Hour

	Thru Volumes			+ Opposing Lefts			AM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
EB	554	1.00	554				554
WB	94	1.00	94				94
NB	1506	1.00	1506	40	1.00	40	1546
SB	1391	0.55	765	479	1.00	479	

CLV TOTAL= 2,194
Level of Service (LOS)= F
AM V/C =1.37

Evening Peak Hour

	Thru Volumes			+ Opposing Lefts			PM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
EB	118	1.00	118				118
WB	114	1.00	114				114
NB	1992	1.00	1992	41	1.00	41	2033
SB	1383	0.55	761	1264	1.00	1264	

CLV TOTAL= 2,265
Level of Service (LOS)= F
PM V/C =1.42

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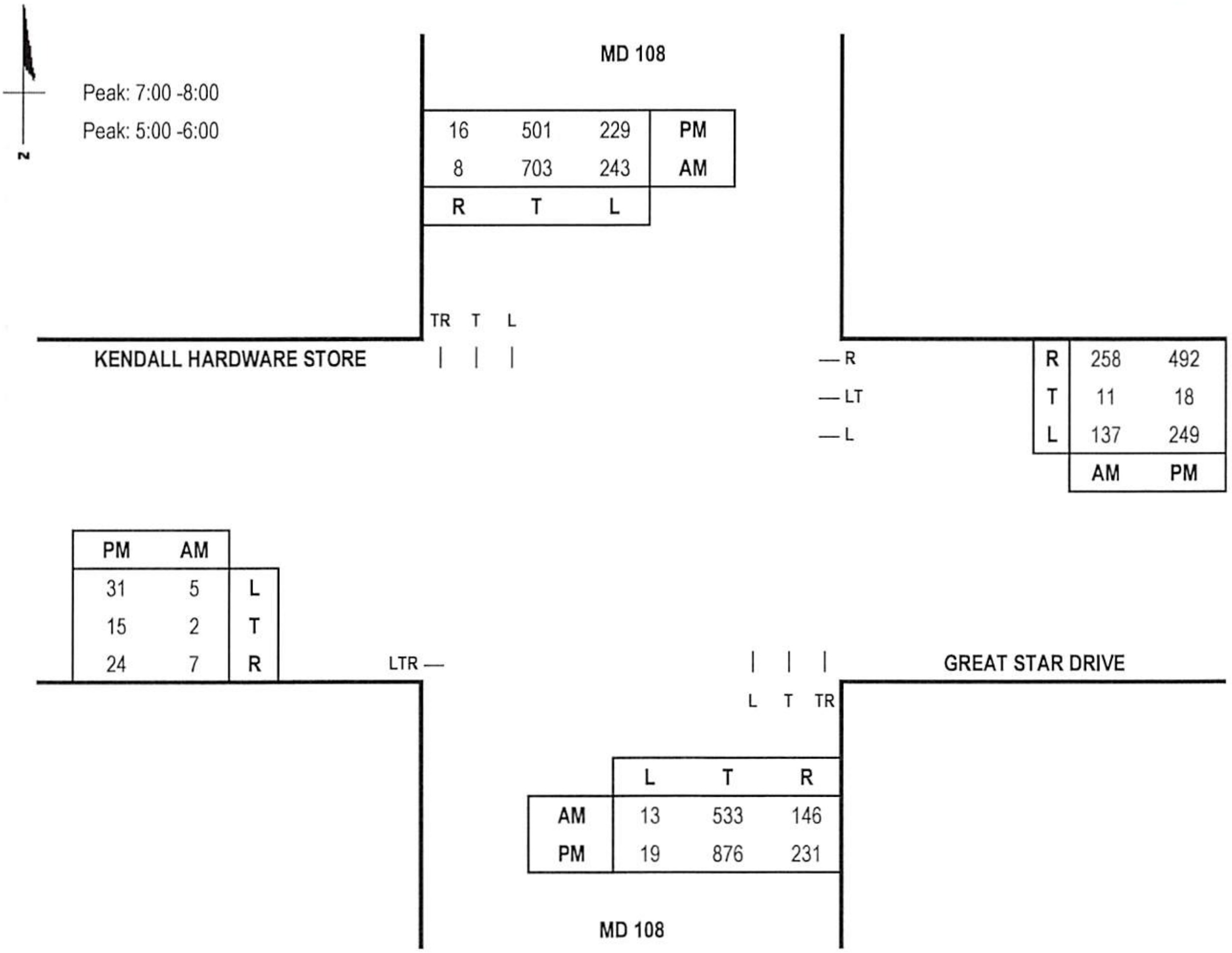
CRITICAL LANE VOLUME (CLV) METHODOLOGY
for MSHA

E/W Road: Great Star Drive/Kendall Hardware Store **Date of Count:** 4/26/2017
N/S Road: MD 108 **Day of Week:** Wednesday
Conditions: Existing Traffic **Analyst:** Richard Huang



Capacity Analysis - East/West Split

Morning Peak Hour							
	Thru Volumes			+ Opposing Lefts			AM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
EB	14	1.00	14				14
WB	148	0.60	89				89
NB	679	0.55	373	243	1.00	243	616
SB	711	0.55	391	13	1.00	13	

CLV TOTAL= 719
Level of Service (LOS)= A
AM V/C =0.45

Evening Peak Hour							
	Thru Volumes			+ Opposing Lefts			PM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
EB	70	1.00	70				70
WB	263	1.00	263				263
NB	1107	0.55	609	229	1.00	229	838
SB	517	0.55	284	19	1.00	19	

CLV TOTAL= 1,171
Level of Service (LOS)= C
PM V/C =0.73

Scenario ID - EXIST2

CRITICAL LANE VOLUME (CLV) METHODOLOGY
for MSHA

E/W Road: Great Star Drive/Kendall Hardware Store **Date of Count:** 4/26/2017
N/S Road: MD 108 **Day of Week:** Wednesday
Conditions: 2023 Background Traffic **Analyst:** Richard Huang

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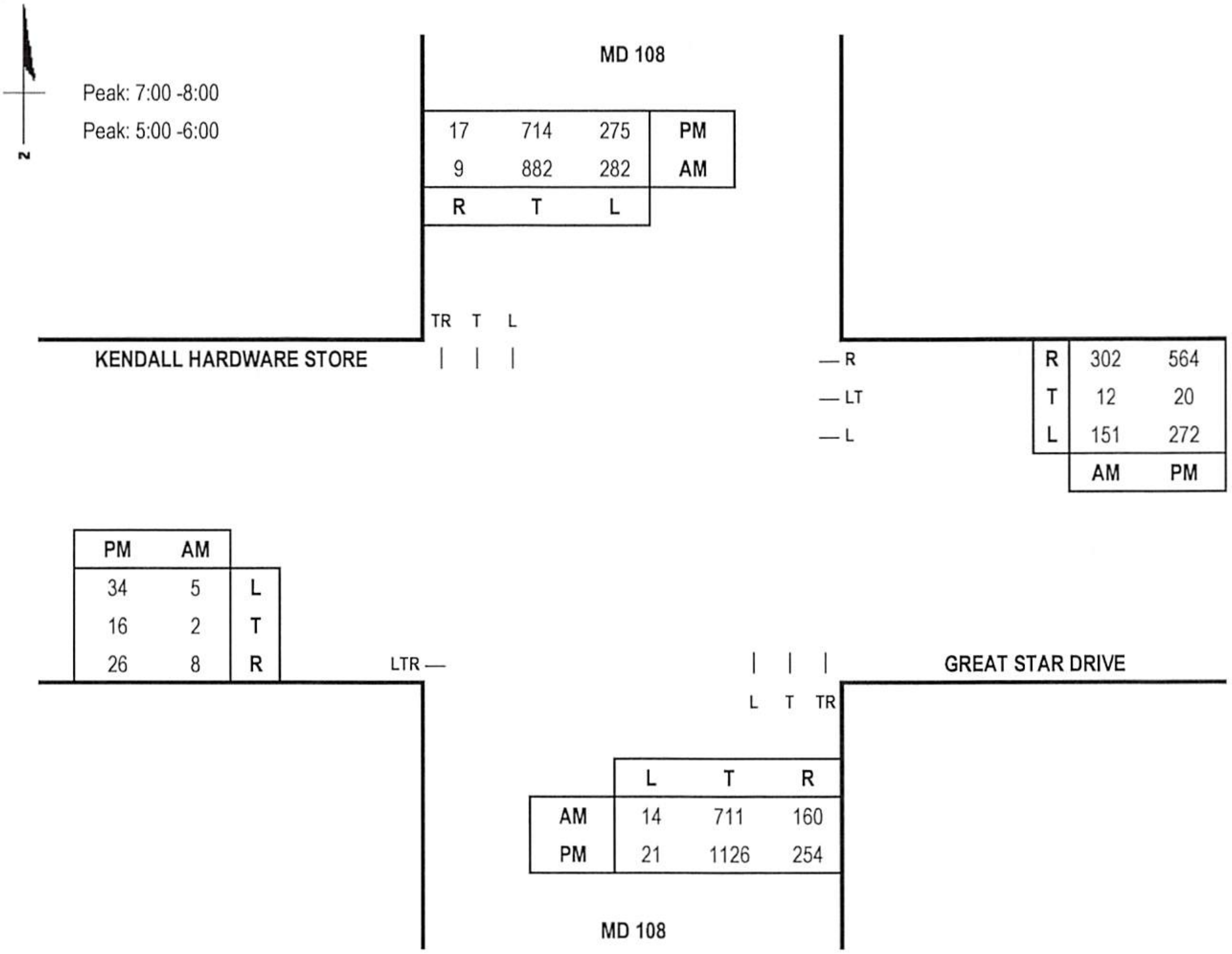
Peak: 7:00 -8:00
Peak: 5:00 -6:00



R	T	L	
17	714	275	PM
9	882	282	AM

	AM	PM
R	302	564
T	12	20
L	151	272

PM	AM	
34	5	L
16	2	T
26	8	R

	L	T	R
AM	14	711	160
PM	21	1126	254

Capacity Analysis - East/West Split

Morning Peak Hour

	Thru Volumes			+ Opposing Lefts			AM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
EB	15	1.00	15				15
WB	163	0.60	98				98
NB	871	0.55	479	282	1.00	282	761
SB	891	0.55	490	14	1.00	14	

CLV TOTAL= **874**
Level of Service (LOS)= A

Evening Peak Hour

	Thru Volumes			+ Opposing Lefts			PM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
EB	76	1.00	76				76
WB	289	1.00	289				289
NB	1380	0.55	759	275	1.00	275	1034
SB	731	0.55	402	21	1.00	21	

CLV TOTAL= **1,399**
Level of Service (LOS)= D

Scenario ID - BACK12 AM V/C =0.55 PM V/C =0.87

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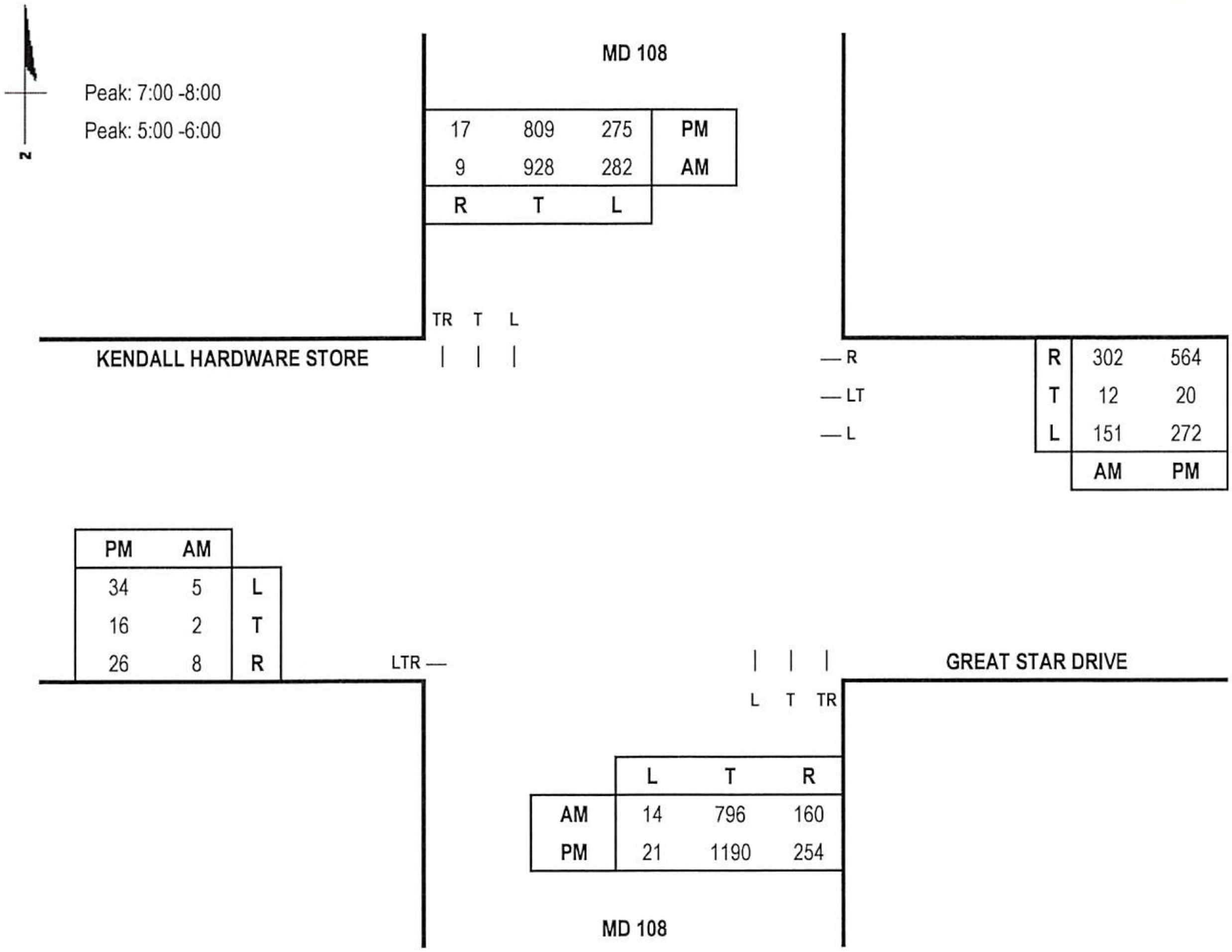
CRITICAL LANE VOLUME (CLV) METHODOLOGY
for MSHA

E/W Road: Great Star Drive/Kendall Hardware Store **Date of Count:** 4/26/2017
N/S Road: MD 108 **Day of Week:** Wednesday
Conditions: 2023 Total Traffic **Analyst:** Richard Huang



17	809	275	**PM**
9	928	282	**AM**
R	**T**	**L**	

R	302	564
T	12	20
L	151	272
	AM	**PM**

PM	**AM**	
34	5	**L**
16	2	**T**
26	8	**R**

	L	**T**	**R**
AM	14	796	160
PM	21	1190	254

Capacity Analysis - East/West Split

Morning Peak Hour

	Thru Volumes			+ Opposing Lefts			**AM**
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	**CLV**
EB	15	1.00	15				15
WB	163	0.60	98				98
NB	956	0.55	526	282	1.00	282	808
SB	937	0.55	515	14	1.00	14	
						CLV TOTAL=	**921**
						Level of Service (LOS)=	**A**

Evening Peak Hour

	Thru Volumes			+ Opposing Lefts			**PM**
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	**CLV**
EB	76	1.00	76				76
WB	289	1.00	289				289
NB	1444	0.55	794	275	1.00	275	1069
SB	826	0.55	454	21	1.00	21	
						CLV TOTAL=	**1,434**
						Level of Service (LOS)=	**D**

Scenario ID - TOT12

AM V/C =0.58

PM V/C =0.9

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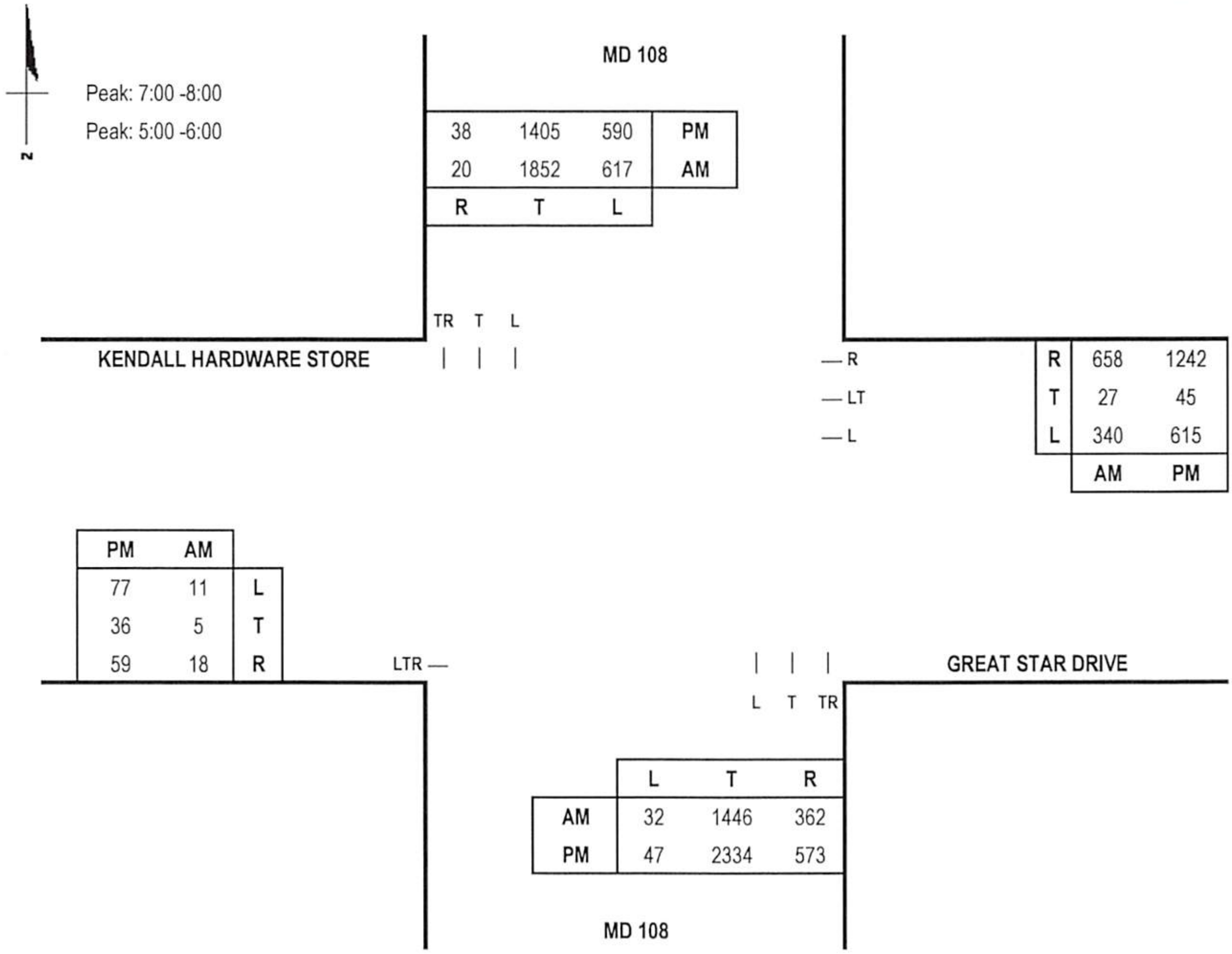
CRITICAL LANE VOLUME (CLV) METHODOLOGY

for MSHA

E/W Road: Great Star Drive/Kendall Hardware Store
Date of Count: 4/26/2017
N/S Road: MD 108
Day of Week: Wednesday
Conditions: 2037 Background Traffic
Analyst: Richard Huang



R	T	L	
38	1405	590	PM
20	1852	617	AM

	AM	PM
R	658	1242
T	27	45
L	340	615

PM	AM	
77	11	L
36	5	T
59	18	R

	L	T	R
AM	32	1446	362
PM	47	2334	573

Capacity Analysis - East/West Split

Morning Peak Hour

	Thru Volumes			+ Opposing Lefts			AM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
EB	34	1.00	34				34
WB	367	0.60	220				220
NB	1808	0.55	994	617	1.00	617	1611
SB	1872	0.55	1030	32	1.00	32	

CLV TOTAL= 1,865

Level of Service (LOS)= F

AM V/C =1.17

Evening Peak Hour

	Thru Volumes			+ Opposing Lefts			PM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
EB	172	1.00	172				172
WB	652	1.00	652				652
NB	2907	0.55	1599	590	1.00	590	2189
SB	1443	0.55	794	47	1.00	47	

CLV TOTAL= 3,013

Level of Service (LOS)= F

PM V/C =1.88

Scenario ID - BACK22

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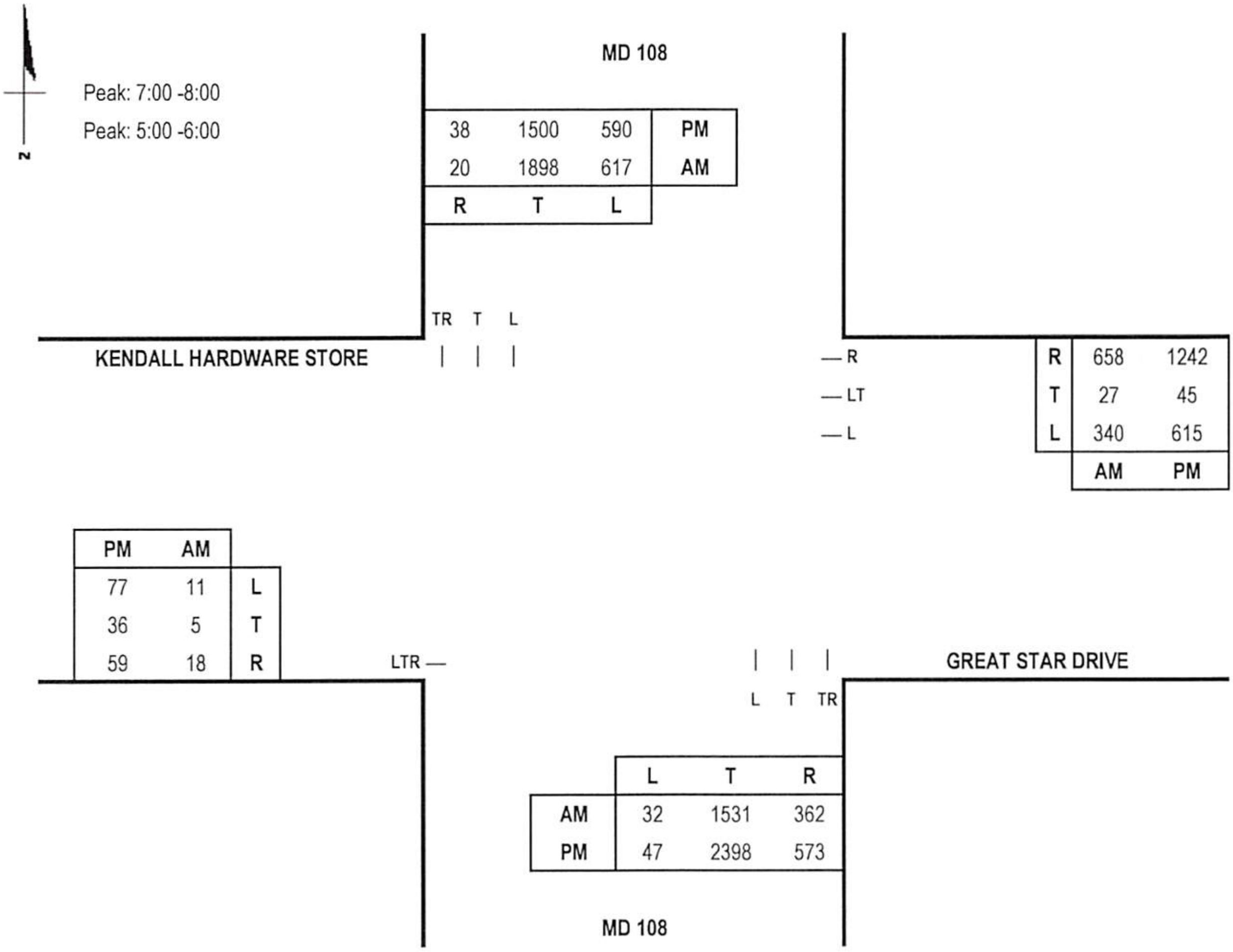
CRITICAL LANE VOLUME (CLV) METHODOLOGY
for MSHA

E/W Road: Great Star Drive/Kendall Hardware Store **Date of Count:** 4/26/2017
N/S Road: MD 108 **Day of Week:** Wednesday
Conditions: 2037 Total Traffic **Analyst:** Richard Huang



Peak: 7:00 -8:00
Peak: 5:00 -6:00

R	T	L	
38	1500	590	PM
20	1898	617	AM

	AM	PM
R	658	1242
T	27	45
L	340	615

PM	AM	
77	11	L
36	5	T
59	18	R

	L	T	R
AM	32	1531	362
PM	47	2398	573

Capacity Analysis - East/West Split

Morning Peak Hour							
	Thru Volumes			+ Opposing Lefts			AM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
EB	34	1.00	34				34
WB	367	0.60	220				220
NB	1893	0.55	1041	617	1.00	617	1658
SB	1918	0.55	1055	32	1.00	32	
						CLV TOTAL=	1,912
						Level of Service (LOS)=	F

Evening Peak Hour							
	Thru Volumes			+ Opposing Lefts			PM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
EB	172	1.00	172				172
WB	652	1.00	652				652
NB	2971	0.55	1634	590	1.00	590	2224
SB	1538	0.55	846	47	1.00	47	
						CLV TOTAL=	3,048
						Level of Service (LOS)=	F

Scenario ID - TOT22 AM V/C =1.2 PM V/C =1.91

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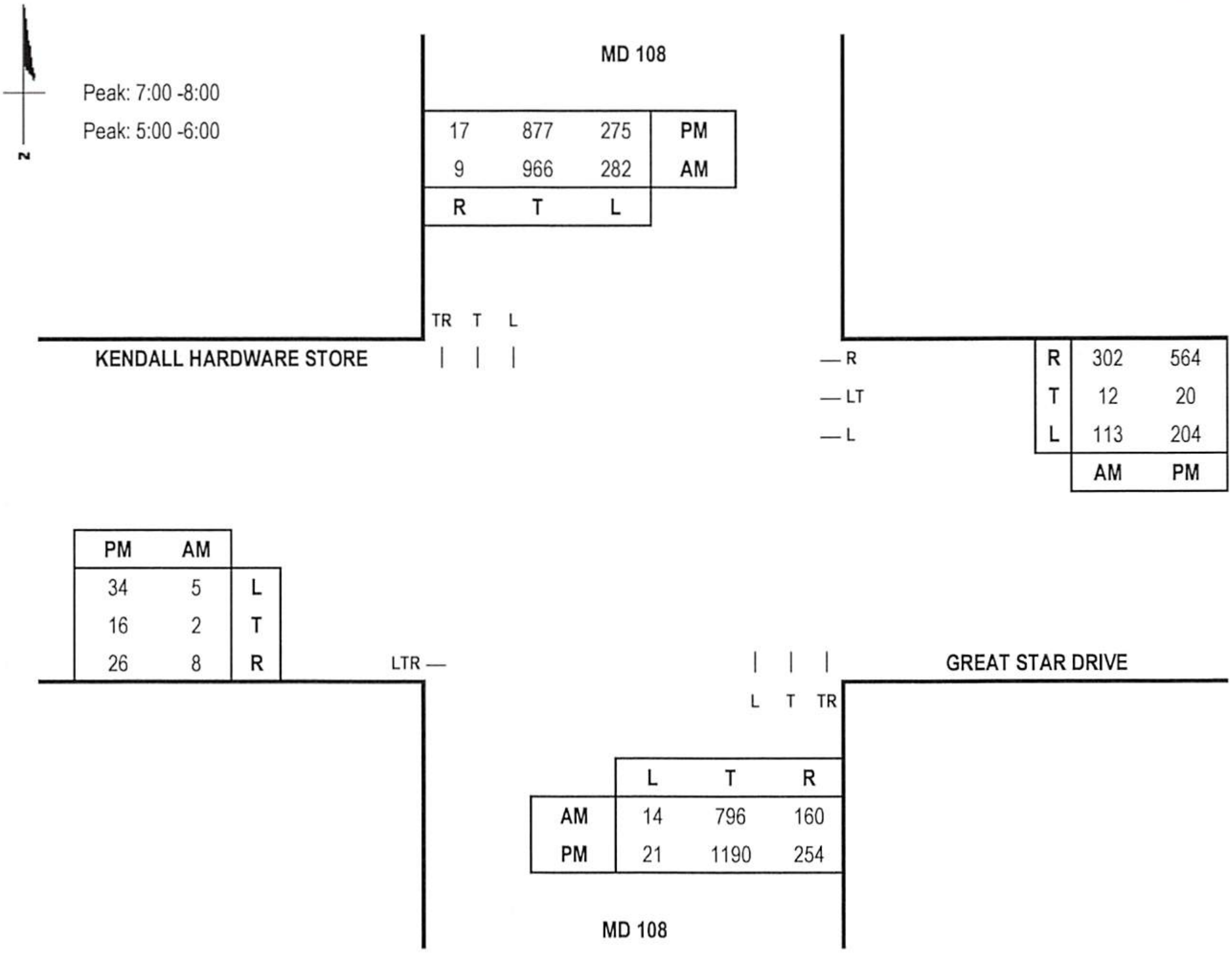
CRITICAL LANE VOLUME (CLV) METHODOLOGY

for MSHA

E/W Road: Great Star Drive/Kendall Hardware Store **Date of Count:** 4/26/2017
N/S Road: MD 108 **Day of Week:** Wednesday
Conditions: Adjusted 2023 Total Traffic **Analyst:** Richard Huang

Peak: 7:00 -8:00
Peak: 5:00 -6:00



MD 108 (southbound approach)

	R	T	L
PM	17	877	275
AM	9	966	282

Great Star Drive (westbound approach)

	AM	PM
R	302	564
T	12	20
L	113	204

Kendall Hardware Store (eastbound approach)

	PM	AM
L	34	5
T	16	2
R	26	8

MD 108 (northbound approach)

	L	T	R
AM	14	796	160
PM	21	1190	254

Capacity Analysis - East/West Split

Morning Peak Hour

	Thru Volumes			+ Opposing Lefts			AM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
EB	15	1.00	15				15
WB	125	0.60	75				75
NB	956	0.55	526	282	1.00	282	808
SB	975	0.55	536	14	1.00	14	

CLV TOTAL= **898**
Level of Service (LOS)= A

Evening Peak Hour

	Thru Volumes			+ Opposing Lefts			PM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
EB	76	1.00	76				76
WB	289	1.00	289				289
NB	1444	0.55	794	275	1.00	275	1069
SB	894	0.55	492	21	1.00	21	

CLV TOTAL= **1,434**
Level of Service (LOS)= D

Scenario ID - TOT32
AM V/C =0.56
PM V/C =0.9

CRITICAL LANE VOLUME (CLV) METHODOLOGY
for MSHA

E/W Road: Signal Bell Lane/Auto Drive
N/S Road: MD 108
Conditions: Existing Traffic
Date of Count: 4/26/2017
Day of Count: Wednesday
Analyst: Richard Huang

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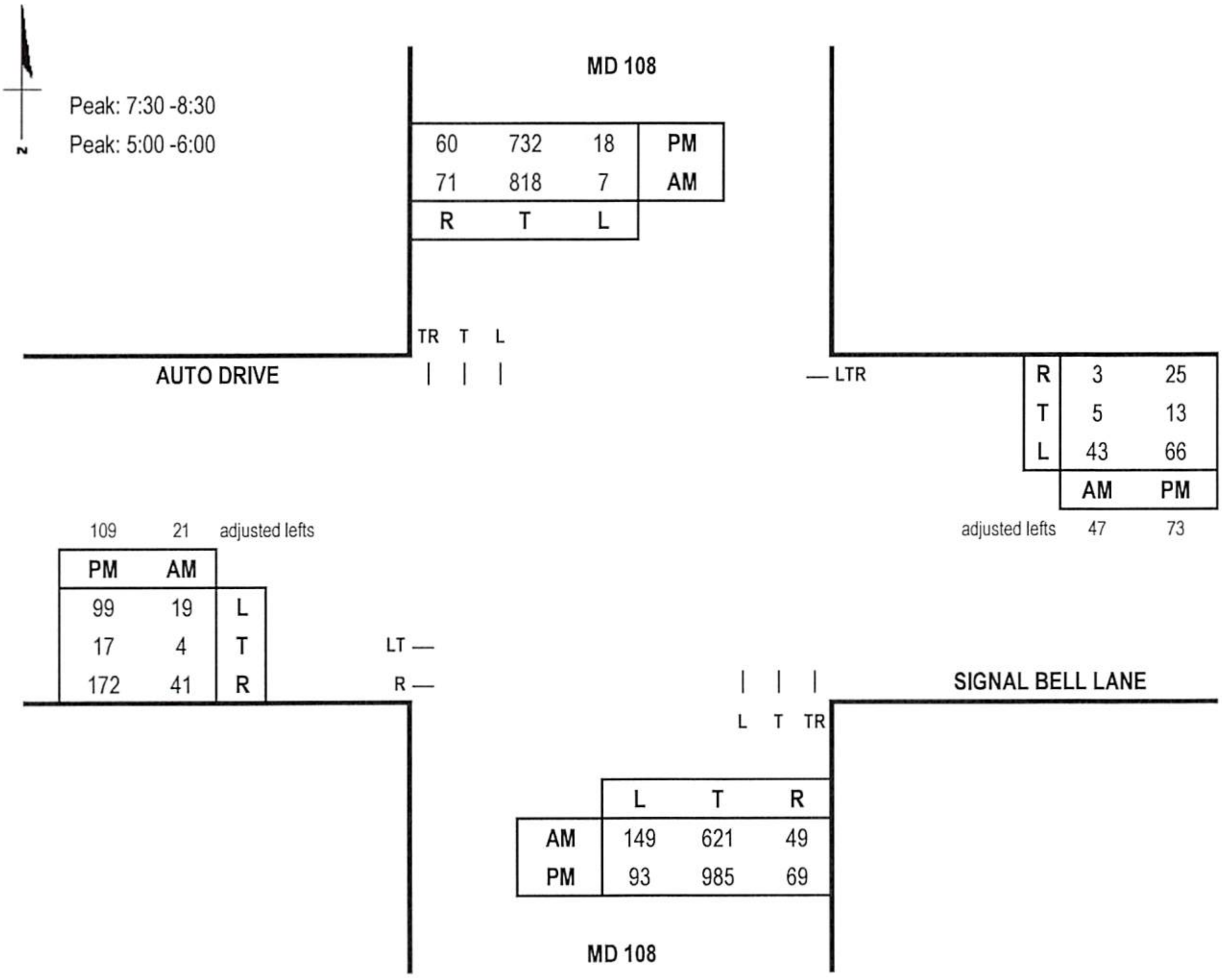
Peak: 7:30 -8:30
Peak: 5:00 -6:00



60	732	18	PM
71	818	7	AM
R	T	L	

R	3	25
T	5	13
L	43	66
	AM	PM
adjusted lefts	47	73

109	21	adjusted lefts
PM	AM	
99	19	L
17	4	T
172	41	R

	L	T	R
AM	149	621	49
PM	93	985	69

Capacity Analysis

Morning Peak Hour

	Thru Volumes			+ Opposing Lefts			AM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
NB	670	0.55	369	7	1.00	7	638
SB	889	0.55	489	149	1.00	149	
EB	25	1.00	25	43	1.00	43	74
WB	55	1.00	55	19	1.00	19	

CLV TOTAL= 712
Level of Service (LOS)= A

AM V/C =0.45

Evening Peak Hour

	Thru Volumes			+ Opposing Lefts			PM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
NB	1054	0.55	580	18	1.00	18	598
SB	792	0.55	436	93	1.00	93	
EB	126	1.00	126	66	1.00	66	210
WB	111	1.00	111	99	1.00	99	

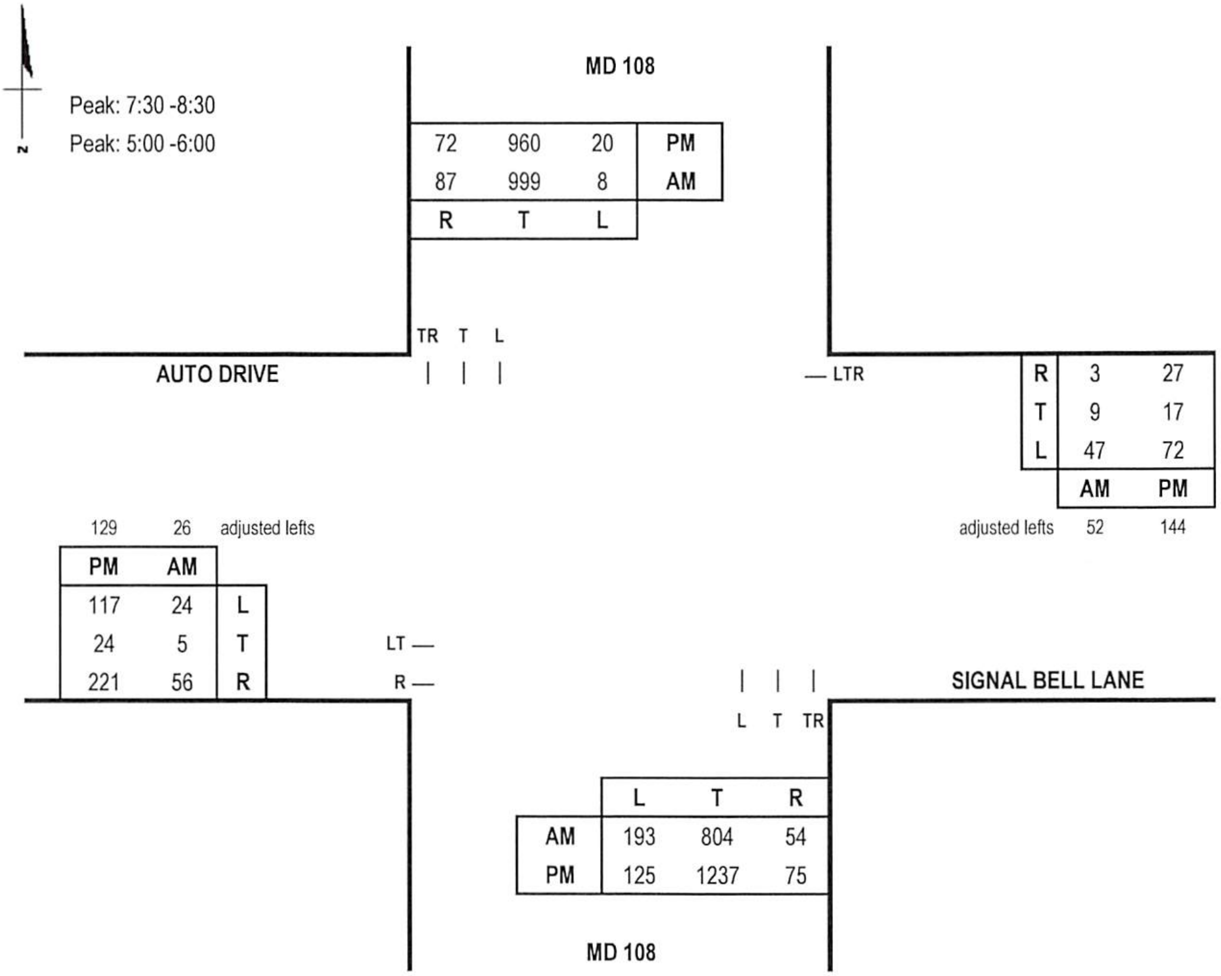
CLV TOTAL= 808
Level of Service (LOS)= A

PM V/C =0.51

Scenario ID - EXIST3

CRITICAL LANE VOLUME (CLV) METHODOLOGY
for MSHA

E/W Road: Signal Bell Lane/Auto Drive
N/S Road: MD 108
Conditions: 2023 Background Traffic
Date of Count: 4/26/2017
Day of Count: Wednesday
Analyst: Richard Huang



Capacity Analysis

Morning Peak Hour							
	Thru Volumes			+ Opposing Lefts			AM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
NB	858	0.55	472	8	1.00	8	790
SB	1086	0.55	597	193	1.00	193	
EB	31	1.00	31	47	1.00	47	88
WB	64	1.00	64	24	1.00	24	

CLV TOTAL= 878
Level of Service (LOS)= A
AM V/C =0.55

Evening Peak Hour							
	Thru Volumes			+ Opposing Lefts			PM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
NB	1312	0.55	722	20	1.00	20	742
SB	1032	0.55	568	125	1.00	125	
EB	153	1.00	153	72	1.00	72	305
WB	188	1.00	188	117	1.00	117	

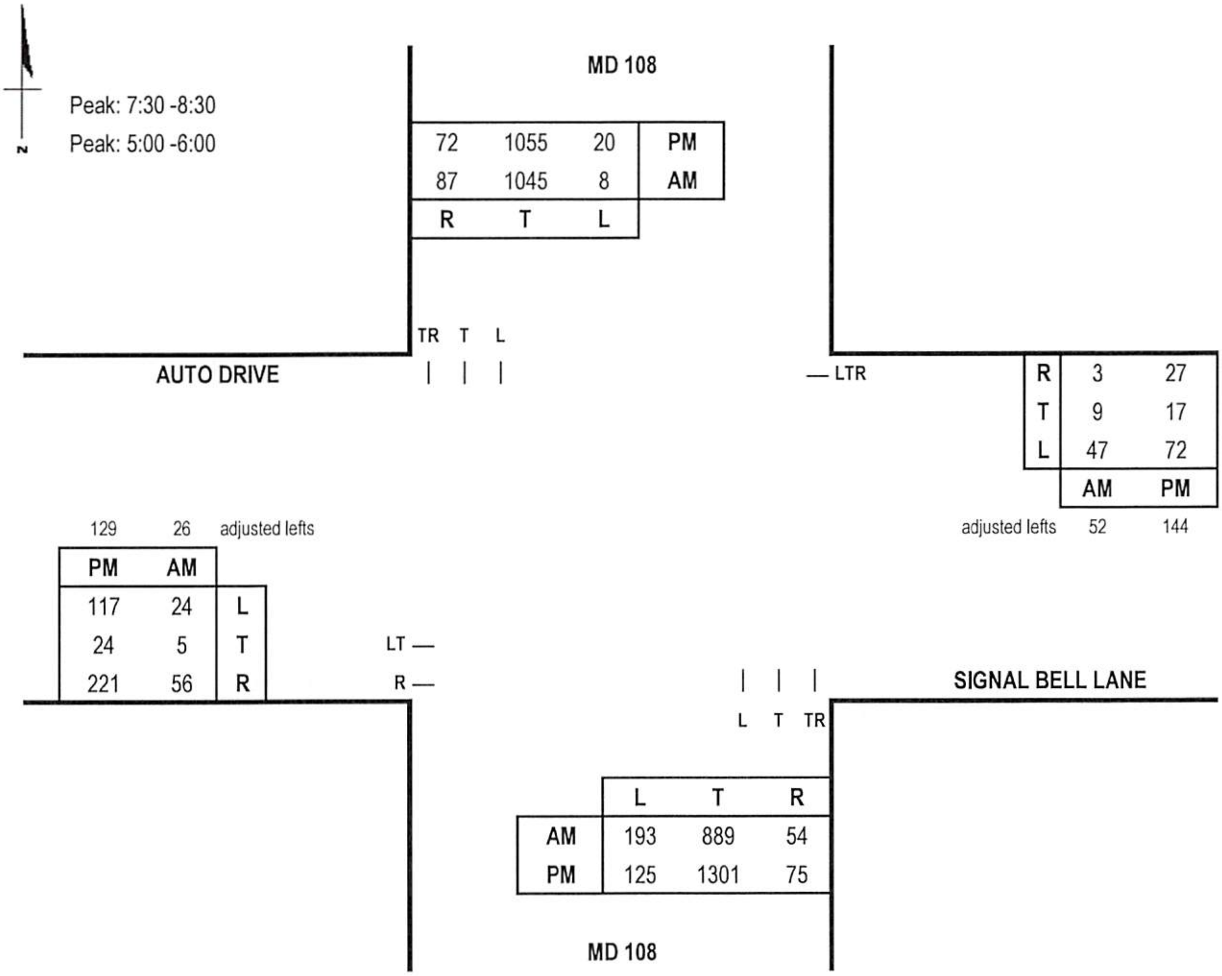
CLV TOTAL= 1,047
Level of Service (LOS)= B
PM V/C =0.65

Scenario ID - BACK13

CRITICAL LANE VOLUME (CLV) METHODOLOGY
for MSHA

The Traffic Group®

E/W Road: Signal Bell Lane/Auto Drive
N/S Road: MD 108
Conditions: 2023 Total Traffic
Date of Count: 4/26/2017
Day of Count: Wednesday
Analyst: Richard Huang



Peak: 7:30 -8:30
Peak: 5:00 -6:00

	R	T	L
PM	72	1055	20
AM	87	1045	8

	AM	PM
R	3	27
T	9	17
L	47	72
adjusted lefts	52	144

	PM	AM
adjusted lefts	129	26
L	117	24
T	24	5
R	221	56

	L	T	R
AM	193	889	54
PM	125	1301	75

Capacity Analysis

Morning Peak Hour

Dir	Thru Volumes			+ Opposing Lefts			AM CLV
	VOL	x LUF	= Total	VOL	x LUF	= Total	
NB	943	0.55	519	8	1.00	8	816
SB	1132	0.55	623	193	1.00	193	
EB	31	1.00	31	47	1.00	47	88
WB	64	1.00	64	24	1.00	24	
						CLV TOTAL=	904
						Level of Service (LOS)=	A

AM V/C =0.57

Evening Peak Hour

Dir	Thru Volumes			+ Opposing Lefts			PM CLV
	VOL	x LUF	= Total	VOL	x LUF	= Total	
NB	1376	0.55	757	20	1.00	20	777
SB	1127	0.55	620	125	1.00	125	
EB	153	1.00	153	72	1.00	72	305
WB	188	1.00	188	117	1.00	117	
						CLV TOTAL=	1,082
						Level of Service (LOS)=	B

PM V/C =0.68

Scenario ID - TOT13

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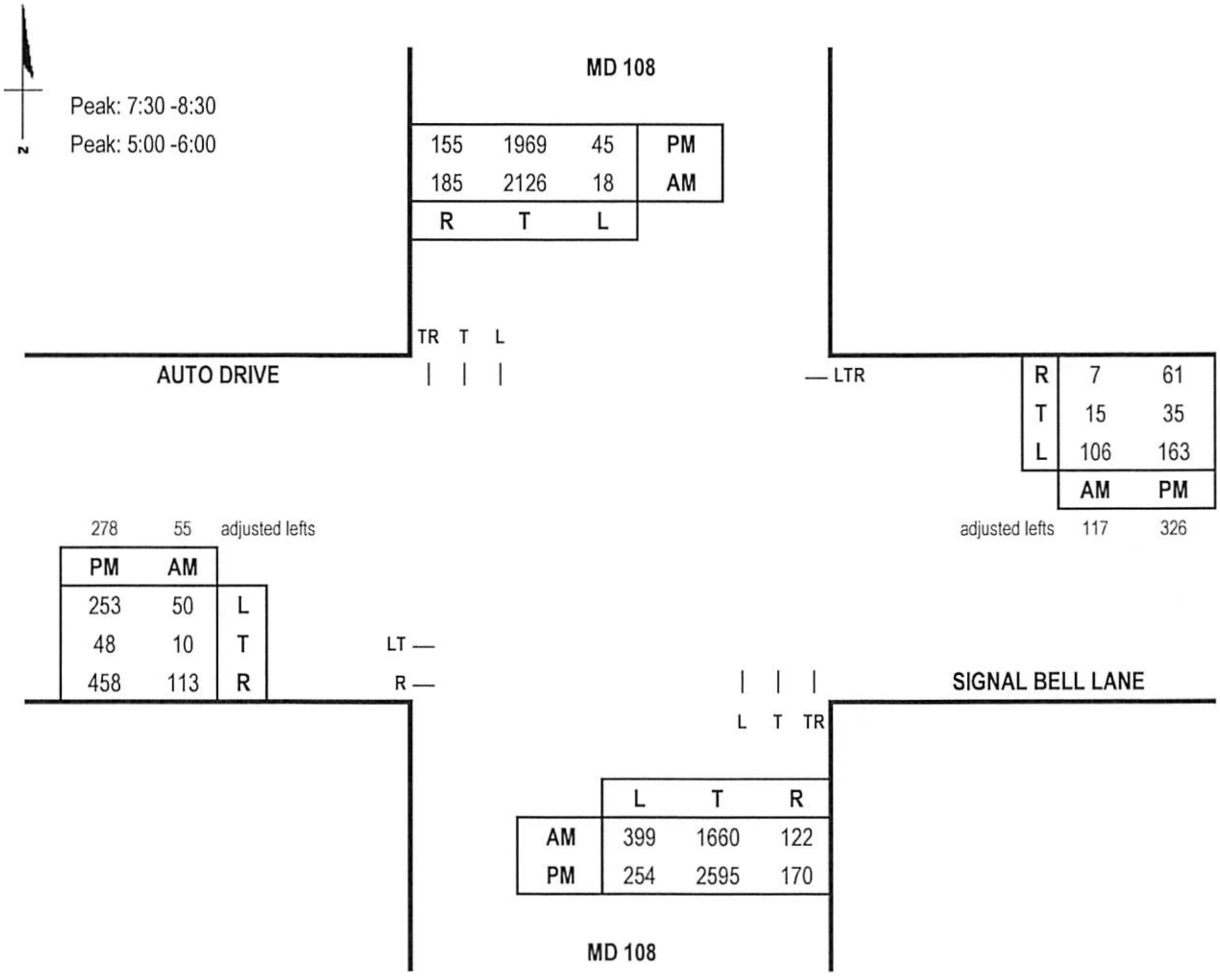
CRITICAL LANE VOLUME (CLV) METHODOLOGY
for MSHA

E/W Road: Signal Bell Lane/Auto Drive **Date of Count:** 4/26/2017
N/S Road: MD 108 **Day of Count:** Wednesday
Conditions: 2037 Background Traffic **Analyst:** Richard Huang



Southbound (MD 108, north approach):

R	T	L	
155	1969	45	PM
185	2126	18	AM

Westbound (Signal Bell Lane):

	AM	PM
R	7	61
T	15	35
L	106	163
adjusted lefts	117	326

Eastbound (Auto Drive):

PM	AM	
278	55	adjusted lefts
253	50	L
48	10	T
458	113	R

Northbound (MD 108, south approach):

	L	T	R
AM	399	1660	122
PM	254	2595	170

Capacity Analysis

Morning Peak Hour

	Thru Volumes			+ Opposing Lefts			AM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
NB	1782	0.55	980	18	1.00	18	1670
SB	2311	0.55	1271	399	1.00	399	
EB	65	1.00	65	106	1.00	106	189
WB	139	1.00	139	50	1.00	50	

CLV TOTAL= **1,859**

Level of Service (LOS)= F

Evening Peak Hour

	Thru Volumes			+ Opposing Lefts			PM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
NB	2765	0.55	1521	45	1.00	45	1566
SB	2124	0.55	1168	254	1.00	254	
EB	326	1.00	326	163	1.00	163	675
WB	422	1.00	422	253	1.00	253	

CLV TOTAL= **2,241**

Level of Service (LOS)= F

Scenario ID - BACK23

AM V/C =1.16

PM V/C =1.4

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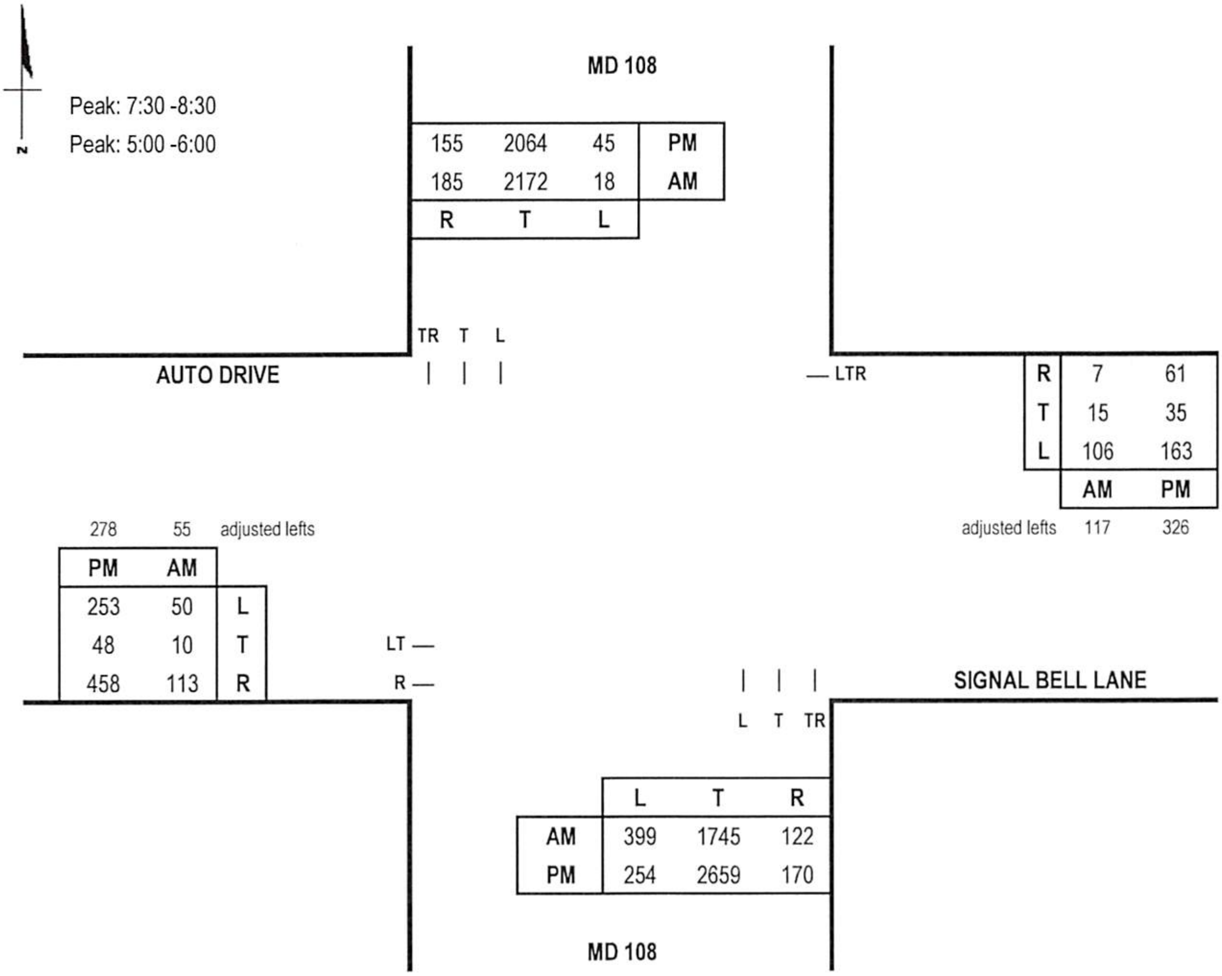
CRITICAL LANE VOLUME (CLV) METHODOLOGY
for MSHA

E/W Road: Signal Bell Lane/Auto Drive
N/S Road: MD 108
Conditions: 2037 Total Traffic

Date of Count: 4/26/2017
Day of Count: Wednesday
Analyst: Richard Huang



Capacity Analysis

Morning Peak Hour							
	Thru Volumes			+ Opposing Lefts			AM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
NB	1867	0.55	1027	18	1.00	18	1695
SB	2357	0.55	1296	399	1.00	399	
EB	65	1.00	65	106	1.00	106	189
WB	139	1.00	139	50	1.00	50	
						CLV TOTAL=	1,884
						Level of Service (LOS)=	F

AM V/C =1.18

Evening Peak Hour							
	Thru Volumes			+ Opposing Lefts			PM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
NB	2829	0.55	1556	45	1.00	45	1601
SB	2219	0.55	1220	254	1.00	254	
EB	326	1.00	326	163	1.00	163	675
WB	422	1.00	422	253	1.00	253	
						CLV TOTAL=	2,276
						Level of Service (LOS)=	F

PM V/C =1.42

Scenario ID - TOT23

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CRITICAL LANE VOLUME (CLV) METHODOLOGY
for MSHA

E/W Road: MD 32 WB Off Ramp/Md 32 Wb On Ramp **Date of Count:** 4/26/2017
N/S Road: MD 108 **Day of Week:** Wednesday
Conditions: Existing Traffic **Analyst:** Richard Huang

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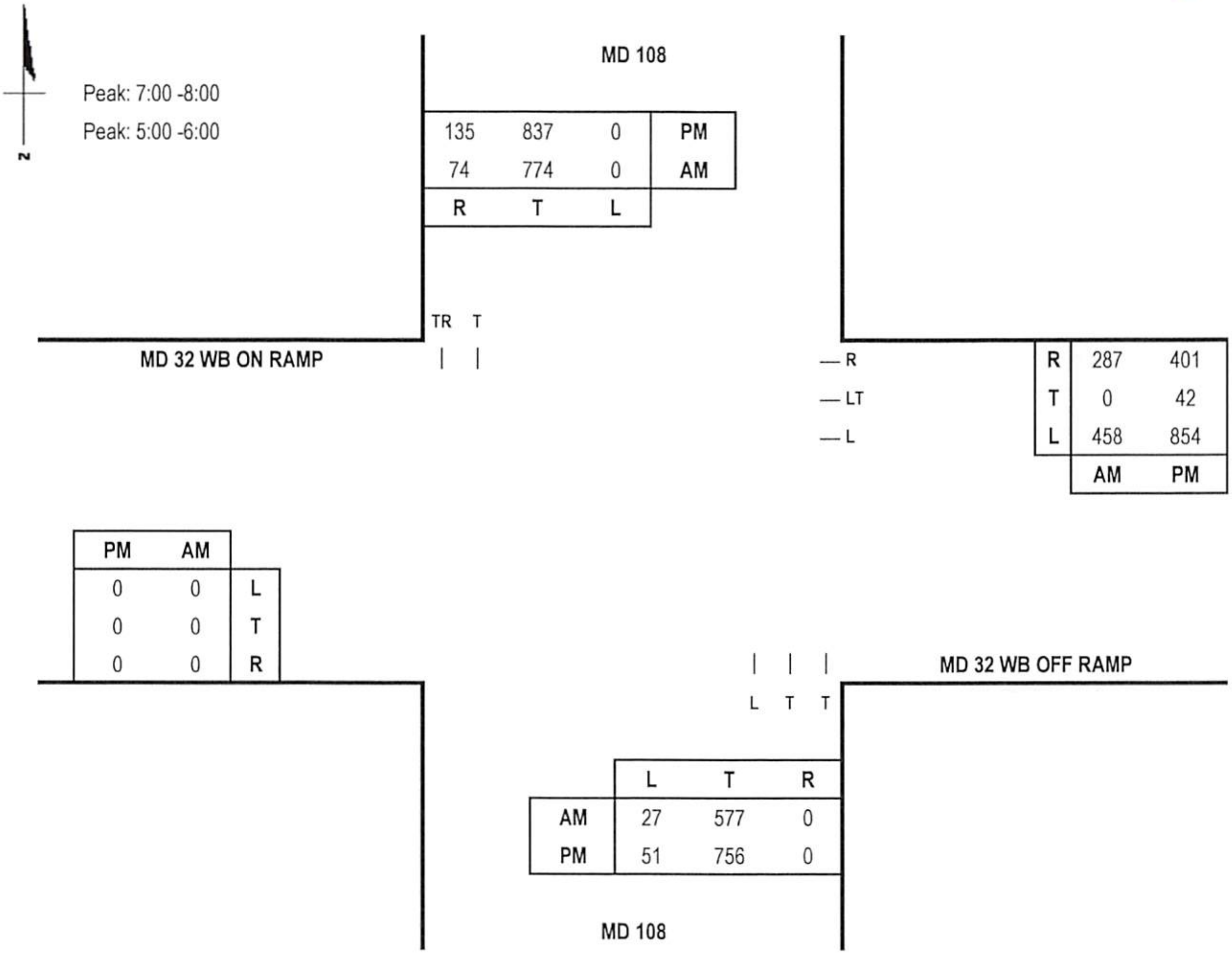


Capacity Analysis - East/West Split

Morning Peak Hour							
	Thru Volumes			+ Opposing Lefts			AM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
EB	0	0.00	0				0
WB	287	1.00	287				287
NB	577	0.55	317	0	0.00	0	493
SB	848	0.55	466	27	1.00	27	
						CLV TOTAL=	780
						Level of Service (LOS)=	A

Evening Peak Hour							
	Thru Volumes			+ Opposing Lefts			PM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
EB	0	0.00	0				0
WB	896	0.60	538				538
NB	756	0.55	416	0	0.00	0	586
SB	972	0.55	535	51	1.00	51	
						CLV TOTAL=	1,124
						Level of Service (LOS)=	B

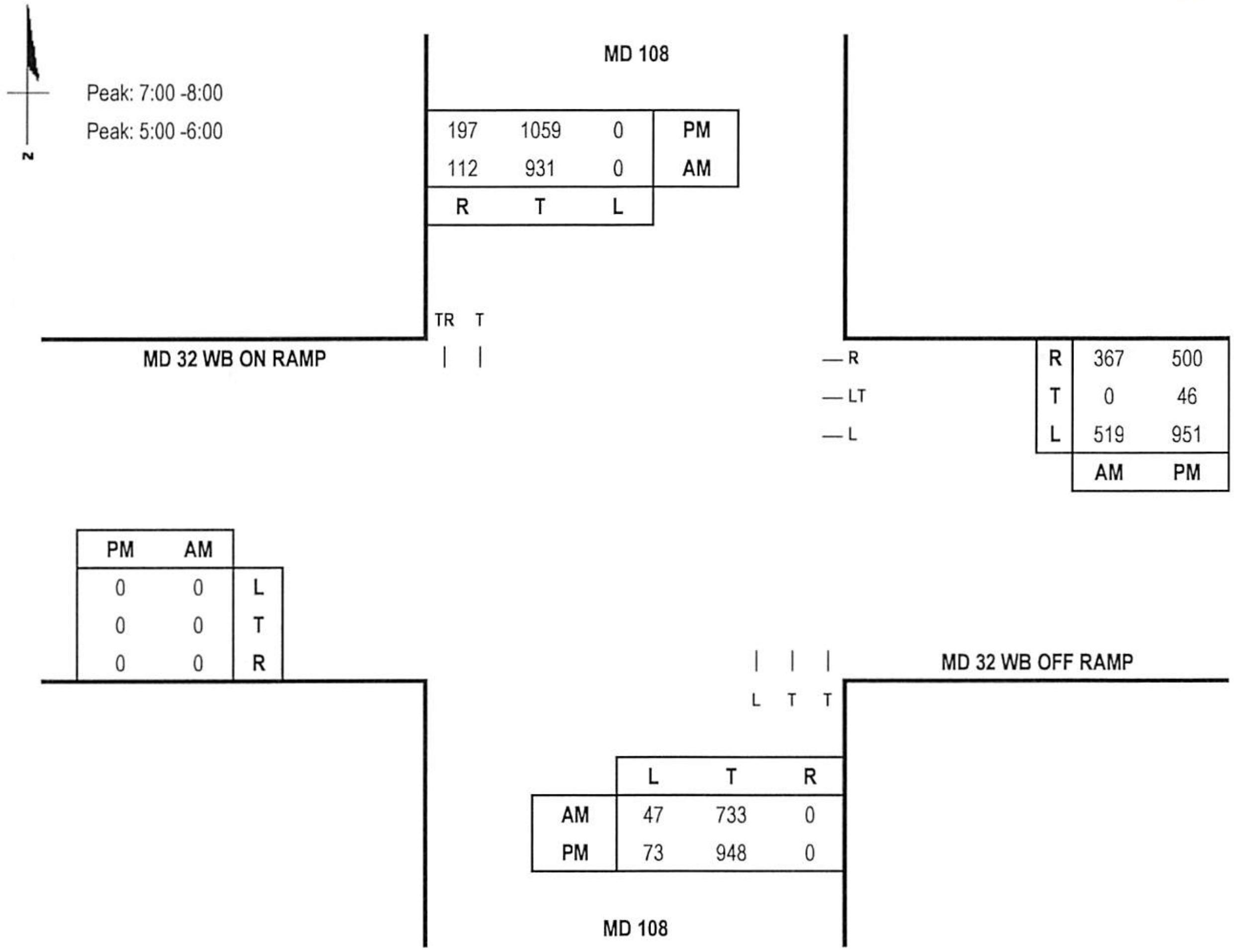
Scenario ID - EXIST4 AM V/C =0.49 PM V/C =0.7

CRITICAL LANE VOLUME (CLV) METHODOLOGY

for MSHA

E/W Road: MD 32 WB Off Ramp/Md 32 Wb On Ramp **Date of Count:** 4/26/2017
N/S Road: MD 108 **Day of Week:** Wednesday
Conditions: 2023 Background Traffic **Analyst:** Richard Huang

The Traffic Group®



Capacity Analysis - East/West Split

Morning Peak Hour							
	Thru Volumes			+ Opposing Lefts			AM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
EB	0	0.00	0				0
WB	367	1.00	367				367
NB	733	0.55	403	0	0.00	0	621
SB	1043	0.55	574	47	1.00	47	
						CLV TOTAL=	988
						Level of Service (LOS)=	A

AM V/C =0.62

Evening Peak Hour							
	Thru Volumes			+ Opposing Lefts			PM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
EB	0	0.00	0				0
WB	997	0.60	598				598
NB	948	0.55	521	0	0.00	0	764
SB	1256	0.55	691	73	1.00	73	
						CLV TOTAL=	1,362
						Level of Service (LOS)=	D

PM V/C =0.85

Scenario ID - BACK14

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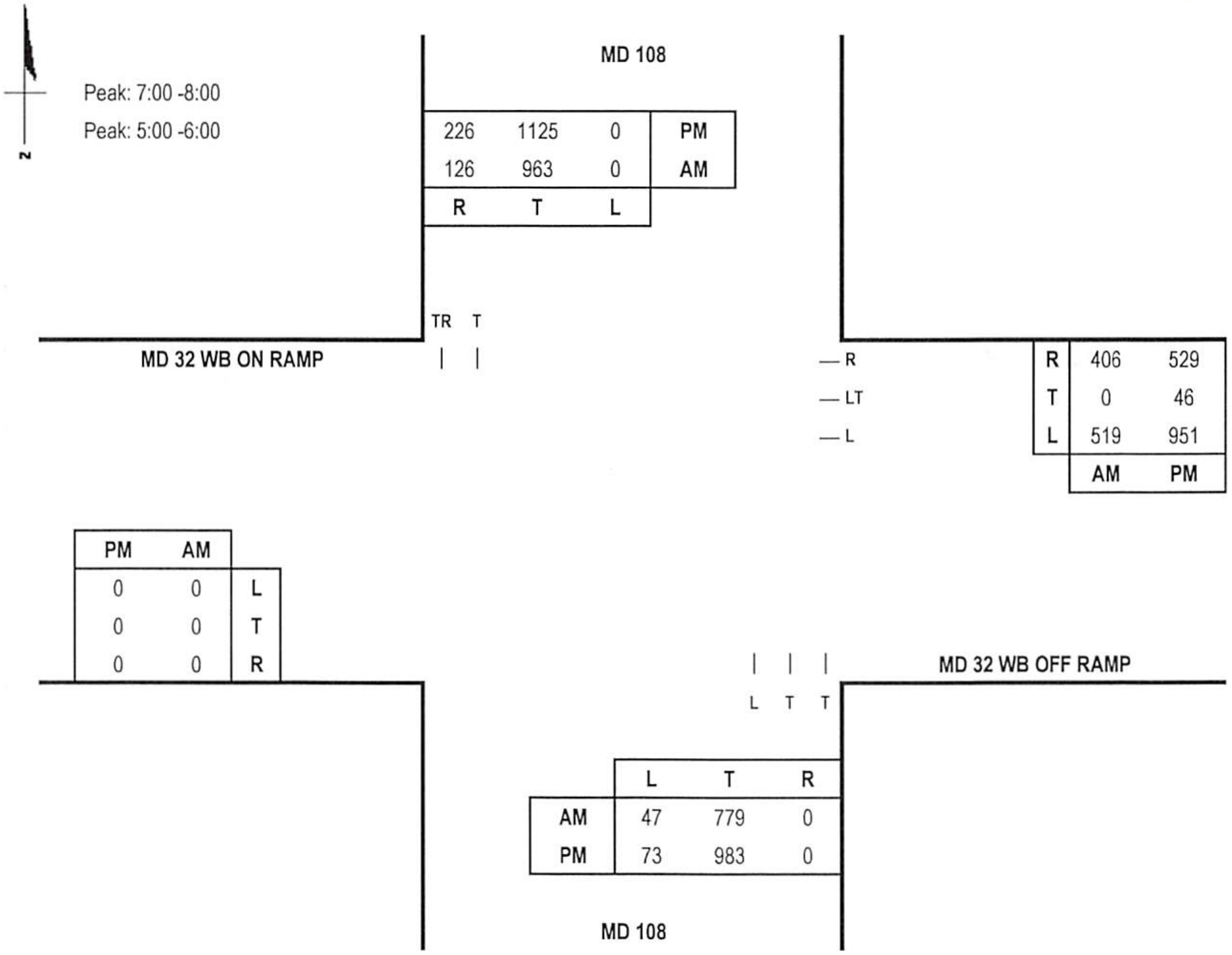
CRITICAL LANE VOLUME (CLV) METHODOLOGY

for MSHA

E/W Road: MD 32 WB Off Ramp/Md 32 Wb On Ramp **Date of Count:** 4/26/2017
N/S Road: MD 108 **Day of Week:** Wednesday
Conditions: 2023 Total Traffic **Analyst:** Richard Huang



Capacity Analysis - East/West Split

Morning Peak Hour							
	Thru Volumes			+ Opposing Lefts			AM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
EB	0	0.00	0				0
WB	406	1.00	406				406
NB	779	0.55	428	0	0.00	0	646
SB	1089	0.55	599	47	1.00	47	
						CLV TOTAL=	1,052
						Level of Service (LOS)=	B

Evening Peak Hour							
	Thru Volumes			+ Opposing Lefts			PM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
EB	0	0.00	0				0
WB	997	0.60	598				598
NB	983	0.55	541	0	0.00	0	816
SB	1351	0.55	743	73	1.00	73	
						CLV TOTAL=	1,414
						Level of Service (LOS)=	D

Scenario ID - TOT14

AM V/C =0.66

PM V/C =0.88

CRITICAL LANE VOLUME (CLV) METHODOLOGY

for MSHA

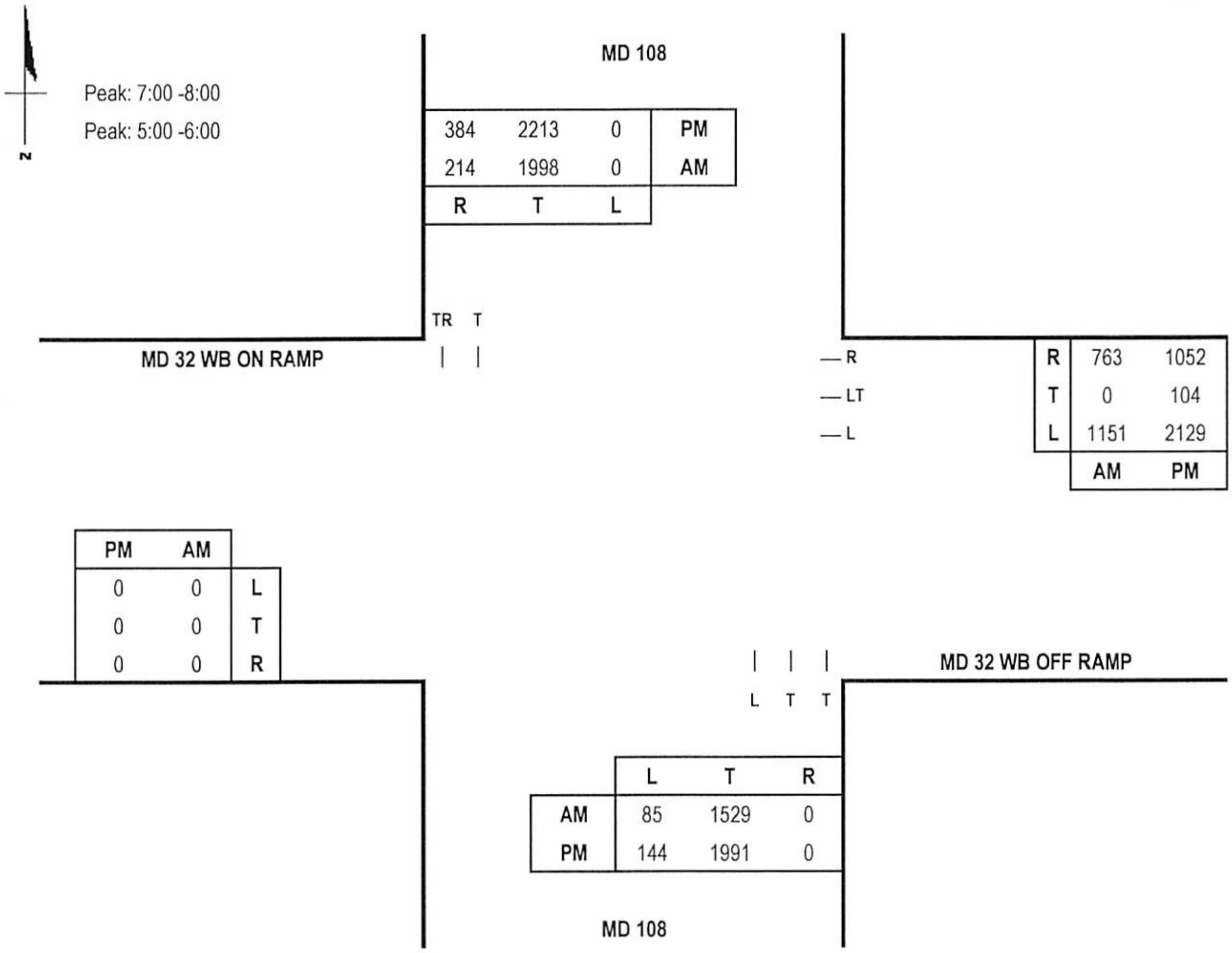
E/W Road: MD 32 WB Off Ramp/Md 32 Wb On Ramp **Date of Count:** 4/26/2017

N/S Road: MD 108 **Day of Week:** Wednesday

Conditions: 2037 Background Traffic **Analyst:** Richard Huang

Peak: 7:00 -8:00

Peak: 5:00 -6:00



R	T	L	
384	2213	0	PM
214	1998	0	AM

	AM	PM
R	763	1052
T	0	104
L	1151	2129

PM	AM	
0	0	L
0	0	T
0	0	R

	L	T	R
AM	85	1529	0
PM	144	1991	0

Capacity Analysis - East/West Split

Morning Peak Hour

	Thru Volumes			+ Opposing Lefts			AM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
EB	0	0.00	0				0
WB	763	1.00	763				763
NB	1529	0.55	841	0	0.00	0	1302
SB	2212	0.55	1217	85	1.00	85	

CLV TOTAL= **2,065**

Level of Service (LOS)= F

AM V/C =1.29

Evening Peak Hour

	Thru Volumes			+ Opposing Lefts			PM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
EB	0	0.00	0				0
WB	2233	0.60	1340				1340
NB	1991	0.55	1095	0	0.00	0	1572
SB	2597	0.55	1428	144	1.00	144	

CLV TOTAL= **2,912**

Level of Service (LOS)= F

PM V/C =1.82

Scenario ID - BACK24

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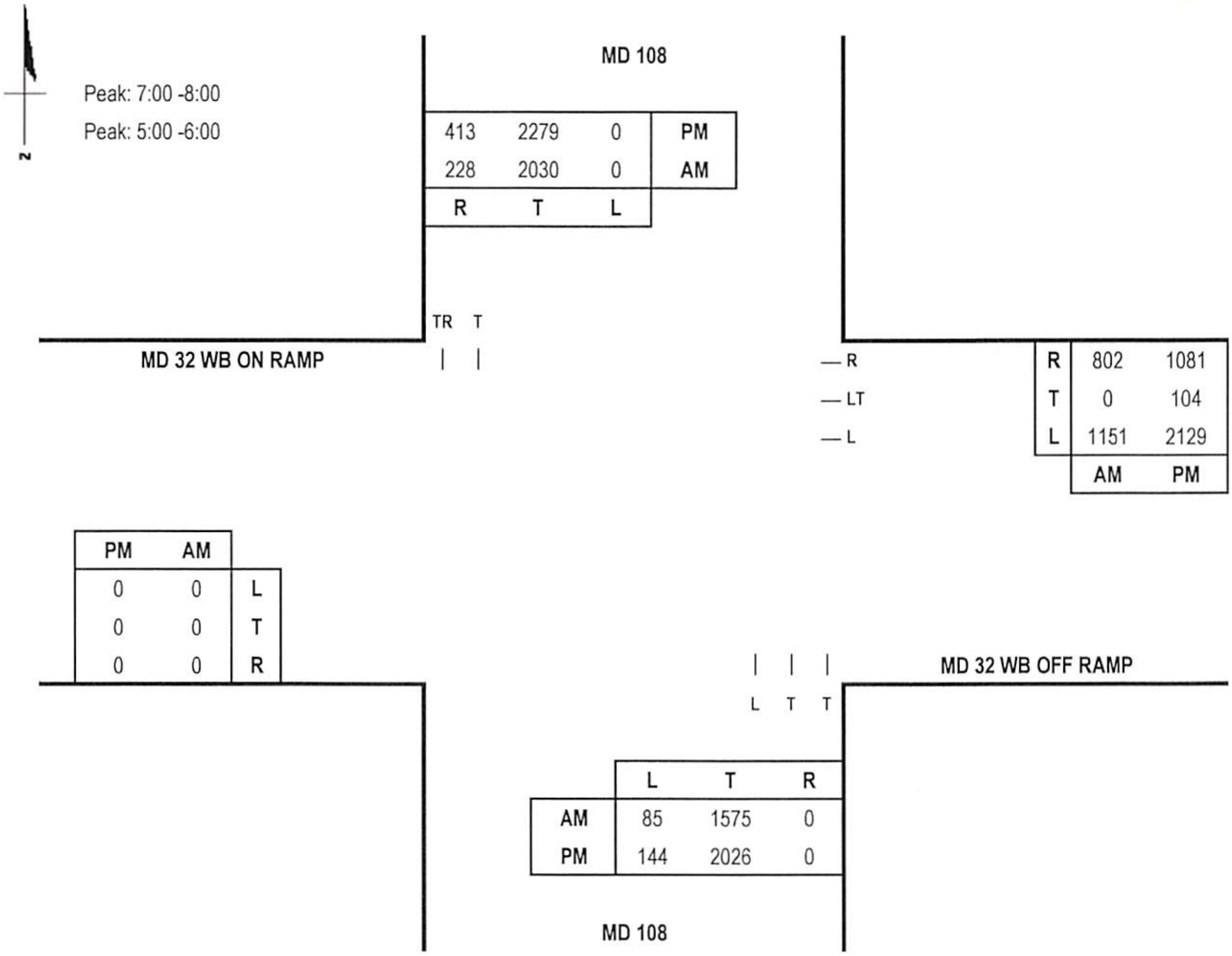
CRITICAL LANE VOLUME (CLV) METHODOLOGY

for MSHA

E/W Road: MD 32 WB Off Ramp/Md 32 Wb On Ramp **Date of Count:** 4/26/2017
N/S Road: MD 108 **Day of Week:** Wednesday
Conditions: 2037 Total Traffic **Analyst:** Richard Huang



Capacity Analysis - East/West Split

Morning Peak Hour							
	Thru Volumes			+ Opposing Lefts			AM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
EB	0	0.00	0				0
WB	802	1.00	802				802
NB	1575	0.55	866	0	0.00	0	1327
SB	2258	0.55	1242	85	1.00	85	
						CLV TOTAL=	2,129
						Level of Service (LOS)=	F

Evening Peak Hour							
	Thru Volumes			+ Opposing Lefts			PM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
EB	0	0.00	0				0
WB	2233	0.60	1340				1340
NB	2026	0.55	1114	0	0.00	0	1625
SB	2692	0.55	1481	144	1.00	144	
						CLV TOTAL=	2,965
						Level of Service (LOS)=	F

Scenario ID - TOT24

AM V/C =1.33

PM V/C =1.85

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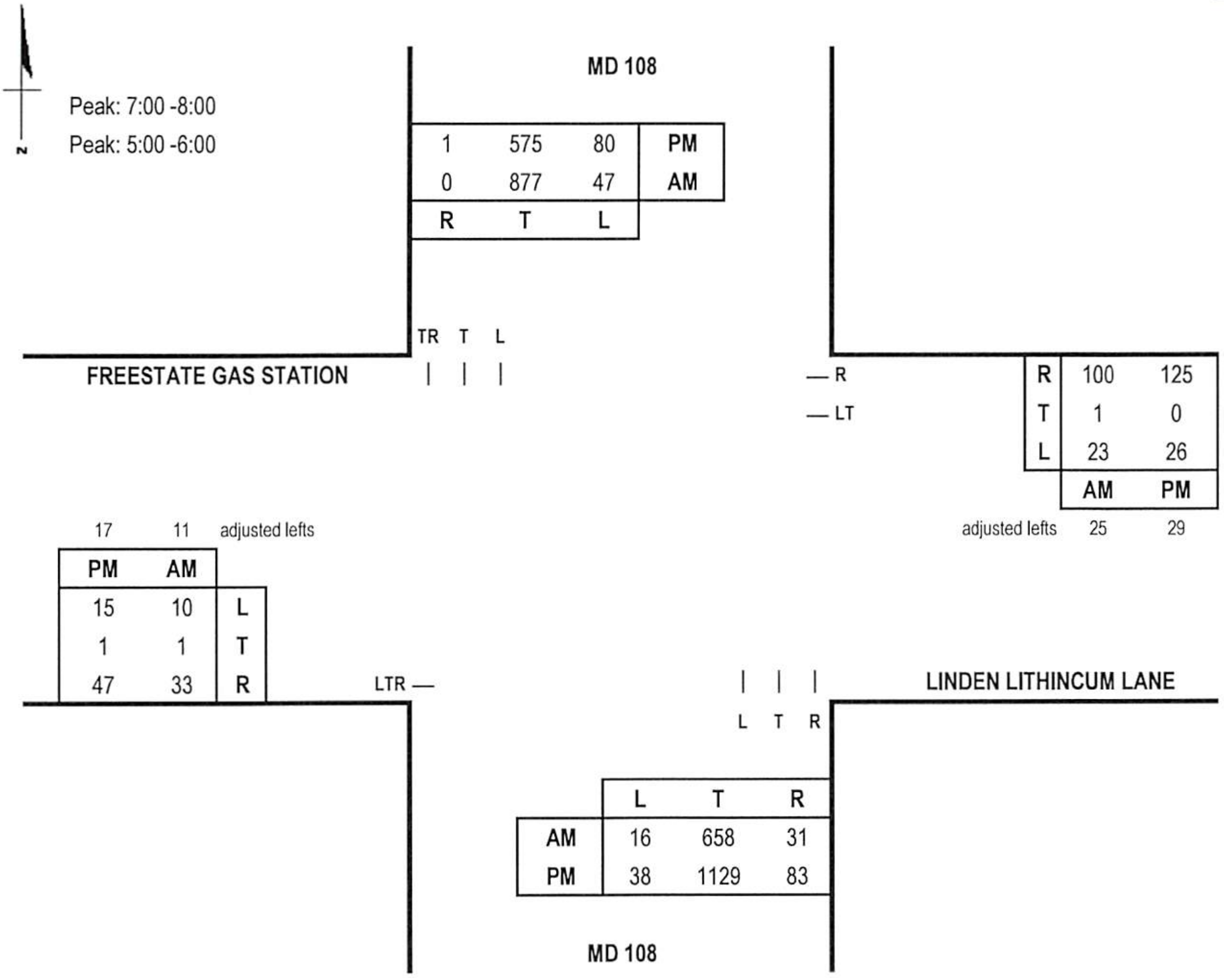
CRITICAL LANE VOLUME (CLV) METHODOLOGY
for MSHA

The Traffic Group®

E/W Road: Linden Lithincum Lane/Freestate Gas S **Date of Count:** 4/26/2017
N/S Road: MD 108 **Day of Count:** Wednesday
Conditions: Existing Traffic **Analyst:** Richard Huang



Peak: 7:00 -8:00
Peak: 5:00 -6:00

R	T	L	
1	575	80	PM
0	877	47	AM

R	100	125	
T	1	0	
L	23	26	
	AM	PM	
adjusted lefts	25	29	

17	11	adjusted lefts
PM	AM	
15	10	L
1	1	T
47	33	R

	L	T	R
AM	16	658	31
PM	38	1129	83

Capacity Analysis

Morning Peak Hour

	Thru Volumes			+ Opposing Lefts			AM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
NB	658	1.00	658	47	1.00	47	705
SB	877	0.55	482	16	1.00	16	
EB	45	1.00	45	23	1.00	23	68
WB	53	1.00	53	10	1.00	10	

CLV TOTAL= 773
Level of Service (LOS)= A

Evening Peak Hour

	Thru Volumes			+ Opposing Lefts			PM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
NB	1129	1.00	1129	80	1.00	80	1209
SB	576	0.55	317	38	1.00	38	
EB	65	1.00	65	26	1.00	26	91
WB	45	1.00	45	15	1.00	15	

CLV TOTAL= 1,300
Level of Service (LOS)= C

Scenario ID - EXIST6

AM V/C =0.48

PM V/C =0.81

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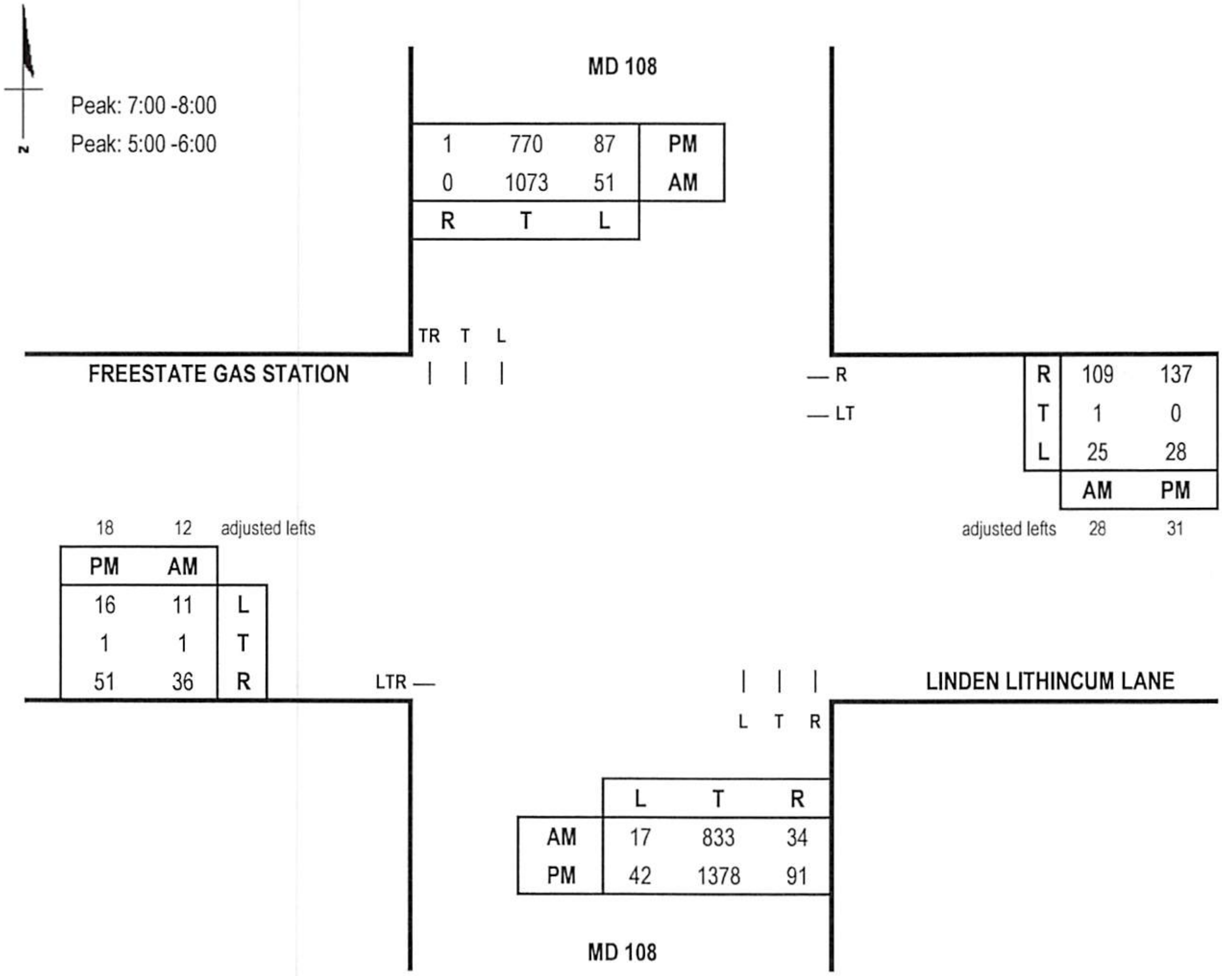
CRITICAL LANE VOLUME (CLV) METHODOLOGY
for MSHA

The Traffic Group®

E/W Road: Linden Lithincum Lane/Freestate Gas S **Date of Count:** 4/26/2017
N/S Road: MD 108 **Day of Count:** Wednesday
Conditions: 2023 Background Traffic **Analyst:** Richard Huang

Peak: 7:00 -8:00
Peak: 5:00 -6:00



1	770	87	PM
0	1073	51	AM
R	T	L	

R	109	137
T	1	0
L	25	28
	AM	PM
adjusted lefts	28	31

18	12	adjusted lefts
PM	AM	
16	11	L
1	1	T
51	36	R

	L	T	R
AM	17	833	34
PM	42	1378	91

Capacity Analysis

Morning Peak Hour

	Thru Volumes			+ Opposing Lefts			AM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
NB	833	1.00	833	51	1.00	51	884
SB	1073	0.55	590	17	1.00	17	
EB	49	1.00	49	25	1.00	25	74
WB	58	1.00	58	11	1.00	11	

CLV TOTAL= 958
Level of Service (LOS)= A
AM V/C =0.6

Evening Peak Hour

	Thru Volumes			+ Opposing Lefts			PM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
NB	1378	1.00	1378	87	1.00	87	1465
SB	771	0.55	424	42	1.00	42	
EB	70	1.00	70	28	1.00	28	98
WB	50	1.00	50	16	1.00	16	

CLV TOTAL= 1,563
Level of Service (LOS)= E
PM V/C =0.98

Scenario ID - BACK16

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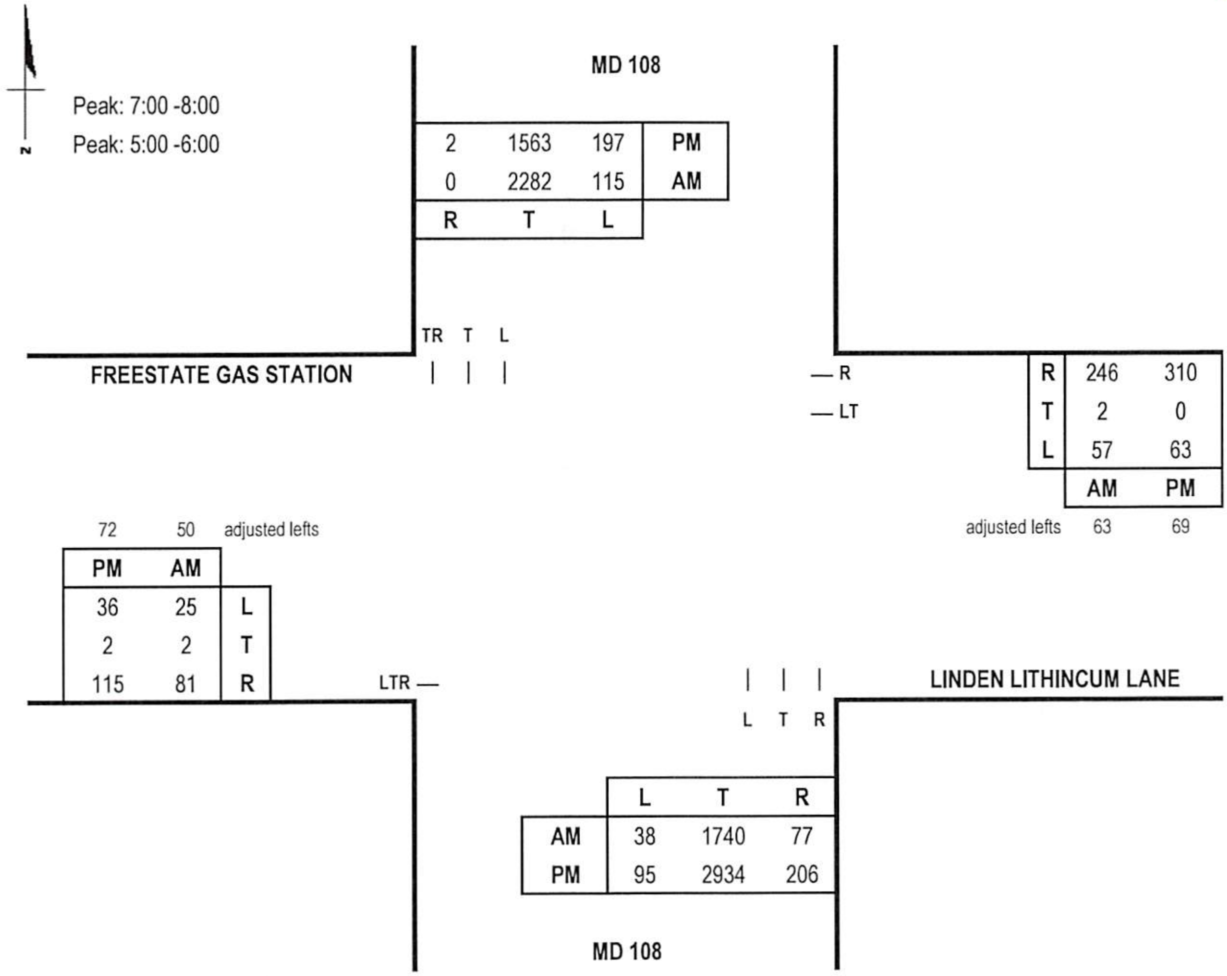
CRITICAL LANE VOLUME (CLV) METHODOLOGY
for MSHA

E/W Road: Linden Lithincum Lane/Freestate Gas S **Date of Count:** 4/26/2017
N/S Road: MD 108 **Day of Count:** Wednesday
Conditions: 2037 Background Traffic **Analyst:** Richard Huang



Peak: 7:00 -8:00
Peak: 5:00 -6:00

R	T	L	
2	1563	197	PM
0	2282	115	AM

	AM	PM
R	246	310
T	2	0
L	57	63
adjusted lefts	63	69

PM	AM	
72	50	adjusted lefts
36	25	L
2	2	T
115	81	R

	L	T	R
AM	38	1740	77
PM	95	2934	206

Capacity Analysis

Morning Peak Hour

	Thru Volumes			+ Opposing Lefts			AM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
NB	1740	1.00	1740	115	1.00	115	1855
SB	2282	0.55	1255	38	1.00	38	
EB	133	1.00	133	57	1.00	57	190
WB	131	1.00	131	25	1.00	25	

CLV TOTAL= **2,045**
Level of Service (LOS)= **F**
AM V/C =1.28

Evening Peak Hour

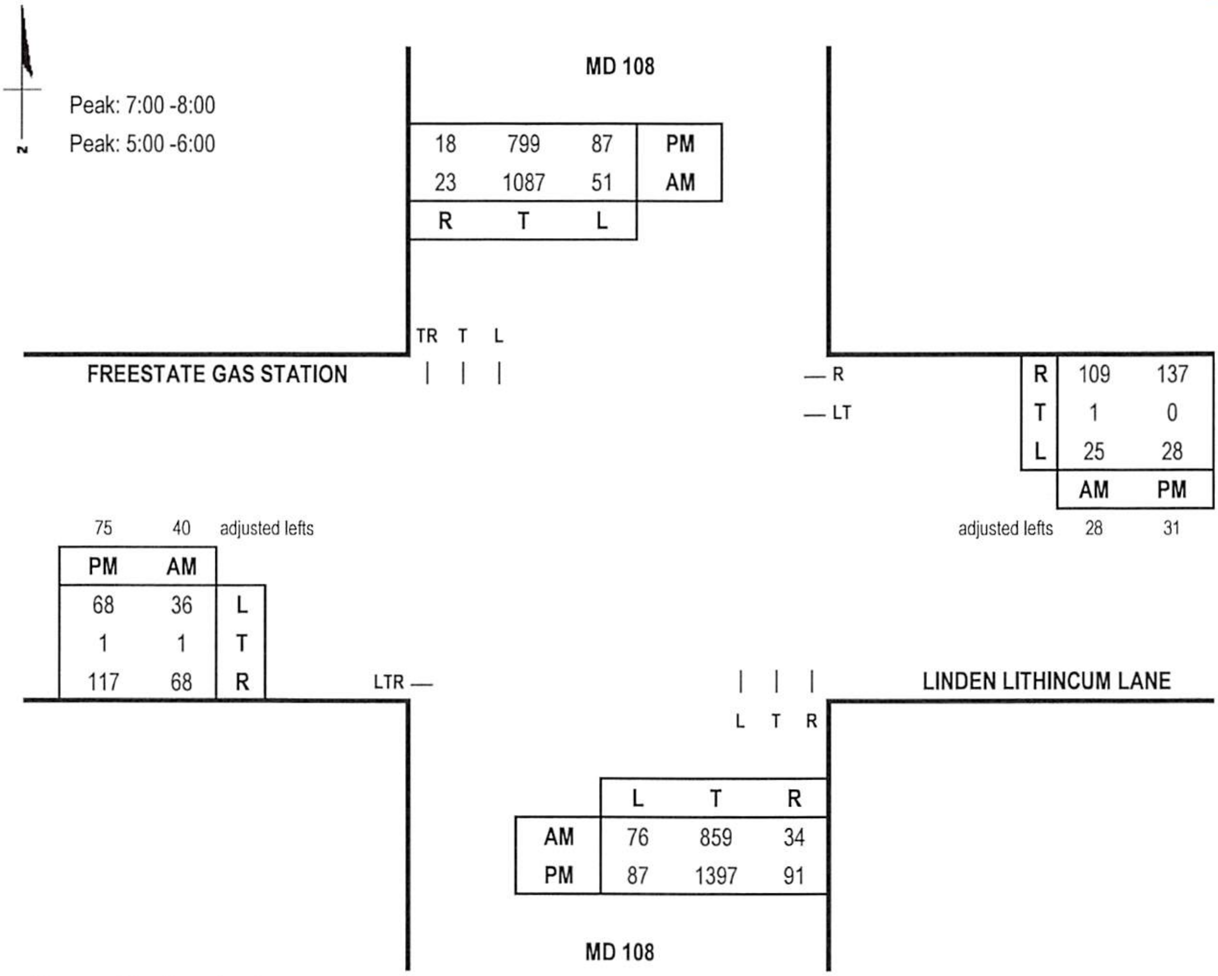
	Thru Volumes			+ Opposing Lefts			PM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
NB	2934	1.00	2934	197	1.00	197	3131
SB	1565	0.55	861	95	1.00	95	
EB	189	1.00	189	63	1.00	63	252
WB	113	1.00	113	36	1.00	36	

CLV TOTAL= **3,383**
Level of Service (LOS)= **F**
PM V/C =2.11

Scenario ID - BACK26

CRITICAL LANE VOLUME (CLV) METHODOLOGY
for MSHA

E/W Road: Linden Lithincum Lane
N/S Road: MD 108
Conditions: 2023 Total Traffic
Date of Count: 4/26/2017
Day of Count: Wednesday
Analyst: Richard Huang



Southbound (MD 108):

R	T	L	
18	799	87	PM
23	1087	51	AM

Westbound (Linden Lithincum Lane):

	AM	PM
R	109	137
T	1	0
L	25	28
adjusted lefts	28	31

Eastbound (Freestate Gas Station):

PM	AM	
75	40	adjusted lefts
68	36	L
1	1	T
117	68	R

Northbound (MD 108):

	L	T	R
AM	76	859	34
PM	87	1397	91

Capacity Analysis

Morning Peak Hour

	Thru Volumes			+ Opposing Lefts			AM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
NB	859	1.00	859	51	1.00	51	910
SB	1110	0.55	611	76	1.00	76	
EB	109	1.00	109	25	1.00	25	134
WB	58	1.00	58	36	1.00	36	

CLV TOTAL= **1,044**
Level of Service (LOS)= **B**
AM V/C =0.65

Evening Peak Hour

	Thru Volumes			+ Opposing Lefts			PM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
NB	1397	1.00	1397	87	1.00	87	1484
SB	817	0.55	449	87	1.00	87	
EB	193	1.00	193	28	1.00	28	221
WB	50	1.00	50	68	1.00	68	

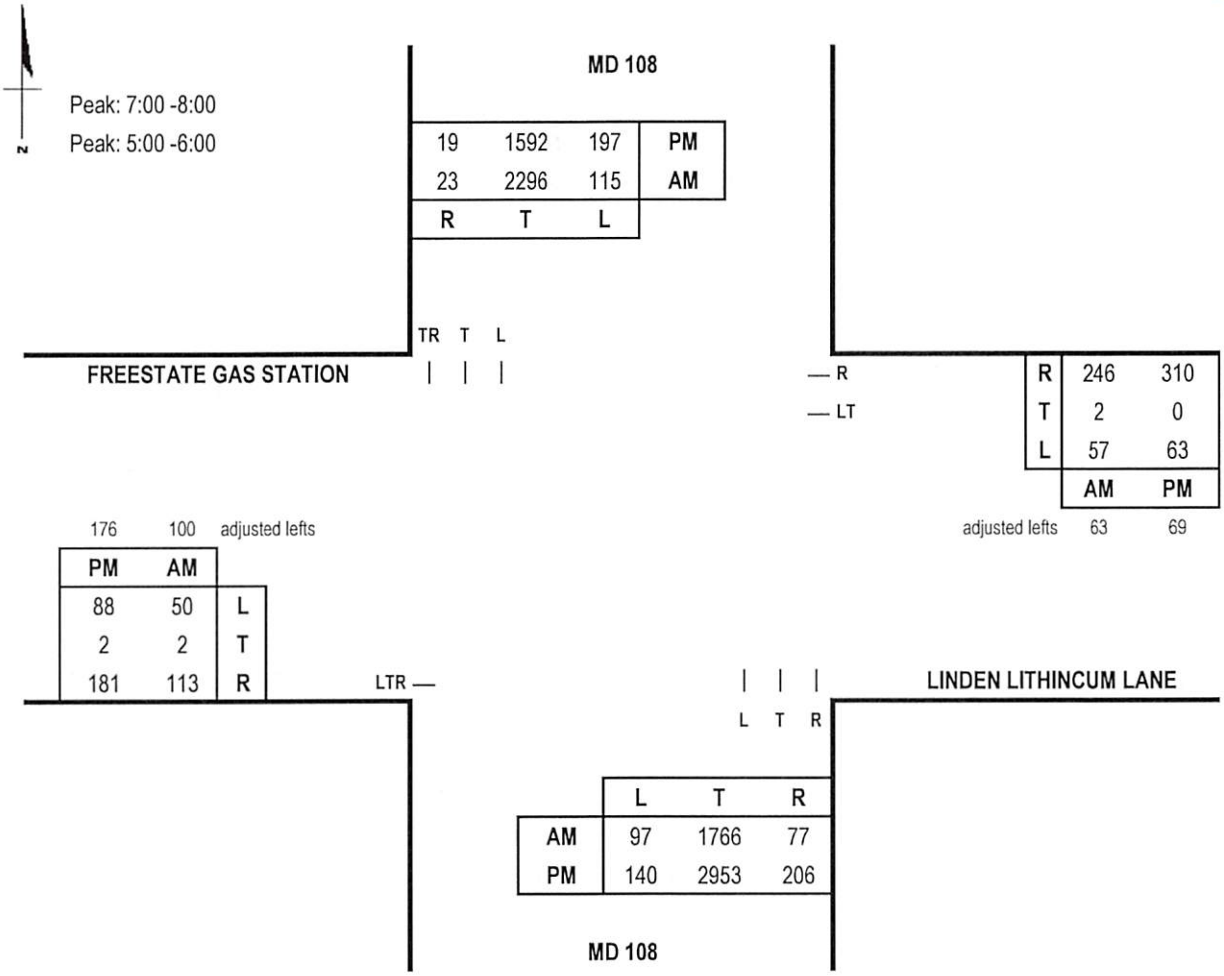
CLV TOTAL= **1,705**
Level of Service (LOS)= **F**
PM V/C =1.07

rh, 170302\rev1\clv\6.xls-clv, f07/13/17

CRITICAL LANE VOLUME (CLV) METHODOLOGY
for MSHA

E/W Road: Linden Lithincum Lane
N/S Road: MD 108
Conditions: 2037 Total Traffic

Date of Count: 4/26/2017
Day of Count: Wednesday
Analyst: Richard Huang



MD 108 (southbound approach):

R	T	L	
19	1592	197	PM
23	2296	115	AM

Westbound approach:

	AM	PM
R	246	310
T	2	0
L	57	63
adjusted lefts	63	69

Eastbound approach (Freestate Gas Station):

PM	AM	
176	100	adjusted lefts
88	50	L
2	2	T
181	113	R

MD 108 (northbound approach):

	L	T	R
AM	97	1766	77
PM	140	2953	206

Capacity Analysis

Morning Peak Hour							
	Thru Volumes			+ Opposing Lefts			AM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
NB	1766	1.00	1766	115	1.00	115	1881
SB	2319	0.55	1275	97	1.00	97	
EB	215	1.00	215	57	1.00	57	272
WB	131	1.00	131	50	1.00	50	

CLV TOTAL= **2,153**
Level of Service (LOS)= F
AM V/C =1.35

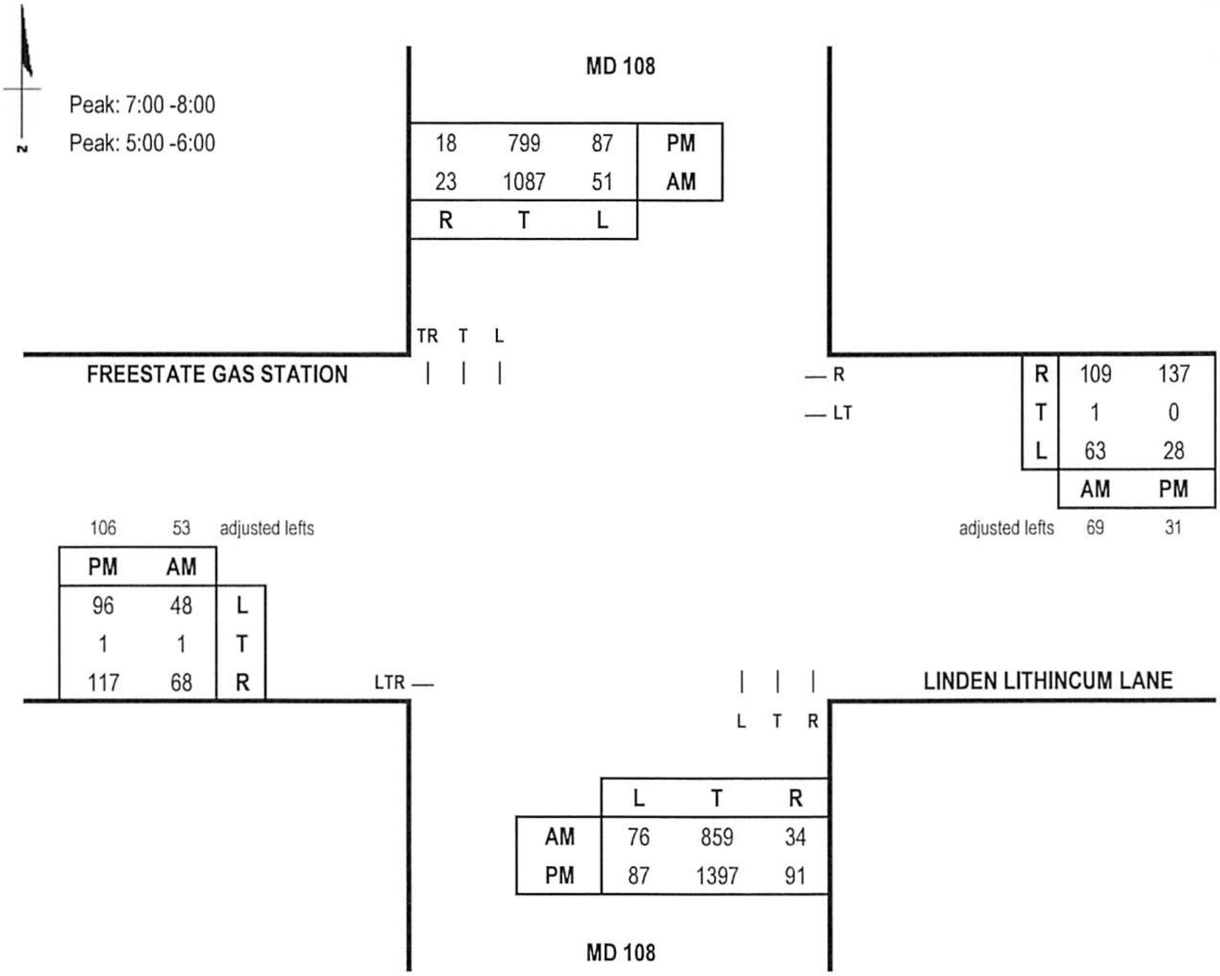
Evening Peak Hour							
	Thru Volumes			+ Opposing Lefts			PM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
NB	2953	1.00	2953	197	1.00	197	3150
SB	1611	0.55	886	140	1.00	140	
EB	359	1.00	359	63	1.00	63	422
WB	113	1.00	113	88	1.00	88	

CLV TOTAL= **3,572**
Level of Service (LOS)= F
PM V/C =2.23

rh, 170302\rev1\clv\6.xls-clv, f07/13/17

CRITICAL LANE VOLUME (CLV) METHODOLOGY
for MSHA

E/W Road: Linden Lithincum Lane
N/S Road: MD 108
Conditions: Adjusted 2023 Total Traffic
Date of Count: 4/26/2017
Day of Count: Wednesday
Analyst: Richard Huang



Southbound (MD 108):

	R	T	L
PM	18	799	87
AM	23	1087	51

Westbound (Linden Lithincum Lane):

	AM	PM
R	109	137
T	1	0
L	63	28
adjusted lefts	69	31

Eastbound (Freestate Gas Station):

	PM	AM
adjusted lefts	106	53
L	96	48
T	1	1
R	117	68

Northbound (MD 108):

	L	T	R
AM	76	859	34
PM	87	1397	91

Capacity Analysis

Morning Peak Hour

	Thru Volumes			+ Opposing Lefts			AM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
NB	859	1.00	859	51	1.00	51	910
SB	1110	0.55	611	76	1.00	76	
EB	122	1.00	122	63	1.00	63	185
WB	70	1.00	70	48	1.00	48	

CLV TOTAL= **1,095**

Level of Service (LOS)= **B**

AM V/C =0.68

Evening Peak Hour

	Thru Volumes			+ Opposing Lefts			PM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
NB	1397	1.00	1397	87	1.00	87	1484
SB	817	0.55	449	87	1.00	87	
EB	224	1.00	224	28	1.00	28	252
WB	50	1.00	50	96	1.00	96	

CLV TOTAL= **1,736**

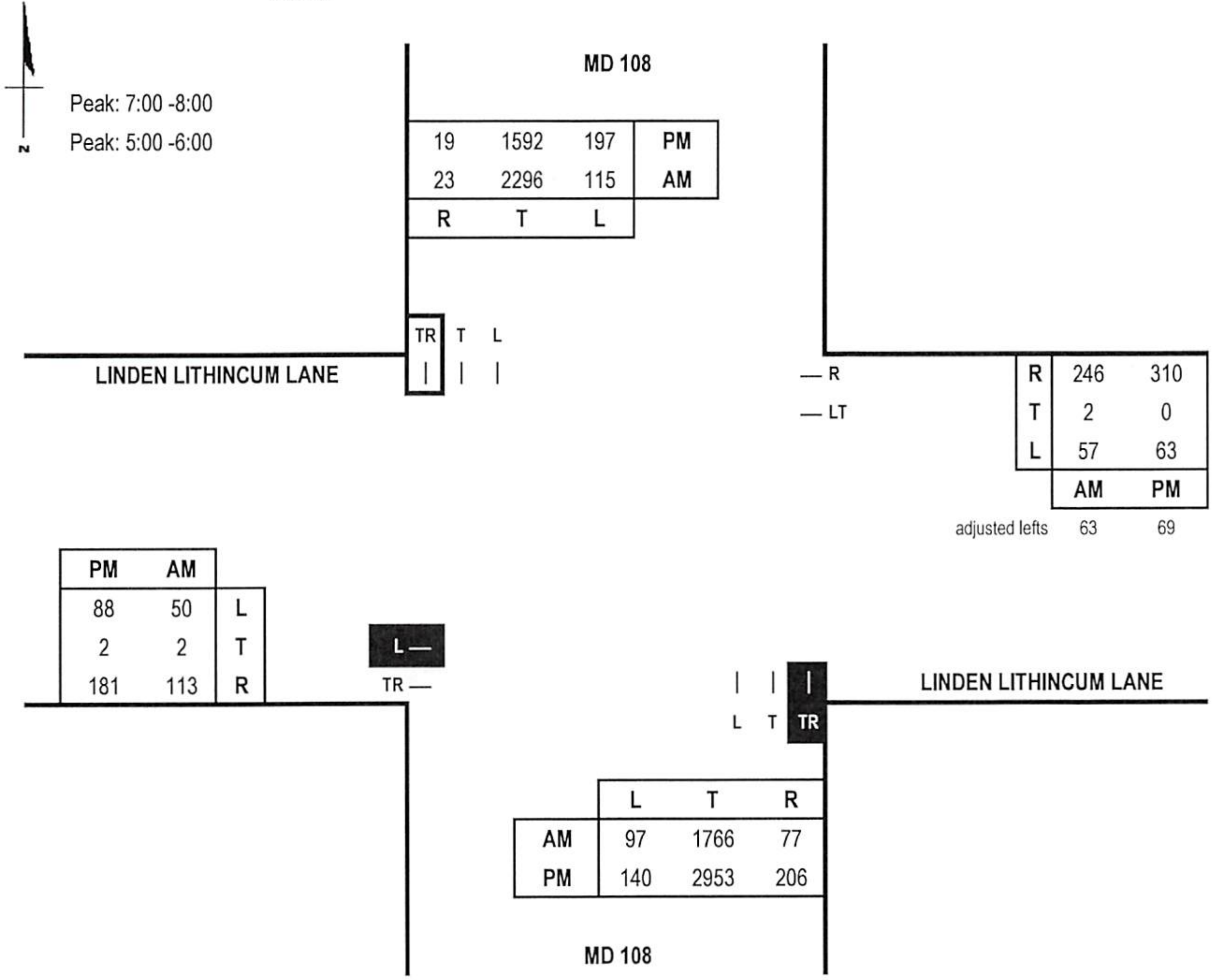
Level of Service (LOS)= **F**

PM V/C =1.09

rh, 170302\rev1\clv\6.xls-imp2, f07/14/17

CRITICAL LANE VOLUME (CLV) METHODOLOGY
for MSHA

E/W Road: Linden Lithincum Lane
N/S Road: MD 108
Conditions: 2037 Total Traffic w/imp
Date of Count: 4/26/2017
Day of Count: Wednesday
Analyst: Richard Huang



Capacity Analysis

Morning Peak Hour							
	Thru Volumes			+ Opposing Lefts			AM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
NB	1843	0.55	1014	115	1.00	115	1372
SB	2319	0.55	1275	97	1.00	97	
EB	115	1.00	115	57	1.00	57	181
WB	131	1.00	131	50	1.00	50	
						CLV TOTAL=	1,553
						Level of Service (LOS)=	E

AM V/C =0.97

Evening Peak Hour							
	Thru Volumes			+ Opposing Lefts			PM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
NB	3159	0.55	1737	197	1.00	197	1934
SB	1611	0.55	886	140	1.00	140	
EB	183	1.00	183	63	1.00	63	246
WB	113	1.00	113	88	1.00	88	
						CLV TOTAL=	2,180
						Level of Service (LOS)=	F

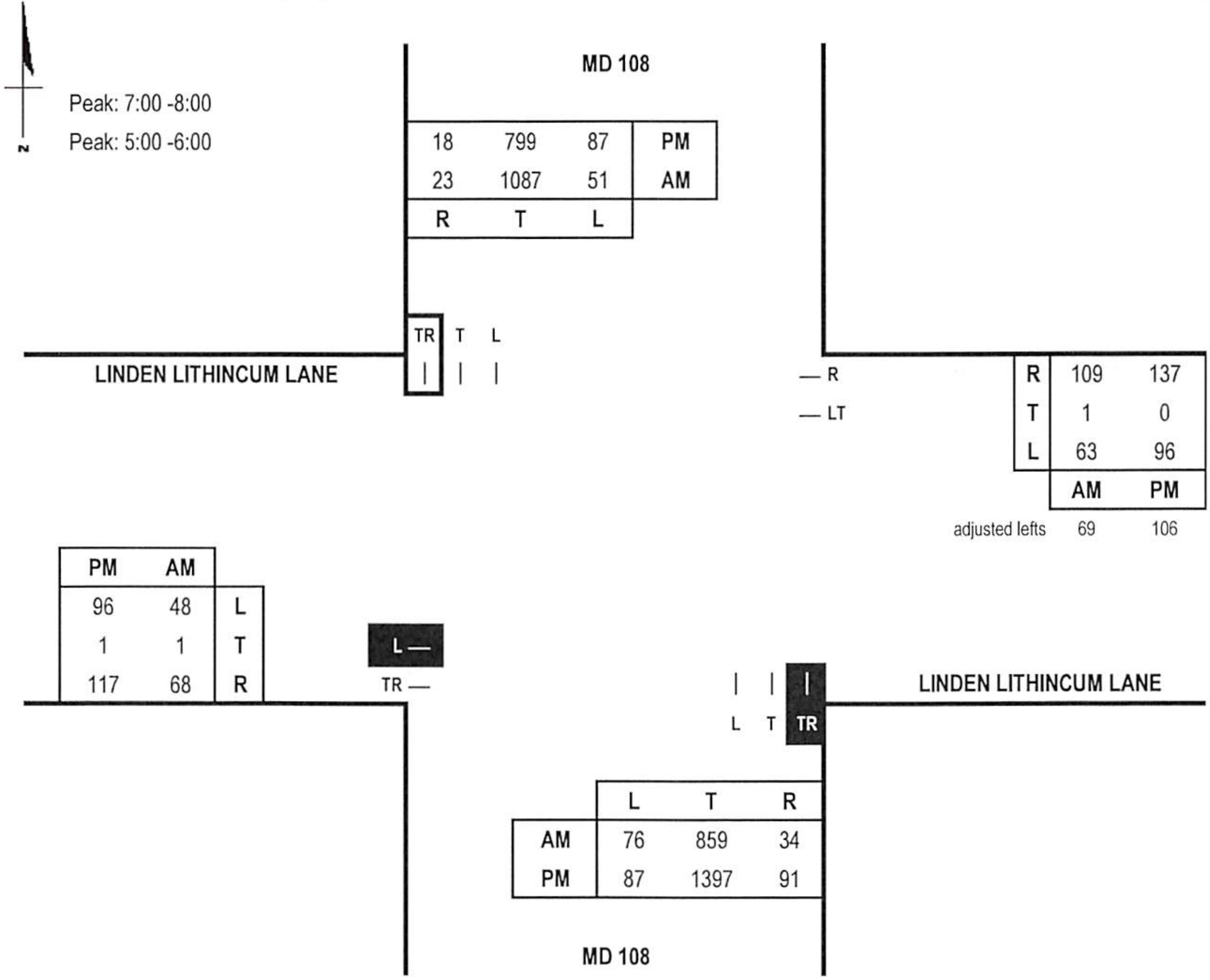
PM V/C =1.36

rh, 170302\rev1\clv\6.xls-imp2, f07/14/17

CRITICAL LANE VOLUME (CLV) METHODOLOGY
for MSHA

E/W Road: Linden Lithincum Lane
N/S Road: MD 108
Conditions: 2023 Total Traffic w/imp

Date of Count: 4/26/2017
Day of Count: Wednesday
Analyst: Richard Huang



Capacity Analysis

Morning Peak Hour							
	Thru Volumes			+ Opposing Lefts			AM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
NB	893	0.55	491	51	1.00	51	687
SB	1110	0.55	611	76	1.00	76	
EB	69	1.00	69	63	1.00	63	132
WB	70	1.00	70	48	1.00	48	

CLV TOTAL= **819**

Level of Service (LOS)= **A**

AM V/C =0.51

Evening Peak Hour							
	Thru Volumes			+ Opposing Lefts			PM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
NB	1488	0.55	818	87	1.00	87	905
SB	817	0.55	449	87	1.00	87	
EB	118	1.00	118	96	1.00	96	214
WB	106	1.00	106	96	1.00	96	

CLV TOTAL= **1,119**

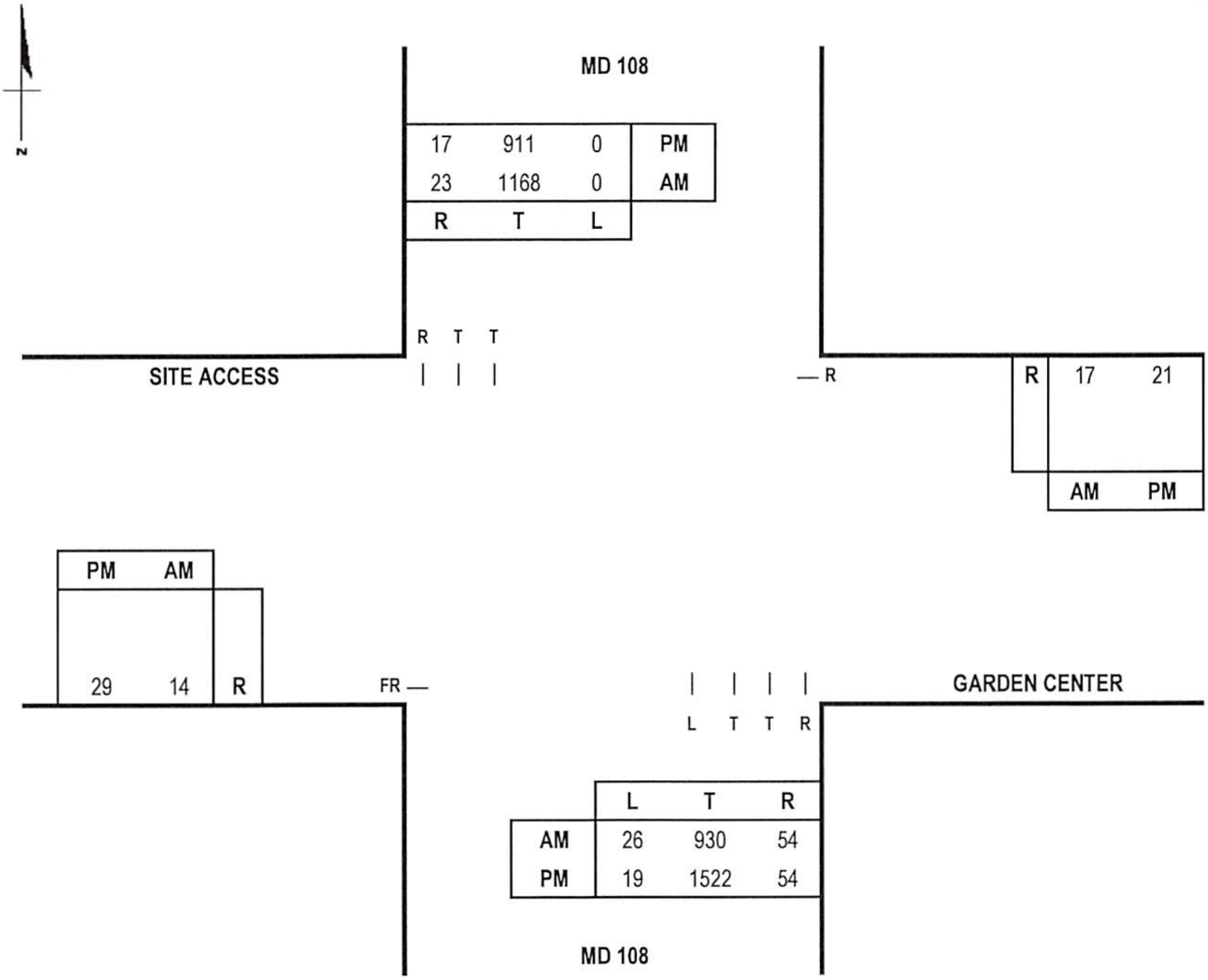
Level of Service (LOS)= **B**

PM V/C =0.7

rh, 170302\rev1\clv\7.xls-clv, f07/26/17

CRITICAL LANE VOLUME (CLV) METHODOLOGY
for MSHA

E/W Road: Garden Center/Site Access
N/S Road: MD 108
Conditions: 2023 Total Traffic
Date of Count:
Day of Count:
Analyst: Richard Huang



Capacity Analysis

Morning Peak Hour

	Thru Volumes			+ Opposing Lefts			AM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
NB	930	0.55	512	0	0.00	0	668
SB	1168	0.55	642	26	1.00	26	
EB	0	0.00	0	0	0.00	0	17
WB	17	1.00	17	0	0.00	0	

CLV TOTAL= **685**

Level of Service (LOS)= **A**

AM V/C =0.43

Evening Peak Hour

	Thru Volumes			+ Opposing Lefts			PM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
NB	1522	0.55	837	0	0.00	0	837
SB	911	0.55	501	19	1.00	19	
EB	0	0.00	0	0	0.00	0	21
WB	21	1.00	21	0	0.00	0	

CLV TOTAL= **858**

Level of Service (LOS)= **A**

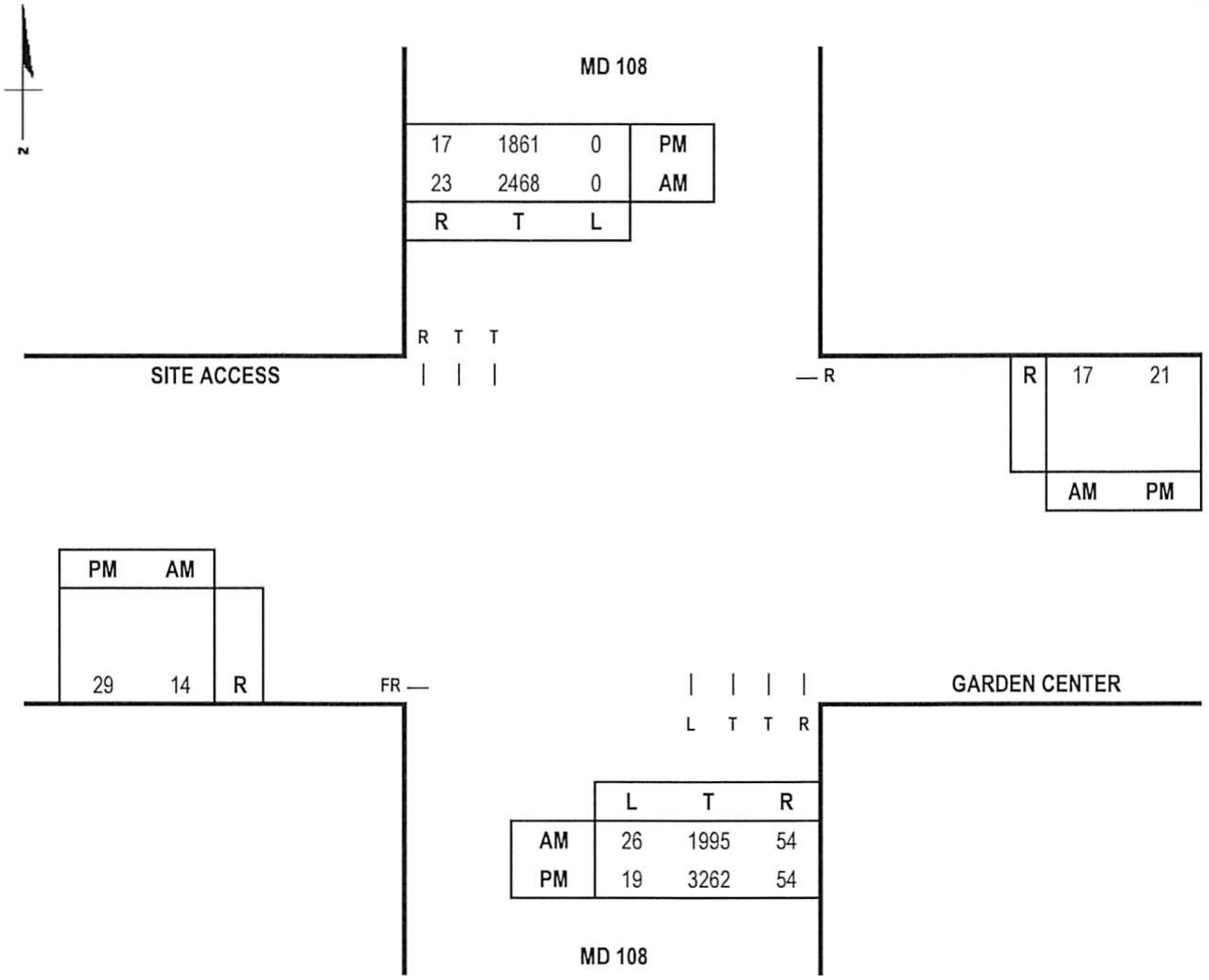
PM V/C =0.54

rh, 170302\rev1\clv\7.xls-clv, f07/26/17

CRITICAL LANE VOLUME (CLV) METHODOLOGY
for MSHA

The Traffic Group®

E/W Road: Garden Center/Site Access
N/S Road: MD 108
Conditions: 2037 Total Traffic
Date of Count:
Day of Count:
Analyst: Richard Huang



Capacity Analysis

Morning Peak Hour

	Thru Volumes			+ Opposing Lefts			AM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
NB	1995	0.55	1097	0	0.00	0	1383
SB	2468	0.55	1357	26	1.00	26	
EB	0	0.00	0	0	0.00	0	17
WB	17	1.00	17	0	0.00	0	

CLV TOTAL= **1,400**
Level of Service (LOS)= **D**
AM V/C =0.88

Evening Peak Hour

	Thru Volumes			+ Opposing Lefts			PM
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
NB	3262	0.55	1794	0	0.00	0	1794
SB	1861	0.55	1024	19	1.00	19	
EB	0	0.00	0	0	0.00	0	21
WB	21	1.00	21	0	0.00	0	

CLV TOTAL= **1,815**
Level of Service (LOS)= **F**
PM V/C =1.13

APPENDIX D

Trip Assignment for Background Developments

TRAFFIC GROWTH PROJECTION

Average Growth: -0.07%
Mathematical Growth: -0.09%

Year	ADT Volume	Vol. increase	% increase	Average %
2006	20,271			
2007	20,272	1	0.00%	0.00%
2008	19,663	-609	-3.00%	-1.50%
2009	19,870	207	1.05%	-0.65%
2010	19,991	121	0.61%	-0.33%
2011	19,990	-1	-0.01%	-0.27%
2012	19,220	-770	-3.85%	-0.87%
2013	19,261	41	0.21%	-0.71%
2014	19,202	-59	-0.31%	-0.66%
2015	19,703	501	2.61%	-0.30%
2016	20,084	381	1.93%	-0.07%

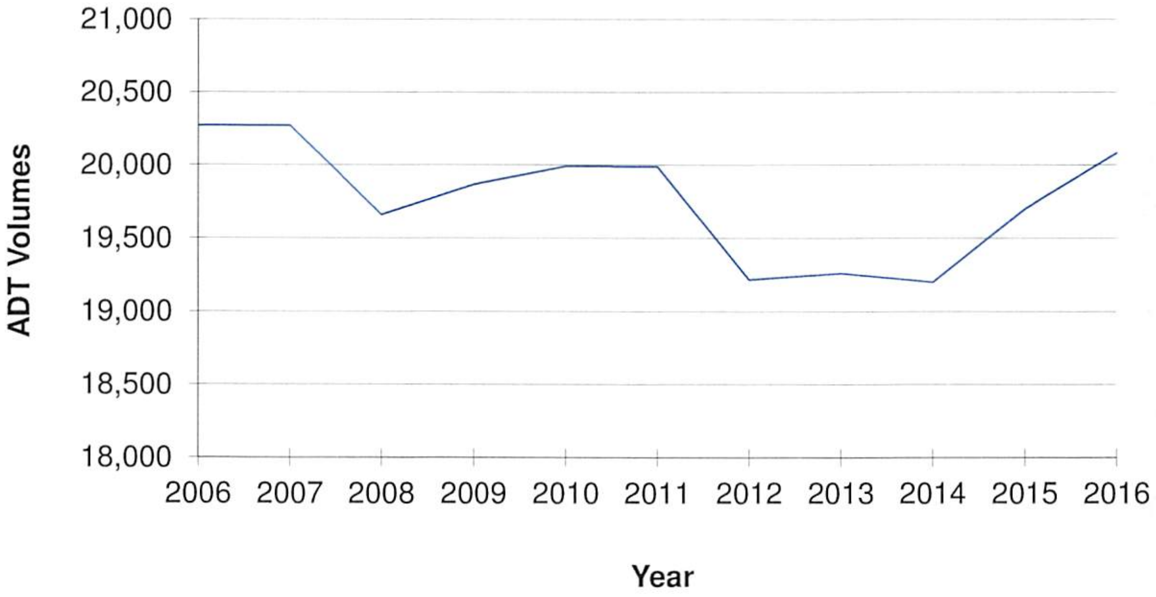


EXHIBIT D-1
TRAFFIC GROWTH PROJECTION
MD 108 N. of MD 32

rh, 170302\initial\adt.xls-md 108, f07/14/17

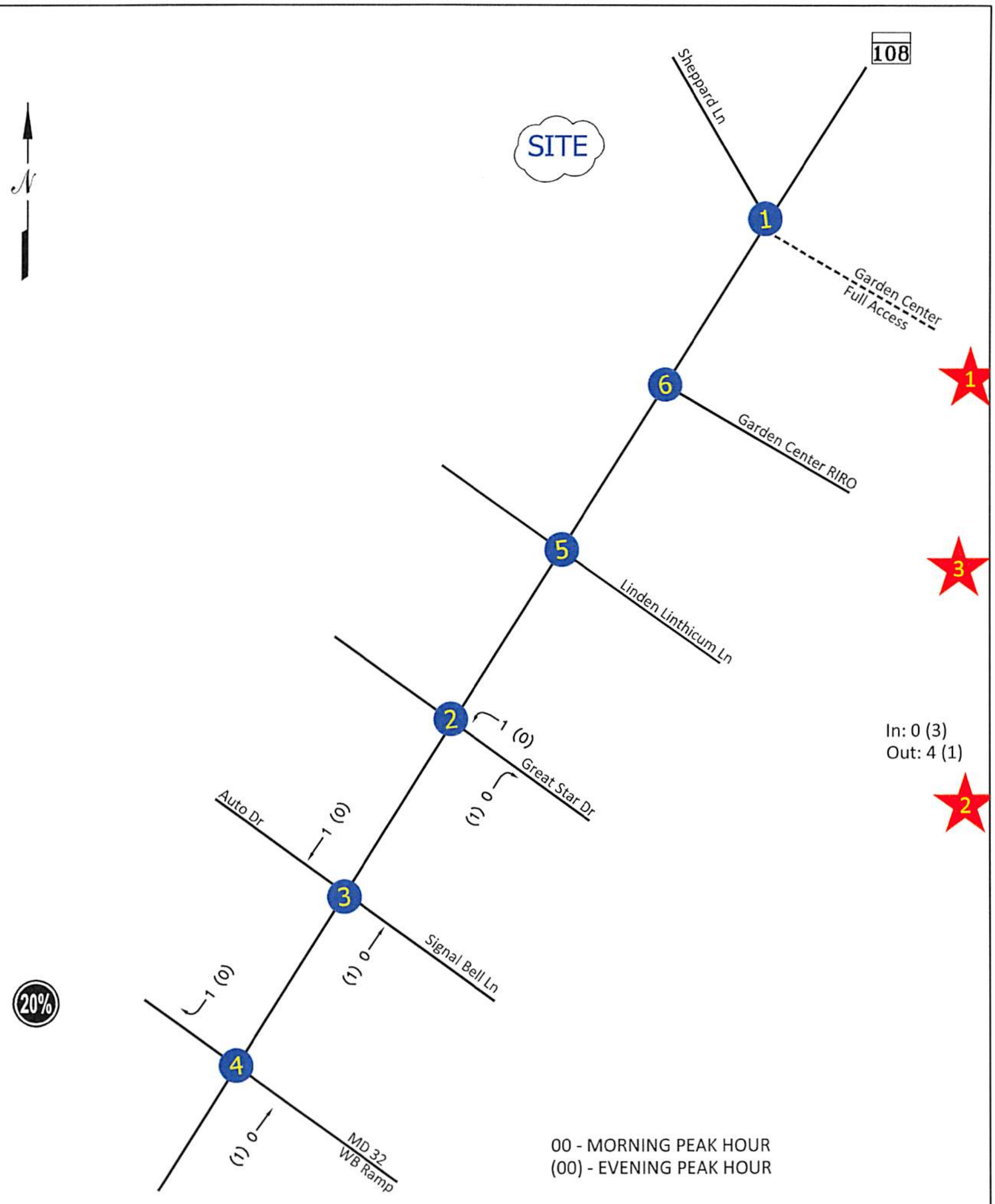


EXHIBIT D-2
TRIP ASSIGNMENT FOR
BACKGROUND DEVELOPMENTS #1~#3

rh, 170302_erickson_md 108 site\rev1\ex.dwg-1, f07/14/17

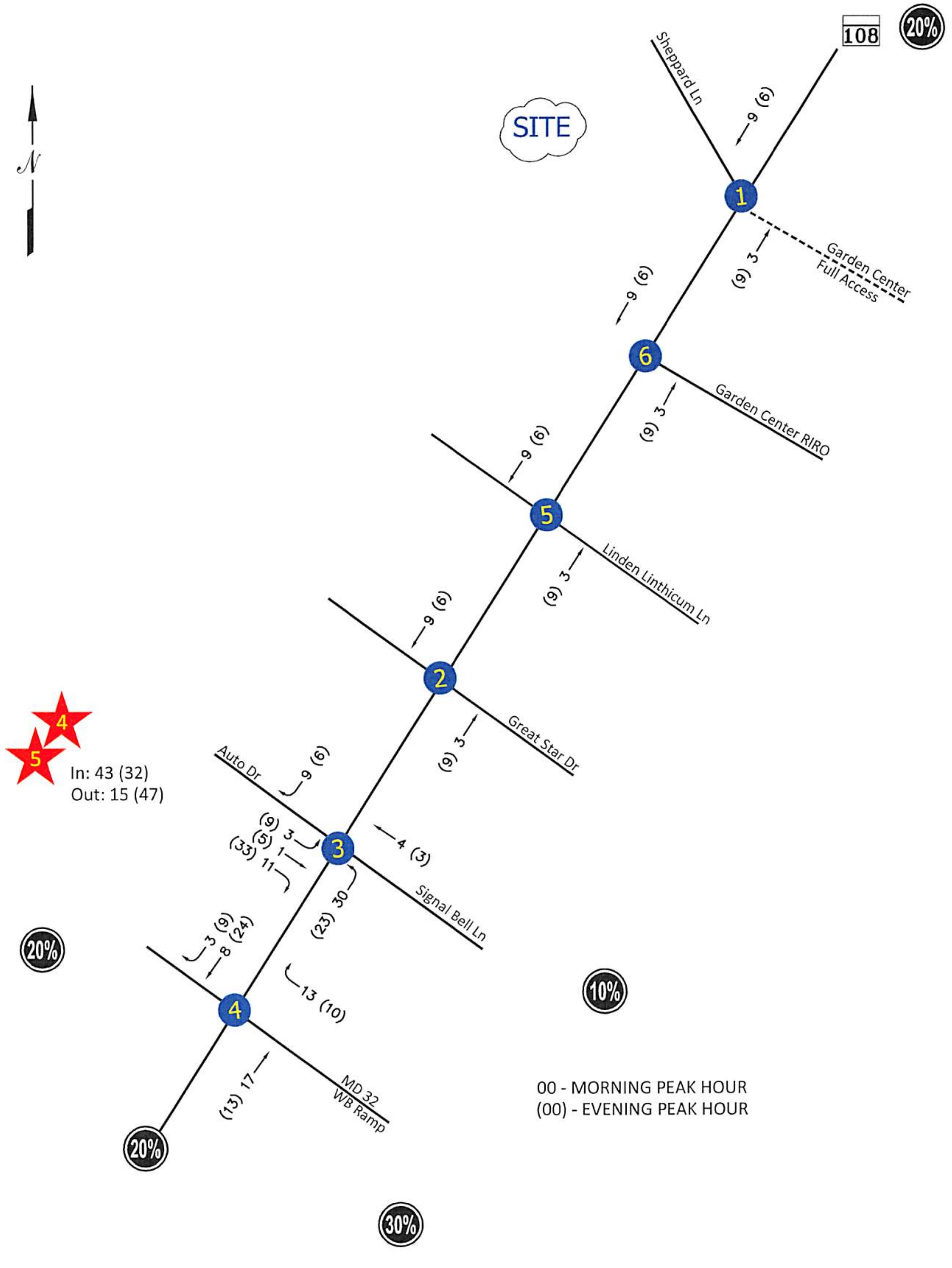


EXHIBIT D-3
TRIP ASSIGNMENT FOR
BACKGROUND DEVELOPMENTS #4~#5

rh, 170302_erickson_md 108 site\rev1\ex.dwg-2, f07/14/17

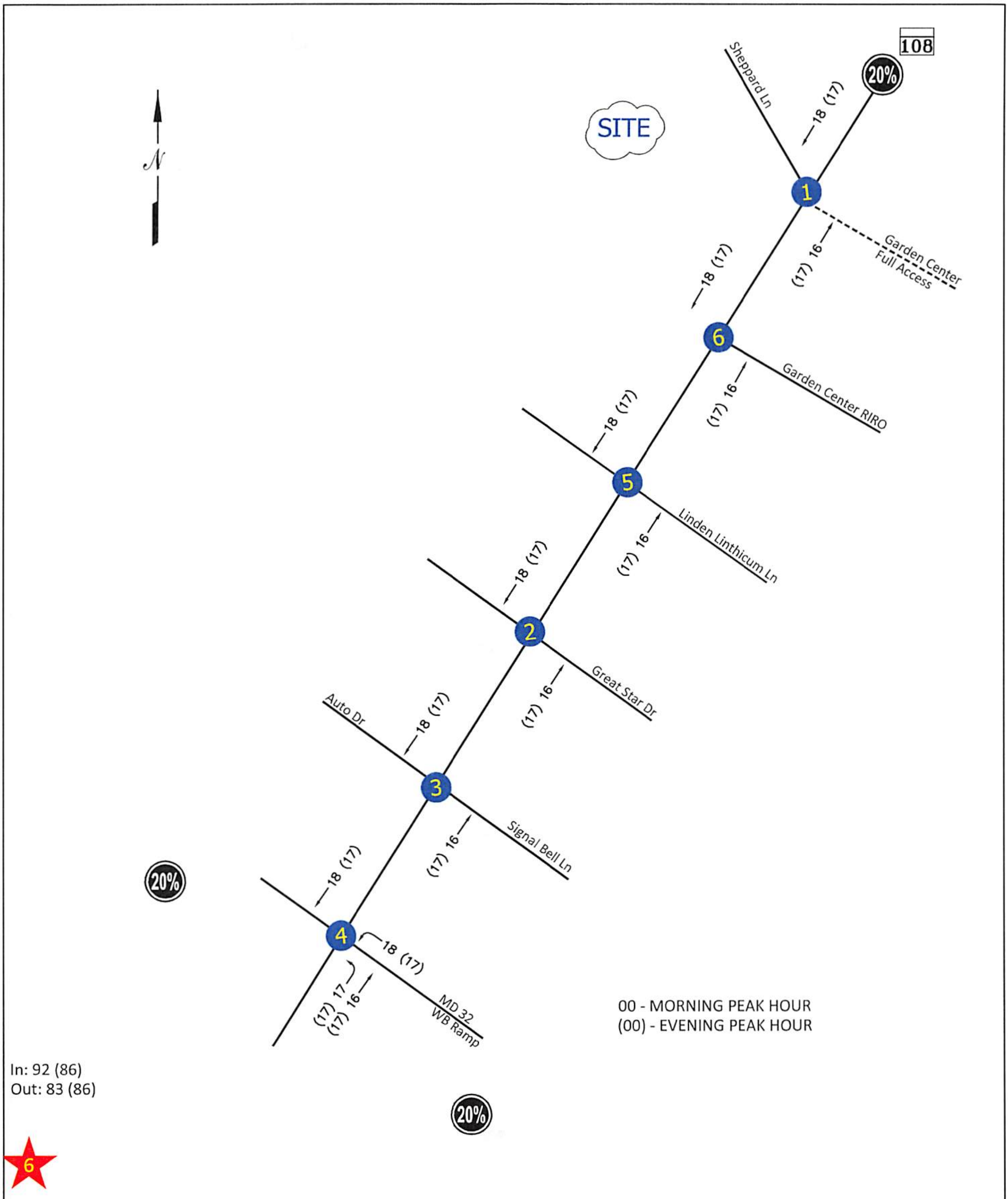


EXHIBIT D-4
TRIP ASSIGNMENT FOR
BACKGROUND DEVELOPMENTS #6

rh, 170302_erickson_md 108 site\rev1\ex.dwg-3, f07/14/17

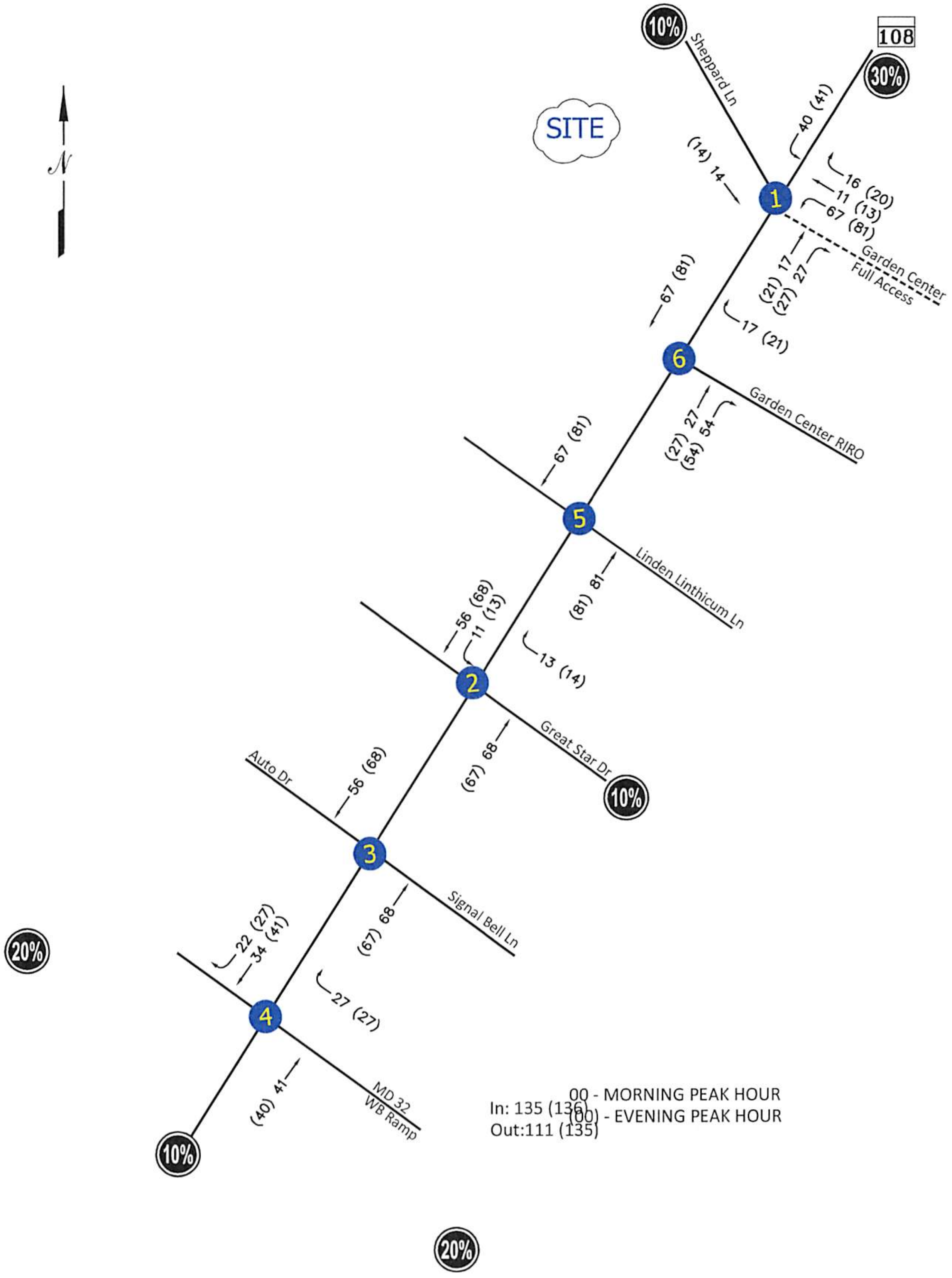


EXHIBIT D-5
TRIP ASSIGNMENT FOR
RIVER HILL GARDEN CENTER

rh, 170302_erickson_md 108 site\rev1\ex.dwg-4, f07/14/17

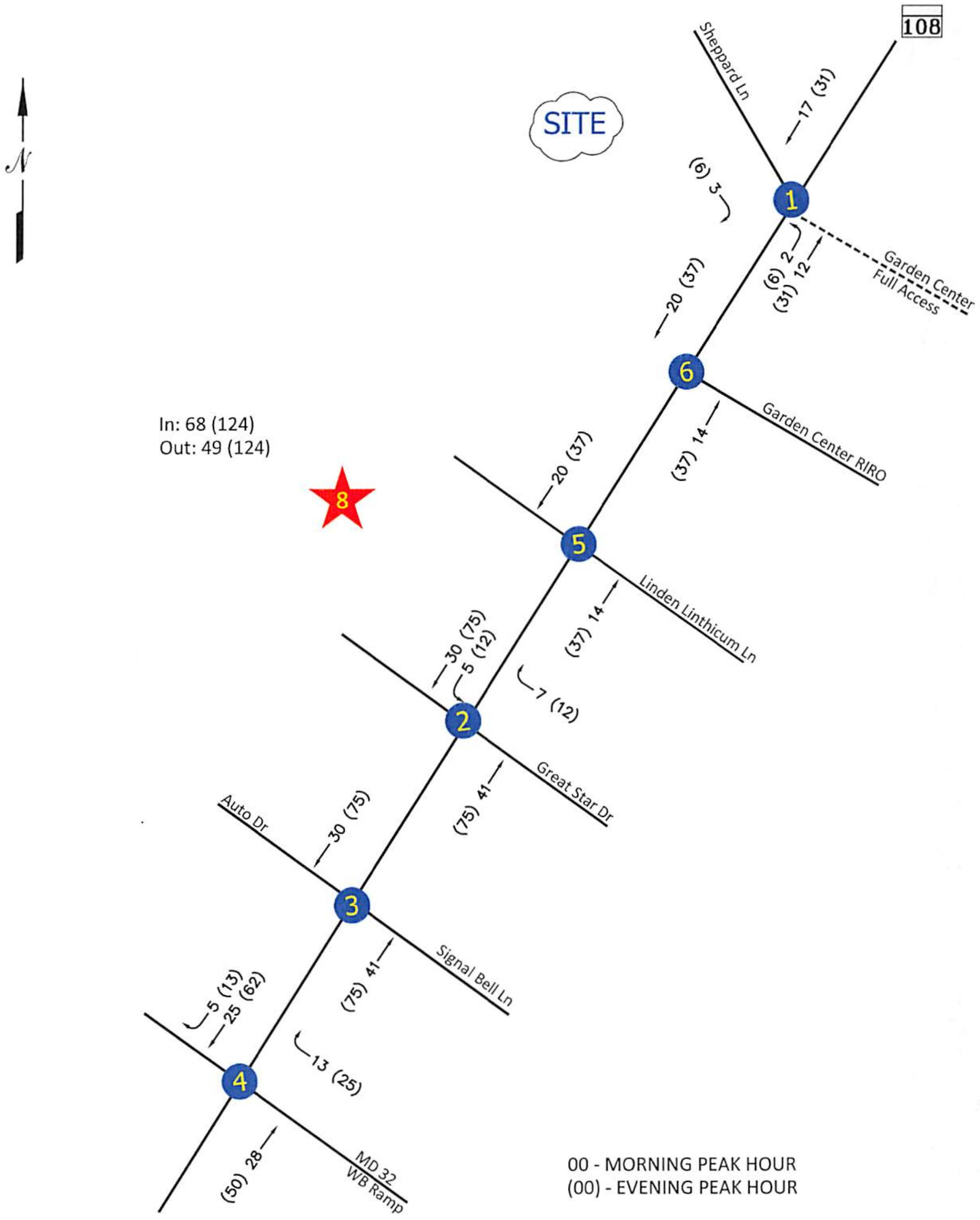


EXHIBIT D-6
TRIP ASSIGNMENT FOR
BACKGROUND DEVELOPMENTS #8

rh, 170302_erickson_md 108 site\rev1\ex.dwg-5, f07/14/17

APPENDIX E

Synchro & SimTraffic

Summary of All Intervals

Run Number	1	10	2	3	4	5	6
Start Time	6:50	6:50	6:50	6:50	6:50	6:50	6:50
End Time	8:00	8:00	8:00	8:00	8:00	8:00	8:00
Total Time (min)	70	70	70	70	70	70	70
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	5	5	5	5	5	5	5
# of Recorded Intervals	4	4	4	4	4	4	4
Vehs Entered	4628	4624	4610	4558	4567	4619	4664
Vehs Exited	4624	4628	4588	4573	4547	4611	4637
Starting Vehs	211	215	183	217	197	197	187
Ending Vehs	215	211	205	202	217	205	214
Travel Distance (mi)	2274	2195	2215	2198	2153	2225	2242
Travel Time (hr)	444.3	473.7	431.8	475.9	403.3	467.3	461.8
Total Delay (hr)	359.0	391.4	348.8	393.4	322.0	383.8	377.6
Total Stops	6581	6530	6684	6484	6570	6638	6558
Fuel Used (gal)	167.4	172.0	162.6	172.6	154.8	171.1	171.5

Summary of All Intervals

Run Number	7	8	9	Avg
Start Time	6:50	6:50	6:50	6:50
End Time	8:00	8:00	8:00	8:00
Total Time (min)	70	70	70	70
Time Recorded (min)	60	60	60	60
# of Intervals	5	5	5	5
# of Recorded Intervals	4	4	4	4
Vehs Entered	4606	4572	4654	4607
Vehs Exited	4587	4579	4632	4599
Starting Vehs	199	196	203	196
Ending Vehs	218	189	225	202
Travel Distance (mi)	2210	2195	2247	2215
Travel Time (hr)	487.1	455.5	467.7	456.8
Total Delay (hr)	404.2	372.9	383.3	373.6
Total Stops	6572	6550	6547	6570
Fuel Used (gal)	175.6	168.0	172.2	168.8

Interval #0 Information Seeding

Start Time	6:50
End Time	7:00
Total Time (min)	10

Volumes adjusted by Growth Factors.

No data recorded this interval.

Intersection: 1: MD 108 & Sheppard Lane

Movement	EB	NB	NB	SB	SB
Directions Served	LR	L	T	T	R
Maximum Queue (ft)	490	199	447	483	350
Average Queue (ft)	229	123	220	271	21
95th Queue (ft)	403	223	400	451	165
Link Distance (ft)	772		445	472	
Upstream Blk Time (%)			1	2	
Queuing Penalty (veh)			5	0	
Storage Bay Dist (ft)		150			265
Storage Blk Time (%)		4	15	11	
Queuing Penalty (veh)		22	29	5	

Intersection: 2: MD 108 & Hardware Store/Great Star Drive

Movement	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	L	LT	R	L	T	TR	L	T	TR
Maximum Queue (ft)	47	92	106	135	64	240	190	162	160	137
Average Queue (ft)	12	41	49	61	7	120	76	71	75	53
95th Queue (ft)	38	80	88	103	40	217	156	128	135	107
Link Distance (ft)	272		325			602	602		324	324
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)		200		200	200			200		
Storage Blk Time (%)				0		2		0	0	
Queuing Penalty (veh)				0		0		0	0	

Intersection: 3: MD 108 & Auto Dr./Signal Bell Ln

Movement	EB	EB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	LTR	L	T	TR	L	T	TR
Maximum Queue (ft)	48	64	96	108	156	114	39	248	181
Average Queue (ft)	17	25	34	42	42	28	6	108	68
95th Queue (ft)	45	53	75	84	109	81	27	203	140
Link Distance (ft)	300		208		347	347		602	602
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)		250		190			180		
Storage Blk Time (%)					0			1	
Queuing Penalty (veh)					0			0	

Intersection: 4: MD 108 & MD 32 WB Ramps

Movement	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	LT	R	L	T	T	T	TR
Maximum Queue (ft)	294	260	306	49	191	183	326	265
Average Queue (ft)	172	140	182	13	93	67	191	89
95th Queue (ft)	259	230	283	39	179	149	321	202
Link Distance (ft)		520			440	440	347	347
Upstream Blk Time (%)							0	0
Queuing Penalty (veh)							1	0
Storage Bay Dist (ft)	430		350	400				
Storage Blk Time (%)			0					
Queuing Penalty (veh)			0					

Intersection: 5: MD 108 & MD32 EB Ramps

Movement	EB	EB	NB	NB	SB	SB	SB
Directions Served	L	LTR	TR	R	L	T	T
Maximum Queue (ft)	200	355	189	140	313	400	193
Average Queue (ft)	164	283	97	11	167	117	54
95th Queue (ft)	230	415	207	69	290	298	145
Link Distance (ft)		332	173	173		440	440
Upstream Blk Time (%)		43	3	0		0	
Queuing Penalty (veh)		0	21	0		1	
Storage Bay Dist (ft)	175				400		
Storage Blk Time (%)	34	75			0	0	
Queuing Penalty (veh)	30	36			1	1	

Intersection: 6: MD 108 & Gas Station/Linden Linthicum Lane

Movement	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	LT	R	L	T	R	L	T	TR
Maximum Queue (ft)	113	78	105	30	47	4	54	29	22
Average Queue (ft)	36	26	42	7	3	0	17	2	1
95th Queue (ft)	91	66	79	28	26	4	44	14	11
Link Distance (ft)	159	467	467		191	191	77	77	77
Upstream Blk Time (%)	3						0		
Queuing Penalty (veh)	0						0		
Storage Bay Dist (ft)				5					
Storage Blk Time (%)				2	0				
Queuing Penalty (veh)				15	0				

Intersection: 7: MD 108 & Garden Center

Movement	NE
Directions Served	T
Maximum Queue (ft)	153
Average Queue (ft)	9
95th Queue (ft)	74
Link Distance (ft)	424
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	0
Queuing Penalty (veh)	0

Zone Summary

Zone wide Queuing Penalty: 169

Summary of All Intervals

Run Number	1	10	2	3	4	5	6
Start Time	4:50	4:50	4:50	4:50	4:50	4:50	4:50
End Time	6:00	6:00	6:00	6:00	6:00	6:00	6:00
Total Time (min)	70	70	70	70	70	70	70
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	5	5	5	5	5	5	5
# of Recorded Intervals	4	4	4	4	4	4	4
Vehs Entered	5824	5914	5686	5732	5809	5799	5927
Vehs Exited	5845	5832	5640	5709	5720	5747	5848
Starting Vehs	296	262	233	294	203	264	225
Ending Vehs	275	344	279	317	292	316	304
Travel Distance (mi)	2810	2811	2702	2763	2771	2758	2793
Travel Time (hr)	387.9	434.2	349.0	364.2	403.5	425.8	387.8
Total Delay (hr)	281.9	328.0	247.0	260.1	298.7	321.4	282.2
Total Stops	10751	10468	9238	9745	9965	10189	10027
Fuel Used (gal)	171.7	181.7	159.2	164.9	173.5	178.7	172.1

Summary of All Intervals

Run Number	7	8	9	Avg
Start Time	4:50	4:50	4:50	4:50
End Time	6:00	6:00	6:00	6:00
Total Time (min)	70	70	70	70
Time Recorded (min)	60	60	60	60
# of Intervals	5	5	5	5
# of Recorded Intervals	4	4	4	4
Vehs Entered	5810	5839	5927	5829
Vehs Exited	5780	5754	5874	5774
Starting Vehs	265	226	239	239
Ending Vehs	295	311	292	292
Travel Distance (mi)	2786	2756	2806	2776
Travel Time (hr)	392.4	386.6	380.3	391.2
Total Delay (hr)	287.2	282.3	274.3	286.3
Total Stops	9840	9969	9940	10019
Fuel Used (gal)	172.3	169.9	170.8	171.5

Interval #0 Information Seeding

Start Time	4:50
End Time	5:00
Total Time (min)	10

Volumes adjusted by Growth Factors.

No data recorded this interval.

Intersection: 1: MD 108 & Sheppard Lane

Movement	EB	NB	NB	SB	SB
Directions Served	LR	L	T	T	R
Maximum Queue (ft)	205	200	529	456	78
Average Queue (ft)	92	178	307	236	7
95th Queue (ft)	164	233	603	381	92
Link Distance (ft)	772		445	472	
Upstream Blk Time (%)			9	0	
Queuing Penalty (veh)			119	0	
Storage Bay Dist (ft)		150			265
Storage Blk Time (%)		28	4	6	
Queuing Penalty (veh)		211	20	3	

Intersection: 2: MD 108 & Hardware Store/Great Star Drive

Movement	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	L	LT	R	L	T	TR	L	T	TR
Maximum Queue (ft)	119	182	348	225	224	610	596	217	224	209
Average Queue (ft)	53	77	145	152	32	373	328	122	87	84
95th Queue (ft)	99	147	302	240	149	593	554	205	177	161
Link Distance (ft)	272		325			602	602		324	324
Upstream Blk Time (%)			2			1	0		0	0
Queuing Penalty (veh)			0			4	2		1	0
Storage Bay Dist (ft)		200		200	200			200		
Storage Blk Time (%)		0	0	6		41		2		
Queuing Penalty (veh)		0	1	17		8		6		

Intersection: 3: MD 108 & Auto Dr./Signal Bell Ln

Movement	EB	EB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	LTR	L	T	TR	L	T	TR
Maximum Queue (ft)	151	140	152	222	322	295	93	251	264
Average Queue (ft)	60	62	61	38	105	91	16	118	118
95th Queue (ft)	118	115	119	114	241	221	68	223	230
Link Distance (ft)	300		208		347	347		602	602
Upstream Blk Time (%)			0		0	0			
Queuing Penalty (veh)			0		1	0			
Storage Bay Dist (ft)		250		190			180		
Storage Blk Time (%)					2			2	
Queuing Penalty (veh)					2			0	

Intersection: 4: MD 108 & MD 32 WB Ramps

Movement	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	LT	R	L	T	T	T	TR
Maximum Queue (ft)	455	546	375	113	343	329	372	376
Average Queue (ft)	309	364	273	40	177	162	292	277
95th Queue (ft)	478	565	440	90	300	290	420	411
Link Distance (ft)		520			440	440	347	347
Upstream Blk Time (%)		4					7	5
Queuing Penalty (veh)		0					36	26
Storage Bay Dist (ft)	430		350	400				
Storage Blk Time (%)	0	8	2		0			
Queuing Penalty (veh)	2	68	22		0			

Intersection: 5: MD 108 & MD32 EB Ramps

Movement	EB	EB	NB	SB	SB	SB
Directions Served	L	LTR	TR	L	T	T
Maximum Queue (ft)	200	357	195	330	463	459
Average Queue (ft)	153	274	107	159	152	199
95th Queue (ft)	237	410	229	288	416	498
Link Distance (ft)		332	173		440	440
Upstream Blk Time (%)		34	7	0	1	3
Queuing Penalty (veh)		0	44	0	8	25
Storage Bay Dist (ft)	175			400		
Storage Blk Time (%)	23	68			2	
Queuing Penalty (veh)	24	35			5	

Intersection: 6: MD 108 & Gas Station/Linden Linthicum Lane

Movement	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	LT	R	L	T	R	L	T	TR
Maximum Queue (ft)	175	304	430	30	193	34	128	44	32
Average Queue (ft)	84	116	196	12	22	2	47	3	1
95th Queue (ft)	189	373	473	35	109	16	106	21	16
Link Distance (ft)	159	467	467		191	191	77	77	77
Upstream Blk Time (%)	26	10	13		0		7	0	0
Queuing Penalty (veh)	0	0	0		2		17	0	0
Storage Bay Dist (ft)				5					
Storage Blk Time (%)				2	0				
Queuing Penalty (veh)				28	0				

Intersection: 7: MD 108 & Garden Center

Movement	NE	NE	B17
Directions Served	T	R	T
Maximum Queue (ft)	341	40	80
Average Queue (ft)	75	2	12
95th Queue (ft)	325	36	80
Link Distance (ft)	424		106
Upstream Blk Time (%)	3		2
Queuing Penalty (veh)	37		25
Storage Bay Dist (ft)		175	
Storage Blk Time (%)	5		
Queuing Penalty (veh)	0		

Zone Summary

Zone wide Queuing Penalty: 800

Summary of All Intervals

Run Number	1	10	2	3	4	5	6
Start Time	6:50	6:50	6:50	6:50	6:50	6:50	6:50
End Time	8:00	8:00	8:00	8:00	8:00	8:00	8:00
Total Time (min)	70	70	70	70	70	70	70
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	5	5	5	5	5	5	5
# of Recorded Intervals	4	4	4	4	4	4	4
Vehs Entered	4650	4620	4638	4629	4596	4639	4715
Vehs Exited	4653	4616	4632	4564	4568	4605	4636
Starting Vehs	177	158	172	177	154	125	160
Ending Vehs	174	162	178	242	182	159	239
Travel Distance (mi)	2219	2177	2200	2207	2167	2189	2243
Travel Time (hr)	175.3	178.3	206.4	266.5	195.6	182.6	232.4
Total Delay (hr)	93.4	98.2	125.5	185.3	115.6	102.0	150.2
Total Stops	6916	6328	6409	8165	7337	6904	7711
Fuel Used (gal)	105.0	104.5	112.4	125.8	108.1	106.4	119.4

Summary of All Intervals

Run Number	7	8	9	Avg
Start Time	6:50	6:50	6:50	6:50
End Time	8:00	8:00	8:00	8:00
Total Time (min)	70	70	70	70
Time Recorded (min)	60	60	60	60
# of Intervals	5	5	5	5
# of Recorded Intervals	4	4	4	4
Vehs Entered	4668	3157	4681	4500
Vehs Exited	4649	2873	4663	4445
Starting Vehs	146	156	169	153
Ending Vehs	165	440	187	207
Travel Distance (mi)	2187	1288	2205	2108
Travel Time (hr)	171.1	533.8	218.8	236.1
Total Delay (hr)	90.6	486.2	137.8	158.5
Total Stops	6903	4620	6757	6803
Fuel Used (gal)	103.7	159.8	115.3	116.0

Interval #0 Information Seeding

Start Time	6:50
End Time	7:00
Total Time (min)	10

Volumes adjusted by Growth Factors.

No data recorded this interval.

Intersection: 1: MD 108 & Sheppard Lane

Movement	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	L	TR	L	T	R	L	T	R
Maximum Queue (ft)	810	178	36	200	400	224	120	507	436
Average Queue (ft)	613	76	4	157	323	26	32	437	75
95th Queue (ft)	968	166	21	257	499	131	94	573	360
Link Distance (ft)	777	192	192		383			477	477
Upstream Blk Time (%)	35	6			14			30	2
Queuing Penalty (veh)	0	0			131			0	0
Storage Bay Dist (ft)				150		150	100		
Storage Blk Time (%)				29	22		1	54	
Queuing Penalty (veh)				205	53		3	22	

Intersection: 2: MD 108 & Hardware Store/Great Star Drive

Movement	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	L	LT	R	L	T	TR	L	T	TR
Maximum Queue (ft)	54	145	216	203	166	410	375	192	171	202
Average Queue (ft)	13	10	108	92	17	223	165	104	71	93
95th Queue (ft)	43	68	210	172	97	418	373	180	137	171
Link Distance (ft)	272		325			602	602		324	324
Upstream Blk Time (%)			4			4	4			
Queuing Penalty (veh)			0			17	17			
Storage Bay Dist (ft)		200		200	200			200		
Storage Blk Time (%)			0	5		15		0	0	
Queuing Penalty (veh)			0	8		2		2	0	

Intersection: 3: MD 108 & Auto Dr./Signal Bell Ln

Movement	EB	EB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	LTR	L	T	TR	L	T	TR
Maximum Queue (ft)	69	68	102	161	225	181	33	243	272
Average Queue (ft)	22	31	42	63	79	57	4	102	127
95th Queue (ft)	56	58	84	127	202	176	22	201	233
Link Distance (ft)	300		208		347	347		602	602
Upstream Blk Time (%)					4	4			
Queuing Penalty (veh)					20	20			
Storage Bay Dist (ft)		250		190			180		
Storage Blk Time (%)				0	4			1	
Queuing Penalty (veh)				0	8			0	

Intersection: 4: MD 108 & MD 32 WB Ramps

Movement	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	LT	R	L	T	T	T	TR
Maximum Queue (ft)	325	463	360	125	340	287	347	352
Average Queue (ft)	174	251	225	34	185	122	195	210
95th Queue (ft)	298	396	346	91	331	271	341	362
Link Distance (ft)		520			463	463	347	347
Upstream Blk Time (%)		3			3	0	0	1
Queuing Penalty (veh)		0			0	0	2	4
Storage Bay Dist (ft)	430		350	400				
Storage Blk Time (%)	0	0	4		3			
Queuing Penalty (veh)	0	2	20		2			

Intersection: 6: MD 108 & Gas Station/Linden Linthicum Lane

Movement	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	LT	R	L	T	R	L	T	TR
Maximum Queue (ft)	167	233	298	30	142	18	79	49	47
Average Queue (ft)	74	73	122	10	36	1	24	8	5
95th Queue (ft)	174	284	364	32	150	9	61	56	26
Link Distance (ft)	159	467	467		191	191	77	77	77
Upstream Blk Time (%)	23	7	9		2		2	5	
Queuing Penalty (veh)	0	0	0		11		6	17	
Storage Bay Dist (ft)				5					
Storage Blk Time (%)				3	4				
Queuing Penalty (veh)				25	1				

Intersection: 7: MD 108 & Garden Center

Movement	NW	NE	NE	B17	SW
Directions Served	R	T	R	T	T
Maximum Queue (ft)	77	491	180	149	44
Average Queue (ft)	24	207	23	42	19
95th Queue (ft)	75	553	129	166	163
Link Distance (ft)	128	424		106	383
Upstream Blk Time (%)	2	12		9	4
Queuing Penalty (veh)	0	113		83	47
Storage Bay Dist (ft)			175		
Storage Blk Time (%)		17	0		4
Queuing Penalty (veh)		9	0		0

Zone Summary

Zone wide Queuing Penalty: 852

Summary of All Intervals

Run Number	1	10	2	3	4	5	6
Start Time	4:50	4:50	4:50	4:50	4:50	4:50	4:50
End Time	6:00	6:00	6:00	6:00	6:00	6:00	6:00
Total Time (min)	70	70	70	70	70	70	70
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	5	5	5	5	5	5	5
# of Recorded Intervals	4	4	4	4	4	4	4
Vehs Entered	5301	5233	1347	5340	5370	5319	5368
Vehs Exited	5171	5070	1082	5193	5196	5209	5235
Starting Vehs	272	265	287	257	230	288	239
Ending Vehs	402	428	552	404	404	398	372
Travel Distance (mi)	2305	2321	424	2337	2336	2289	2319
Travel Time (hr)	832.5	1060.7	2618.8	852.6	867.7	860.2	807.7
Total Delay (hr)	746.9	974.9	2602.9	766.1	780.9	774.9	721.5
Total Stops	10997	11443	2261	11467	11525	11049	11372
Fuel Used (gal)	259.0	309.8	607.4	263.1	265.4	264.2	252.2

Summary of All Intervals

Run Number	7	8	9	Avg
Start Time	4:50	4:50	4:50	4:50
End Time	6:00	6:00	6:00	6:00
Total Time (min)	70	70	70	70
Time Recorded (min)	60	60	60	60
# of Intervals	5	5	5	5
# of Recorded Intervals	4	4	4	4
Vehs Entered	5448	5304	5514	4953
Vehs Exited	5316	5222	5412	4811
Starting Vehs	253	298	277	259
Ending Vehs	385	380	379	400
Travel Distance (mi)	2353	2317	2381	2138
Travel Time (hr)	746.8	877.9	731.3	1025.6
Total Delay (hr)	659.4	791.8	642.6	946.2
Total Stops	11115	10933	11310	10353
Fuel Used (gal)	240.6	269.2	238.4	296.9

Interval #0 Information Seeding

Start Time	4:50
End Time	5:00
Total Time (min)	10

Volumes adjusted by Growth Factors.

No data recorded this interval.

Intersection: 1: MD 108 & Sheppard Lane

Movement	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	L	TR	L	T	R	L	T	R
Maximum Queue (ft)	350	150	50	200	487	205	114	513	390
Average Queue (ft)	196	61	6	181	412	15	29	485	125
95th Queue (ft)	482	142	29	268	630	101	88	546	425
Link Distance (ft)	777	192	192		383			477	
Upstream Blk Time (%)	7	0			26			61	
Queuing Penalty (veh)	0	0			387			0	
Storage Bay Dist (ft)				150		150	100		265
Storage Blk Time (%)				40	8		0	67	
Queuing Penalty (veh)				374	45		0	68	

Intersection: 2: MD 108 & Hardware Store/Great Star Drive

Movement	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	L	LT	R	L	T	TR	L	T	TR
Maximum Queue (ft)	146	212	359	225	204	640	654	215	308	293
Average Queue (ft)	72	97	281	212	37	616	619	137	114	120
95th Queue (ft)	168	218	414	255	167	633	642	245	244	241
Link Distance (ft)	272		325			602	602		324	324
Upstream Blk Time (%)	0		23			47	41		0	0
Queuing Penalty (veh)	0		0			327	287		1	1
Storage Bay Dist (ft)		200		200	200			200		
Storage Blk Time (%)		0	5	32		80		5	1	
Queuing Penalty (veh)		1	32	94		17		18	2	

Intersection: 3: MD 108 & Auto Dr./Signal Bell Ln

Movement	EB	EB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	LTR	L	T	TR	L	T	TR
Maximum Queue (ft)	325	275	226	255	381	390	123	473	502
Average Queue (ft)	215	172	137	175	359	360	14	214	236
95th Queue (ft)	384	338	244	358	383	383	70	453	478
Link Distance (ft)	300		208		347	347		602	602
Upstream Blk Time (%)	37		27		37	44		0	0
Queuing Penalty (veh)	0		0		271	319		0	1
Storage Bay Dist (ft)		250		190			180		
Storage Blk Time (%)	28	18			83			16	
Queuing Penalty (veh)	62	25			103			3	

Intersection: 4: MD 108 & MD 32 WB Ramps

Movement	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	LT	R	L	T	T	T	TR
Maximum Queue (ft)	455	554	375	425	497	498	375	373
Average Queue (ft)	372	535	370	243	469	455	314	318
95th Queue (ft)	619	568	391	573	537	555	470	479
Link Distance (ft)		520			463	463	347	347
Upstream Blk Time (%)		54			76	58	17	23
Queuing Penalty (veh)		0			0	0	105	147
Storage Bay Dist (ft)	430		350	400				
Storage Blk Time (%)	1	10	53	0	77			
Queuing Penalty (veh)	9	94	523	0	57			

Intersection: 6: MD 108 & Gas Station/Linden Linthicum Lane

Movement	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	LT	R	L	T	R	L	T	TR
Maximum Queue (ft)	172	494	499	30	273	19	160	55	48
Average Queue (ft)	130	293	343	15	84	1	81	15	8
95th Queue (ft)	214	631	644	38	247	13	178	80	41
Link Distance (ft)	159	467	467		191	191	77	77	77
Upstream Blk Time (%)	69	53	59		4		37	8	8
Queuing Penalty (veh)	0	0	0		32		106	24	24
Storage Bay Dist (ft)				5					
Storage Blk Time (%)				10	2				
Queuing Penalty (veh)				142	1				

Intersection: 7: MD 108 & Garden Center

Movement	NW	NE	NE	B17	SW
Directions Served	R	T	R	T	T
Maximum Queue (ft)	136	516	180	206	44
Average Queue (ft)	91	299	28	82	33
95th Queue (ft)	165	663	141	231	221
Link Distance (ft)	128	424		106	383
Upstream Blk Time (%)	50	17		14	8
Queuing Penalty (veh)	0	268		221	71
Storage Bay Dist (ft)			175		
Storage Blk Time (%)		21	0		8
Queuing Penalty (veh)		11	0		0

Zone Summary

Zone wide Queuing Penalty: 4273

Summary of All Intervals

Run Number	1	10	2	3	4	5	6
Start Time	6:50	6:50	6:50	6:50	6:50	6:50	6:50
End Time	8:00	8:00	8:00	8:00	8:00	8:00	8:00
Total Time (min)	70	70	70	70	70	70	70
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1	1
Vehs Entered	4342	4360	4347	4265	4388	4353	4388
Vehs Exited	4334	4347	4376	4272	4383	4390	4362
Starting Vehs	157	145	164	164	155	170	155
Ending Vehs	165	158	135	157	160	133	181
Travel Distance (mi)	2342	2424	2350	2364	2364	2394	2360
Travel Time (hr)	151.1	157.7	151.5	154.9	151.7	156.0	151.8
Total Delay (hr)	65.4	69.5	65.6	68.7	65.2	68.4	65.6
Total Stops	7170	7354	7146	7377	7381	7502	7352
Fuel Used (gal)	103.8	107.1	103.9	105.0	104.9	105.7	104.5

Summary of All Intervals

Run Number	7	8	9	Avg
Start Time	6:50	6:50	6:50	6:50
End Time	8:00	8:00	8:00	8:00
Total Time (min)	70	70	70	70
Time Recorded (min)	60	60	60	60
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	4377	4298	4315	4337
Vehs Exited	4363	4296	4261	4339
Starting Vehs	138	137	118	144
Ending Vehs	152	139	172	150
Travel Distance (mi)	2404	2325	2305	2363
Travel Time (hr)	158.1	152.3	152.0	153.7
Total Delay (hr)	70.3	67.4	67.8	67.4
Total Stops	7460	7277	7377	7343
Fuel Used (gal)	107.1	104.0	103.1	104.9

Interval #0 Information Seeding

Start Time	6:50
End Time	7:00
Total Time (min)	10

Volumes adjusted by Growth Factors.

No data recorded this interval.

Interval #1 Information Recording

Start Time	7:00
End Time	8:00
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	1	10	2	3	4	5	6
Vehs Entered	4342	4360	4347	4265	4388	4353	4388
Vehs Exited	4334	4347	4376	4272	4383	4390	4362
Starting Vehs	157	145	164	164	155	170	155
Ending Vehs	165	158	135	157	160	133	181
Travel Distance (mi)	2342	2424	2350	2364	2364	2394	2360
Travel Time (hr)	151.1	157.7	151.5	154.9	151.7	156.0	151.8
Total Delay (hr)	65.4	69.5	65.6	68.7	65.2	68.4	65.6
Total Stops	7170	7354	7146	7377	7381	7502	7352
Fuel Used (gal)	103.8	107.1	103.9	105.0	104.9	105.7	104.5

Interval #1 Information Recording

Start Time	7:00
End Time	8:00
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	7	8	9	Avg
Vehs Entered	4377	4298	4315	4337
Vehs Exited	4363	4296	4261	4339
Starting Vehs	138	137	118	144
Ending Vehs	152	139	172	150
Travel Distance (mi)	2404	2325	2305	2363
Travel Time (hr)	158.1	152.3	152.0	153.7
Total Delay (hr)	70.3	67.4	67.8	67.4
Total Stops	7460	7277	7377	7343
Fuel Used (gal)	107.1	104.0	103.1	104.9

Intersection: 1: MD 108 & Sheppard Lane

Movement	EB	EB	WB	WB	B12	NB	NB	NB	SB	SB	SB	SB
Directions Served	LT	R	L	TR	T	L	T	R	L	T	T	R
Maximum Queue (ft)	190	247	118	53	17	234	399	244	198	349	274	99
Average Queue (ft)	62	97	54	20	1	99	273	10	33	191	140	22
95th Queue (ft)	133	192	103	49	9	177	430	103	116	300	254	66
Link Distance (ft)	747		55	55	188	370	370	370		476	476	
Upstream Blk Time (%)			21	3			4	0				
Queuing Penalty (veh)			0	0			11	0				
Storage Bay Dist (ft)		200							150			100
Storage Blk Time (%)	0	1								17	9	0
Queuing Penalty (veh)	0	1								7	4	0

Intersection: 2: MD 108 & Hardware Store/Great Star Drive

Movement	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	L	LT	R	L	T	TR	L	T	TR
Maximum Queue (ft)	51	108	233	217	125	334	340	220	302	306
Average Queue (ft)	15	10	91	104	11	167	188	108	106	121
95th Queue (ft)	43	65	175	185	60	291	312	196	233	241
Link Distance (ft)	272		325			602	602		326	326
Upstream Blk Time (%)									0	0
Queuing Penalty (veh)									1	1
Storage Bay Dist (ft)		200		200	200			200		
Storage Blk Time (%)			0	1		5		1	1	
Queuing Penalty (veh)			0	1		1		7	2	

Intersection: 3: MD 108 & Auto Dr./Signal Bell Ln

Movement	EB	EB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	LTR	L	T	TR	L	T	TR
Maximum Queue (ft)	64	73	101	154	198	218	83	323	363
Average Queue (ft)	23	31	43	69	61	65	8	126	157
95th Queue (ft)	56	60	84	126	152	152	45	253	292
Link Distance (ft)	300		208		347	347		602	602
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)		250		190			180		
Storage Blk Time (%)				0	0			2	
Queuing Penalty (veh)				0	1			0	

Intersection: 4: MD 32 WB Ramp & MD 108

Movement	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	LT	R	L	T	T	T	TR
Maximum Queue (ft)	270	332	278	81	332	286	358	368
Average Queue (ft)	126	198	117	32	180	129	229	245
95th Queue (ft)	251	293	213	67	288	239	377	396
Link Distance (ft)		520			463	463	347	347
Upstream Blk Time (%)							1	2
Queuing Penalty (veh)							7	12
Storage Bay Dist (ft)	430		350	400				
Storage Blk Time (%)		0	0		0			
Queuing Penalty (veh)		1	0		0			

Intersection: 6: MD 108 & New Road/Linden Linthicum Lane

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	B17
Directions Served	L	TR	LT	R	L	T	TR	L	T	TR	T
Maximum Queue (ft)	73	86	94	104	114	186	197	80	268	275	2
Average Queue (ft)	28	32	37	44	38	67	108	24	99	110	0
95th Queue (ft)	61	65	76	82	81	147	188	60	200	210	2
Link Distance (ft)	270	270	456	456		186	186		315	315	367
Upstream Blk Time (%)						0	1		0	0	
Queuing Penalty (veh)						1	4		0	1	
Storage Bay Dist (ft)					100			250			
Storage Blk Time (%)					0	1			0		
Queuing Penalty (veh)					0	1			0		

Intersection: 7: MD 108 & Garden Center

Movement	NB	NB	NB	SB	SB	SB
Directions Served	L	T	T	T	T	R
Maximum Queue (ft)	51	49	204	37	36	4
Average Queue (ft)	14	2	25	1	1	0
95th Queue (ft)	40	38	116	36	35	3
Link Distance (ft)		367	367	370	370	370
Upstream Blk Time (%)		0	0		0	
Queuing Penalty (veh)		0	0		0	
Storage Bay Dist (ft)	150					
Storage Blk Time (%)			1			
Queuing Penalty (veh)			0			

Zone Summary

Zone wide Queuing Penalty: 66

Summary of All Intervals

Run Number	1	10	2	3	4	5	6
Start Time	4:50	4:50	4:50	4:50	4:50	4:50	4:50
End Time	6:00	6:00	6:00	6:00	6:00	6:00	6:00
Total Time (min)	70	70	70	70	70	70	70
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1	1
Vehs Entered	5600	5288	5392	4956	5668	5375	5361
Vehs Exited	5575	5275	5357	4852	5527	5260	5290
Starting Vehs	244	255	263	216	230	215	247
Ending Vehs	269	268	298	320	371	330	318
Travel Distance (mi)	2813	2748	2751	2560	2883	2784	2793
Travel Time (hr)	339.8	572.5	523.8	542.6	404.5	483.6	506.9
Total Delay (hr)	236.8	472.1	423.1	449.1	299.0	381.6	404.4
Total Stops	11694	11551	12215	10820	12727	11591	12121
Fuel Used (gal)	163.8	213.6	202.5	201.0	179.6	193.5	200.7

Summary of All Intervals

Run Number	7	8	9	Avg
Start Time	4:50	4:50	4:50	4:50
End Time	6:00	6:00	6:00	6:00
Total Time (min)	70	70	70	70
Time Recorded (min)	60	60	60	60
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	5690	5498	5469	5426
Vehs Exited	5616	5452	5414	5361
Starting Vehs	234	264	238	227
Ending Vehs	308	310	293	302
Travel Distance (mi)	2876	2819	2815	2784
Travel Time (hr)	426.7	421.1	442.0	466.4
Total Delay (hr)	321.3	317.8	338.9	364.4
Total Stops	12229	11762	11568	11828
Fuel Used (gal)	184.2	181.5	186.1	190.7

Interval #0 Information Seeding

Start Time	4:50
End Time	5:00
Total Time (min)	10

Volumes adjusted by Growth Factors.

No data recorded this interval.

Interval #1 Information Recording

Start Time	5:00
End Time	6:00
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	1	10	2	3	4	5	6
Vehs Entered	5600	5288	5392	4956	5668	5375	5361
Vehs Exited	5575	5275	5357	4852	5527	5260	5290
Starting Vehs	244	255	263	216	230	215	247
Ending Vehs	269	268	298	320	371	330	318
Travel Distance (mi)	2813	2748	2751	2560	2883	2784	2793
Travel Time (hr)	339.8	572.5	523.8	542.6	404.5	483.6	506.9
Total Delay (hr)	236.8	472.1	423.1	449.1	299.0	381.6	404.4
Total Stops	11694	11551	12215	10820	12727	11591	12121
Fuel Used (gal)	163.8	213.6	202.5	201.0	179.6	193.5	200.7

Interval #1 Information Recording

Start Time	5:00
End Time	6:00
Total Time (min)	60

Volumes adjusted by Growth Factors.

Run Number	7	8	9	Avg
Vehs Entered	5690	5498	5469	5426
Vehs Exited	5616	5452	5414	5361
Starting Vehs	234	264	238	227
Ending Vehs	308	310	293	302
Travel Distance (mi)	2876	2819	2815	2784
Travel Time (hr)	426.7	421.1	442.0	466.4
Total Delay (hr)	321.3	317.8	338.9	364.4
Total Stops	12229	11762	11568	11828
Fuel Used (gal)	184.2	181.5	186.1	190.7

Intersection: 1: MD 108 & Sheppard Lane

Movement	EB	EB	WB	WB	B12	NB	NB	NB	SB	SB	SB	SB
Directions Served	LT	R	L	TR	T	L	T	R	L	T	T	R
Maximum Queue (ft)	102	102	122	76	38	384	391	218	190	371	314	171
Average Queue (ft)	40	41	64	27	3	234	248	10	37	211	166	34
95th Queue (ft)	83	77	115	65	19	386	418	104	128	328	286	100
Link Distance (ft)	747		64	64	183	370	370	370		508	508	
Upstream Blk Time (%)			14	1		3	3	0				
Queuing Penalty (veh)			0	0		14	13	0				
Storage Bay Dist (ft)		200							150			100
Storage Blk Time (%)										23	15	0
Queuing Penalty (veh)										9	9	0

Intersection: 2: MD 108 & Hardware Store/Great Star Drive

Movement	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	L	LT	R	L	T	TR	L	T	TR
Maximum Queue (ft)	176	204	362	225	208	640	646	225	411	375
Average Queue (ft)	78	72	306	219	28	601	604	197	244	223
95th Queue (ft)	153	194	421	252	132	675	676	261	421	367
Link Distance (ft)	272		325			602	602		326	326
Upstream Blk Time (%)	0		25			26	28		10	2
Queuing Penalty (veh)	0		0			186	204		57	12
Storage Bay Dist (ft)		200		200	200			200		
Storage Blk Time (%)		1	3	37		57		27	4	
Queuing Penalty (veh)		8	22	82		12		118	12	

Intersection: 3: MD 108 & Auto Dr./Signal Bell Ln

Movement	EB	EB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	LTR	L	T	TR	L	T	TR
Maximum Queue (ft)	329	275	223	255	378	381	193	505	530
Average Queue (ft)	180	152	117	127	309	312	23	265	291
95th Queue (ft)	341	297	223	299	440	445	100	520	540
Link Distance (ft)	300		208		347	347		602	602
Upstream Blk Time (%)	17		14		14	19		2	2
Queuing Penalty (veh)	0		0		104	143		8	13
Storage Bay Dist (ft)		250		190			180		
Storage Blk Time (%)	16	6		0	40			19	
Queuing Penalty (veh)	35	9		0	50			4	

Intersection: 4: MD 108 & MD 32 WB Ramps

Movement	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	LT	R	L	T	T	T	TR
Maximum Queue (ft)	455	562	375	366	480	475	370	378
Average Queue (ft)	397	537	372	109	327	295	301	313
95th Queue (ft)	556	557	393	338	513	491	443	446
Link Distance (ft)		520			463	463	347	347
Upstream Blk Time (%)		41			13	11	11	13
Queuing Penalty (veh)		0			0	0	72	89
Storage Bay Dist (ft)	430		350	400				
Storage Blk Time (%)	1	16	32		14			
Queuing Penalty (veh)	7	162	321		10			

Intersection: 6: MD 108 & New Road/Linden Linthicum Lane

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	B17
Directions Served	L	TR	LT	R	L	T	TR	L	T	TR	T
Maximum Queue (ft)	127	106	132	129	125	274	274	131	238	255	2
Average Queue (ft)	58	41	60	61	45	143	169	44	87	97	0
95th Queue (ft)	109	77	113	107	102	256	279	94	194	210	2
Link Distance (ft)	270	270	456	456		186	186		315	315	367
Upstream Blk Time (%)						3	6		0	0	
Queuing Penalty (veh)						24	44		0	0	
Storage Bay Dist (ft)					100			250			
Storage Blk Time (%)					0	9			0		
Queuing Penalty (veh)					1	8			0		

Intersection: 7: MD 108 & Garden Center

Movement	NB	NB	NB	NB	SB
Directions Served	L	T	T	R	R
Maximum Queue (ft)	41	196	250	50	2
Average Queue (ft)	8	15	33	2	0
95th Queue (ft)	31	105	152	35	2
Link Distance (ft)		367	367		370
Upstream Blk Time (%)		0	0		
Queuing Penalty (veh)		0	0		
Storage Bay Dist (ft)	150			175	
Storage Blk Time (%)		1	1		
Queuing Penalty (veh)		0	1		

Zone Summary

Zone wide Queuing Penalty: 1863

HCM 2010 Signalized Intersection Summary
1: MD 108 & Sheppard Lane

	↗	↘	↖	↑	↓	↙
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↱		↰	↑	↑	↱
Traffic Volume (veh/h)	85	412	190	583	531	40
Future Volume (veh/h)	85	412	190	583	531	40
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1900	1863	1863	1863	1863
Adj Flow Rate, veh/h	98	474	218	670	610	0
Adj No. of Lanes	0	0	1	1	1	1
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	0	0	2	2	2	2
Cap, veh/h	107	515	284	944	667	567
Arrive On Green	0.39	0.39	0.10	0.51	0.36	0.00
Sat Flow, veh/h	276	1335	1774	1863	1863	1583
Grp Volume(v), veh/h	573	0	218	670	610	0
Grp Sat Flow(s),veh/h/ln	1613	0	1774	1863	1863	1583
Q Serve(g_s), s	34.6	0.0	7.5	28.4	32.0	0.0
Cycle Q Clear(g_c), s	34.6	0.0	7.5	28.4	32.0	0.0
Prop In Lane	0.17	0.83	1.00			1.00
Lane Grp Cap(c), veh/h	623	0	284	944	667	567
V/C Ratio(X)	0.92	0.00	0.77	0.71	0.91	0.00
Avail Cap(c_a), veh/h	867	0	540	1528	982	835
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	29.9	0.0	22.9	19.5	31.4	0.0
Incr Delay (d2), s/veh	11.8	0.0	4.4	1.0	9.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	24.1	0.0	7.2	21.1	25.2	0.0
LnGrp Delay(d),s/veh	41.7	0.0	27.2	20.5	40.7	0.0
LnGrp LOS	D		C	C	D	
Approach Vol, veh/h	573			888	610	
Approach Delay, s/veh	41.7			22.1	40.7	
Approach LOS	D			C	D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		57.9		44.5	15.2	42.7		
Change Period (Y+Rc), s		6.0		5.0	5.0	6.0		
Max Green Setting (Gmax), s		84.0		55.0	25.0	54.0		
Max Q Clear Time (g_c+I1), s		30.4		36.6	9.5	34.0		
Green Ext Time (p_c), s		3.4		2.9	0.7	2.7		

Intersection Summary	
HCM 2010 Ctrl Delay	33.0
HCM 2010 LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

HCM 2010 Signalized Intersection Summary
2: MD 108 & Hardware Store/Great Star Drive

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥		↰	↰↑	↱	↰	↑↑↱		↰	↑↑↱	
Traffic Volume (veh/h)	5	2	7	137	11	258	13	533	146	243	703	8
Future Volume (veh/h)	5	2	7	137	11	258	13	533	146	243	703	8
Number	7	4	14	3	8	18	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	5	2	7	145	0	258	13	533	146	243	703	8
Adj No. of Lanes	0	1	0	2	0	1	1	2	0	1	2	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	176	88	176	929	0	376	513	1206	329	599	1907	22
Arrive On Green	0.24	0.24	0.22	0.24	0.00	0.24	0.05	0.44	0.40	0.14	0.53	0.50
Sat Flow, veh/h	372	369	742	2801	0	1583	1774	2750	750	1774	3584	41
Grp Volume(v), veh/h	14	0	0	145	0	258	13	342	337	243	347	364
Grp Sat Flow(s),veh/h/ln	1483	0	0	1400	0	1583	1774	1770	1730	1774	1770	1856
Q Serve(g_s), s	0.0	0.0	0.0	1.9	0.0	8.3	0.2	7.5	7.7	3.5	6.3	6.4
Cycle Q Clear(g_c), s	0.4	0.0	0.0	2.2	0.0	8.3	0.2	7.5	7.7	3.5	6.3	6.4
Prop In Lane	0.36		0.50	1.00		1.00	1.00		0.43	1.00		0.02
Lane Grp Cap(c), veh/h	440	0	0	929	0	376	513	776	759	599	941	987
V/C Ratio(X)	0.03	0.00	0.00	0.16	0.00	0.69	0.03	0.44	0.44	0.41	0.37	0.37
Avail Cap(c_a), veh/h	460	0	0	1271	0	569	1093	1623	1587	1013	1623	1701
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	16.5	0.0	0.0	17.0	0.0	19.3	7.8	10.9	11.2	6.4	7.6	7.6
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.1	0.0	2.2	0.0	1.8	1.9	0.4	1.1	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.3	0.0	0.0	1.6	0.0	6.9	0.2	7.2	7.2	3.2	6.1	6.4
LnGrp Delay(d),s/veh	16.5	0.0	0.0	17.1	0.0	21.5	7.9	12.7	13.1	6.8	8.7	8.7
LnGrp LOS	B			B		C	A	B	B	A	A	A
Approach Vol, veh/h		14			403			692			954	
Approach Delay, s/veh		16.5			19.9			12.8			8.2	
Approach LOS		B			B			B			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	5.8	32.6		17.2	11.0	27.4		17.2
Change Period (Y+Rc), s	5.0	6.0		6.0	5.0	6.0		6.0
Max Green Setting (Gmax), s	19.0	48.0		12.0	19.0	48.0		18.0
Max Q Clear Time (g_c+I1), s	12.2	8.4		2.4	5.5	9.7		10.3
Green Ext Time (p_c), s	0.0	12.3		0.0	0.6	11.7		1.0

Intersection Summary	
HCM 2010 Ctrl Delay	12.1
HCM 2010 LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

HCM 2010 Signalized Intersection Summary
3: MD 108 & Auto Dr./Signal Bell Ln

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱		↰↑↱		↰	↑↑↱		↰	↑↑↱	
Traffic Volume (veh/h)	19	4	41	43	5	3	149	621	49	7	818	71
Future Volume (veh/h)	19	4	41	43	5	3	149	621	49	7	818	71
Number	7	4	14	3	8	18	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1863	1900	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	19	4	41	43	5	3	149	621	49	7	818	71
Adj No. of Lanes	0	1	1	0	1	0	1	2	0	1	2	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	321	57	271	307	33	14	574	2081	164	605	1830	159
Arrive On Green	0.17	0.17	0.17	0.17	0.17	0.14	0.12	0.63	0.63	0.04	0.56	0.52
Sat Flow, veh/h	1198	333	1583	1112	196	82	1774	3324	262	1774	3296	286
Grp Volume(v), veh/h	23	0	41	51	0	0	149	330	340	7	439	450
Grp Sat Flow(s),veh/h/ln	1531	0	1583	1389	0	0	1774	1770	1817	1774	1770	1812
Q Serve(g_s), s	0.0	0.0	1.2	1.3	0.0	0.0	1.6	4.9	4.9	0.1	8.3	8.4
Cycle Q Clear(g_c), s	0.6	0.0	1.2	1.9	0.0	0.0	1.6	4.9	4.9	0.1	8.3	8.4
Prop In Lane	0.83		1.00	0.84		0.06	1.00		0.14	1.00		0.16
Lane Grp Cap(c), veh/h	378	0	271	355	0	0	574	1108	1137	605	983	1006
V/C Ratio(X)	0.06	0.00	0.15	0.14	0.00	0.00	0.26	0.30	0.30	0.01	0.45	0.45
Avail Cap(c_a), veh/h	825	0	754	783	0	0	1027	1966	2018	1183	1982	2029
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.7	0.0	20.0	20.3	0.0	0.0	4.3	4.9	4.9	5.0	7.5	7.6
Incr Delay (d2), s/veh	0.1	0.0	0.3	0.2	0.0	0.0	0.2	0.7	0.7	0.0	1.5	1.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.6	0.0	1.0	1.3	0.0	0.0	1.4	4.5	4.6	0.1	7.9	8.1
LnGrp Delay(d),s/veh	19.8	0.0	20.3	20.5	0.0	0.0	4.5	5.6	5.6	5.0	8.9	9.0
LnGrp LOS	B		C	C			A	A	A	A	A	A
Approach Vol, veh/h		64			51			819			896	
Approach Delay, s/veh		20.1			20.5			5.4			8.9	
Approach LOS		C			C			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	9.5	34.5		12.7	5.5	38.5		12.7
Change Period (Y+Rc), s	5.0	* 6		6.0	5.0	6.0		6.0
Max Green Setting (Gmax), s	10.0	* 61		24.0	19.0	60.0		24.0
Max Q Clear Time (g_c+I1), s	3.6	10.4		3.2	2.1	6.9		3.9
Green Ext Time (p_c), s	0.4	18.1		0.1	0.0	12.4		0.1

Intersection Summary		
HCM 2010 Ctrl Delay		8.1
HCM 2010 LOS		A

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

HCM Signalized Intersection Capacity Analysis
4: MD 108 & MD 32 WB Ramps

MD 108
Existing AM

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↰	↰↑	↱	↰	↑↑			↑↑↱	
Traffic Volume (vph)	0	0	0	458	0	287	27	577	0	0	774	74
Future Volume (vph)	0	0	0	458	0	287	27	577	0	0	774	74
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				3.0	3.0	3.0	3.0	3.0			3.0	
Lane Util. Factor				0.95	0.95	1.00	1.00	0.95			0.95	
Frt				1.00	1.00	0.85	1.00	1.00			0.99	
Flt Protected				0.95	0.95	1.00	0.95	1.00			1.00	
Satd. Flow (prot)				1681	1681	1583	1770	3539			3493	
Flt Permitted				0.95	0.95	1.00	0.27	1.00			1.00	
Satd. Flow (perm)				1681	1681	1583	500	3539			3493	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	0	0	458	0	287	27	577	0	0	774	74
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	5	0
Lane Group Flow (vph)	0	0	0	229	229	287	27	577	0	0	843	0
Turn Type				Perm	NA	Perm	custom	NA			NA	
Protected Phases					4		1	1 6			2	
Permitted Phases				4		4	6					
Actuated Green, G (s)				27.2	27.2	27.2	74.8	80.8			66.8	
Effective Green, g (s)				30.2	30.2	30.2	80.8	83.8			69.8	
Actuated g/C Ratio				0.25	0.25	0.25	0.67	0.70			0.58	
Clearance Time (s)				6.0	6.0	6.0	6.0				6.0	
Vehicle Extension (s)				3.0	3.0	3.0	3.0				5.0	
Lane Grp Cap (vph)				423	423	398	453	2471			2031	
v/s Ratio Prot							0.01	c0.16			c0.24	
v/s Ratio Perm				0.14	0.14	c0.18	0.03					
v/c Ratio				0.54	0.54	0.72	0.06	0.23			0.42	
Uniform Delay, d1				38.9	38.9	41.0	12.1	6.5			13.8	
Progression Factor				1.00	1.00	1.00	0.44	0.84			1.00	
Incremental Delay, d2				1.4	1.4	6.3	0.1	0.0			0.6	
Delay (s)				40.3	40.3	47.4	5.4	5.5			14.5	
Level of Service				D	D	D	A	A			B	
Approach Delay (s)		0.0			43.0			5.5			14.5	
Approach LOS		A			D			A			B	

Intersection Summary			
HCM 2000 Control Delay	21.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	75.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

6: MD 108 & Gas Station/Linden Linthicum Lane

Intersection	
Int Delay, s/veh	12.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑↱			↰↑	↱	↰	↑	↱	↰	↑↑↱	
Traffic Vol, veh/h	10	1	33	23	1	100	16	658	31	47	877	0
Future Vol, veh/h	10	1	33	23	1	100	16	658	31	47	877	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	Free	-	-	None
Storage Length	-	-	-	-	-	0	5	-	0	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	73	73	73	73	73	73	73	73	73	73	73	73
Heavy Vehicles, %	0	0	2	2	0	2	0	2	0	2	2	0
Mvmt Flow	14	1	45	32	1	137	22	901	42	64	1201	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2343	2274	601	1674	2274	901	1201	0	-	901	0	0
Stage 1	1329	1329	-	945	945	-	-	-	-	-	-	-
Stage 2	1014	945	-	729	1329	-	-	-	-	-	-	-
Critical Hdwy	7.3	6.5	6.93	7.33	6.5	6.23	4.1	-	-	4.13	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.13	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.53	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.319	3.519	4	3.319	2.2	-	-	2.219	-	-
Pot Cap-1 Maneuver	23	41	444	69	41	336	588	-	0	752	-	-
Stage 1	166	226	-	314	343	-	-	-	0	-	-	-
Stage 2	290	343	-	381	226	-	-	-	0	-	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver	~ 12	36	444	55	36	336	588	-	-	752	-	-
Mov Cap-2 Maneuver	~ 12	36	-	55	36	-	-	-	-	-	-	-
Stage 1	160	207	-	302	330	-	-	-	-	-	-	-
Stage 2	165	330	-	311	207	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	$ 364.8	46.5	0.3	0.5
HCM LOS	F	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	588	-	47	54	336	752	-	-
HCM Lane V/C Ratio	0.037	-	1.282	0.609	0.408	0.086	-	-
HCM Control Delay (s)	11.4	-	$ 364.8	144.9	22.9	10.2	-	-
HCM Lane LOS	B	-	F	F	C	B	-	-
HCM 95th %tile Q(veh)	0.1	-	5.7	2.4	1.9	0.3	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	0

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations	↰	↱	↑	↱	↰	↑
Traffic Vol, veh/h	0	0	773	0	0	943
Future Vol, veh/h	0	0	773	0	0	943
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	175	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	840	0	0	1025

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1865	840	0	0	840	0
Stage 1	840	-	-	-	-	-
Stage 2	1025	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	80	365	-	-	795	-
Stage 1	424	-	-	-	-	-
Stage 2	346	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	80	365	-	-	795	-
Mov Cap-2 Maneuver	80	-	-	-	-	-
Stage 1	424	-	-	-	-	-
Stage 2	346	-	-	-	-	-

Approach	NW	NE	SW
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NET	NER	NWLn1	NWLn2	SWL	SWT
Capacity (veh/h)	-	-	-	-	795	-
HCM Lane V/C Ratio	-	-	-	-	-	-
HCM Control Delay (s)	-	-	0	0	0	-
HCM Lane LOS	-	-	A	A	A	-
HCM 95th %tile Q(veh)	-	-	-	-	0	-

	↗	↘	↖	↑	↓	↙
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y		↰	↑	↑	↱
Traffic Volume (veh/h)	42	161	503	759	528	55
Future Volume (veh/h)	42	161	503	759	528	55
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1900	1863	1863	1863	1863
Adj Flow Rate, veh/h	44	169	565	834	562	0
Adj No. of Lanes	0	0	1	1	1	1
Peak Hour Factor	0.95	0.95	0.89	0.91	0.94	0.65
Percent Heavy Veh, %	0	0	2	2	2	2
Cap, veh/h	56	215	625	1268	644	548
Arrive On Green	0.17	0.17	0.27	0.68	0.35	0.00
Sat Flow, veh/h	333	1280	1774	1863	1863	1583
Grp Volume(v), veh/h	214	0	565	834	562	0
Grp Sat Flow(s),veh/h/ln	1620	0	1774	1863	1863	1583
Q Serve(g_s), s	9.2	0.0	15.8	18.8	20.6	0.0
Cycle Q Clear(g_c), s	9.2	0.0	15.8	18.8	20.6	0.0
Prop In Lane	0.21	0.79	1.00			1.00
Lane Grp Cap(c), veh/h	272	0	625	1268	644	548
V/C Ratio(X)	0.79	0.00	0.90	0.66	0.87	0.00
Avail Cap(c_a), veh/h	1224	0	761	2149	1382	1174
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	29.0	0.0	16.0	6.7	22.3	0.0
Incr Delay (d2), s/veh	5.0	0.0	12.6	0.6	3.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	7.9	0.0	18.7	14.8	16.6	0.0
LnGrp Delay(d),s/veh	34.0	0.0	28.5	7.3	26.2	0.0
LnGrp LOS	C		C	A	C	
Approach Vol, veh/h	214			1399	562	
Approach Delay, s/veh	34.0			15.9	26.2	
Approach LOS	C			B	C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		55.6		17.2	24.4	31.2		
Change Period (Y+Rc), s		6.0		5.0	5.0	6.0		
Max Green Setting (Gmax), s		84.0		55.0	25.0	54.0		
Max Q Clear Time (g_c+I1), s		20.8		11.2	17.8	22.6		
Green Ext Time (p_c), s		4.8		1.0	1.6	2.6		

Intersection Summary	
HCM 2010 Ctrl Delay	20.3
HCM 2010 LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

HCM 2010 Signalized Intersection Summary
2: MD 108 & Hardware Store/Great Star Drive

MD 108
Existing PM

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣		↰	↰↑	↱	↰	↑↑↱		↰	↑↑↱	
Traffic Volume (veh/h)	31	15	24	249	18	492	19	876	231	229	501	16
Future Volume (veh/h)	31	15	24	249	18	492	19	876	231	229	501	16
Number	7	4	14	3	8	18	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	31	15	24	262	0	492	19	876	231	229	501	16
Adj No. of Lanes	0	1	0	2	0	1	1	2	0	1	2	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	217	109	142	1068	0	519	542	1304	344	374	1886	60
Arrive On Green	0.33	0.33	0.32	0.33	0.00	0.33	0.04	0.47	0.45	0.11	0.54	0.52
Sat Flow, veh/h	495	332	431	2726	0	1583	1774	2773	731	1774	3501	112
Grp Volume(v), veh/h	70	0	0	262	0	492	19	559	548	229	253	264
Grp Sat Flow(s),veh/h/ln	1258	0	0	1363	0	1583	1774	1770	1734	1774	1770	1843
Q Serve(g_s), s	0.3	0.0	0.0	3.2	0.0	29.1	0.5	23.5	23.7	5.9	7.4	7.4
Cycle Q Clear(g_c), s	2.8	0.0	0.0	5.9	0.0	29.1	0.5	23.5	23.7	5.9	7.4	7.4
Prop In Lane	0.44		0.34	1.00		1.00	1.00		0.42	1.00		0.06
Lane Grp Cap(c), veh/h	467	0	0	1068	0	519	542	832	815	374	953	993
V/C Ratio(X)	0.15	0.00	0.00	0.25	0.00	0.95	0.04	0.67	0.67	0.61	0.27	0.27
Avail Cap(c_a), veh/h	467	0	0	1068	0	519	611	995	975	562	1235	1286
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	22.7	0.0	0.0	23.5	0.0	31.4	12.2	19.7	20.1	15.6	11.9	12.0
Incr Delay (d2), s/veh	0.1	0.0	0.0	0.1	0.0	26.8	0.0	4.3	4.4	1.6	0.7	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	2.4	0.0	0.0	4.6	0.0	23.2	0.5	18.1	18.1	5.6	6.8	7.1
LnGrp Delay(d),s/veh	22.8	0.0	0.0	23.6	0.0	58.2	12.2	24.0	24.5	17.2	12.6	12.6
LnGrp LOS	C			C		E	B	C	C	B	B	B
Approach Vol, veh/h		70			754			1126			746	
Approach Delay, s/veh		22.8			46.2			24.0			14.0	
Approach LOS		C			D			C			B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.3	54.7		35.0	12.9	48.2		35.0				
Change Period (Y+Rc), s	4.5	6.0		5.5	4.5	6.0		5.5				
Max Green Setting (Gmax), s	5.5	64.0		29.5	18.5	51.0		29.5				
Max Q Clear Time (g_c+I1), s	2.5	9.4		4.8	7.9	25.7		31.1				
Green Ext Time (p_c), s	0.0	8.9		0.2	0.5	16.5		0.0				
Intersection Summary												
HCM 2010 Ctrl Delay			27.4									
HCM 2010 LOS			C									

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		✥		↰	↑↱		↰	↑↱	
Traffic Volume (veh/h)	99	17	172	66	13	25	93	985	69	18	732	60
Future Volume (veh/h)	99	17	172	66	13	25	93	985	69	18	732	60
Number	7	4	14	3	8	18	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1863	1900	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	99	17	172	66	13	25	93	985	69	18	732	60
Adj No. of Lanes	0	1	1	0	1	0	1	2	0	1	2	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	333	50	316	196	45	48	581	2115	148	444	1955	160
Arrive On Green	0.20	0.20	0.20	0.20	0.20	0.17	0.09	0.63	0.63	0.05	0.59	0.56
Sat Flow, veh/h	1169	249	1583	544	224	243	1774	3356	235	1774	3313	271
Grp Volume(v), veh/h	116	0	172	104	0	0	93	519	535	18	391	401
Grp Sat Flow(s),veh/h/ln	1417	0	1583	1011	0	0	1774	1770	1821	1774	1770	1815
Q Serve(g_s), s	0.0	0.0	6.5	3.3	0.0	0.0	1.1	10.3	10.3	0.3	7.8	7.9
Cycle Q Clear(g_c), s	4.7	0.0	6.5	8.0	0.0	0.0	1.1	10.3	10.3	0.3	7.8	7.9
Prop In Lane	0.85		1.00	0.63		0.24	1.00		0.13	1.00		0.15
Lane Grp Cap(c), veh/h	382	0	316	289	0	0	581	1115	1148	444	1044	1071
V/C Ratio(X)	0.30	0.00	0.54	0.36	0.00	0.00	0.16	0.47	0.47	0.04	0.37	0.37
Avail Cap(c_a), veh/h	947	0	945	818	0	0	856	2443	2514	605	2258	2315
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	23.3	0.0	24.1	25.4	0.0	0.0	4.1	6.5	6.5	5.2	7.2	7.3
Incr Delay (d2), s/veh	0.4	0.0	1.5	0.8	0.0	0.0	0.1	1.4	1.4	0.0	1.0	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	3.4	0.0	5.4	3.3	0.0	0.0	1.0	9.1	9.3	0.2	7.4	7.6
LnGrp Delay(d),s/veh	23.8	0.0	25.6	26.1	0.0	0.0	4.2	7.9	7.8	5.2	8.3	8.3
LnGrp LOS	C		C	C			A	A	A	A	A	A
Approach Vol, veh/h		288			104			1147			810	
Approach Delay, s/veh		24.8			26.1			7.6			8.2	
Approach LOS		C			C			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	8.6	42.0		16.4	5.9	44.7		16.4
Change Period (Y+Rc), s	4.5	5.5		6.0	4.5	5.5		6.0
Max Green Setting (Gmax), s	14.5	82.5		37.0	7.5	89.5		37.0
Max Q Clear Time (g_c+I1), s	3.1	9.9		8.5	2.3	12.3		10.0
Green Ext Time (p_c), s	0.2	16.6		1.0	0.0	26.9		0.3

Intersection Summary	
HCM 2010 Ctrl Delay	10.7
HCM 2010 LOS	B

HCM Signalized Intersection Capacity Analysis
4: MD 108 & MD 32 WB Ramps

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↰	↰↑	↱	↰	↑↑			↑↱	
Traffic Volume (vph)	0	0	0	854	42	401	51	756	0	0	837	135
Future Volume (vph)	0	0	0	854	42	401	51	756	0	0	837	135
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				3.0	3.0	3.0	3.0	3.0			3.0	
Lane Util. Factor				0.95	0.95	1.00	1.00	0.95			0.95	
Frt				1.00	1.00	0.85	1.00	1.00			0.98	
Flt Protected				0.95	0.96	1.00	0.95	1.00			1.00	
Satd. Flow (prot)				1681	1693	1583	1770	3539			3465	
Flt Permitted				0.95	0.96	1.00	0.20	1.00			1.00	
Satd. Flow (perm)				1681	1693	1583	364	3539			3465	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	0	0	854	42	401	51	756	0	0	837	135
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	7	0
Lane Group Flow (vph)	0	0	0	427	469	401	51	756	0	0	965	0
Turn Type				Perm	NA	Perm	custom	NA			NA	
Protected Phases					4		1	1 6			2	
Permitted Phases				4		4	6					
Actuated Green, G (s)				49.9	49.9	49.9	82.1	88.1			74.0	
Effective Green, g (s)				52.9	52.9	52.9	88.1	91.1			77.0	
Actuated g/C Ratio				0.35	0.35	0.35	0.59	0.61			0.51	
Clearance Time (s)				6.0	6.0	6.0	6.0				6.0	
Vehicle Extension (s)				3.0	3.0	3.0	3.0				5.0	
Lane Grp Cap (vph)				592	597	558	317	2149			1778	
v/s Ratio Prot							0.01	c0.21			c0.28	
v/s Ratio Perm				0.25	0.28	0.25	0.08					
v/c Ratio				0.72	0.79	0.72	0.16	0.35			0.54	
Uniform Delay, d1				42.1	43.5	42.1	28.4	14.7			24.6	
Progression Factor				1.00	1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2				4.3	6.7	4.4	0.2	0.1			1.2	
Delay (s)				46.5	50.2	46.5	28.6	14.8			25.8	
Level of Service				D	D	D	C	B			C	
Approach Delay (s)		0.0			47.8			15.7			25.8	
Approach LOS		A			D			B			C	

Intersection Summary			
HCM 2000 Control Delay	32.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	68.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

6: MD 108 & Gas Station/Linden Linthicum Lane

Intersection												
Int Delay, s/veh	29.3											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			↰↑	↱	↰	↑	↱	↰	↑↑↱	
Traffic Vol, veh/h	15	1	47	26	0	125	38	1129	83	80	575	1
Future Vol, veh/h	15	1	47	26	0	125	38	1129	83	80	575	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	Free	-	-	None
Storage Length	-	-	-	-	-	0	5	-	0	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	73	73	73	73	73	73	73	73	73	73	73	73
Heavy Vehicles, %	0	0	1	6	6	6	0	2	0	6	6	6
Mvmt Flow	21	1	64	36	0	171	52	1547	114	110	788	1

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2746	2660	395	2266	2660	1547	789	0	-	1547	0	0
Stage 1	1009	1009	-	1651	1651	-	-	-	-	-	-	-
Stage 2	1737	1651	-	615	1009	-	-	-	-	-	-	-
Critical Hdwy	7.3	6.5	6.915	7.39	6.59	6.29	4.1	-	-	4.19	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.19	5.59	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.59	5.59	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3095	3.557	4.057	3.357	2.2	-	-	2.257	-	-
Pot Cap-1 Maneuver	~ 11	23	607	~ 24	21	~ 136	840	-	0	412	-	-
Stage 1	261	320	-	120	151	-	-	-	0	-	-	-
Stage 2	112	158	-	438	310	-	-	-	0	-	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver	-	16	607	~ 15	14	~ 136	840	-	-	412	-	-
Mov Cap-2 Maneuver	-	16	-	~ 15	14	-	-	-	-	-	-	-
Stage 1	245	235	-	113	142	-	-	-	-	-	-	-
Stage 2	-	148	-	285	227	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s		$ 384.2	0.3	2.1
HCM LOS	-	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	840	-	-	15	136	412	-	-
HCM Lane V/C Ratio	0.062	-	-	2.374	1.259	0.266	-	-
HCM Control Delay (s)	9.6	-		$ 1147.6	225.4	16.9	-	-
HCM Lane LOS	A	-	-	F	F	C	-	-
HCM 95th %tile Q(veh)	0.2	-	-	5.2	10.5	1.1	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	0

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations	↰	↱	↑	↱	↰	↑
Traffic Vol, veh/h	0	0	1262	7	0	689
Future Vol, veh/h	0	0	1262	7	0	689
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	175	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	1372	8	0	749

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2121	1372	0	0	1380	0
Stage 1	1372	-	-	-	-	-
Stage 2	749	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	55	179	-	-	497	-
Stage 1	236	-	-	-	-	-
Stage 2	467	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	55	179	-	-	497	-
Mov Cap-2 Maneuver	55	-	-	-	-	-
Stage 1	236	-	-	-	-	-
Stage 2	467	-	-	-	-	-

Approach	NW	NE	SW
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NET	NER	NWLn1	NWLn2	SWL	SWT
Capacity (veh/h)	-	-	-	-	497	-
HCM Lane V/C Ratio	-	-	-	-	-	-
HCM Control Delay (s)	-	-	0	0	0	-
HCM Lane LOS	-	-	A	A	A	-
HCM 95th %tile Q(veh)	-	-	-	-	0	-

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✢		↰	↱		↰	↑	↱	↰	↑	↱
Traffic Volume (veh/h)	93	14	453	67	11	16	210	685	27	40	625	44
Future Volume (veh/h)	93	14	453	67	11	16	210	685	27	40	625	44
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1863	1863	1900	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	107	15	521	73	12	17	241	787	29	43	718	0
Adj No. of Lanes	0	1	0	1	1	0	1	1	1	1	1	1
Peak Hour Factor	0.87	0.92	0.87	0.92	0.92	0.92	0.87	0.87	0.92	0.92	0.87	0.87
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	120	22	485	177	269	380	248	1003	853	184	756	643
Arrive On Green	0.38	0.38	0.38	0.38	0.38	0.38	0.10	0.54	0.54	0.41	0.41	0.00
Sat Flow, veh/h	237	58	1261	865	699	990	1774	1863	1583	667	1863	1583
Grp Volume(v), veh/h	643	0	0	73	0	29	241	787	29	43	718	0
Grp Sat Flow(s),veh/h/ln	1556	0	0	865	0	1688	1774	1863	1583	667	1863	1583
Q Serve(g_s), s	50.5	0.0	0.0	0.0	0.0	1.5	13.3	48.3	1.2	7.9	53.3	0.0
Cycle Q Clear(g_c), s	55.0	0.0	0.0	25.0	0.0	1.5	13.3	48.3	1.2	37.2	53.3	0.0
Prop In Lane	0.17		0.81	1.00		0.59	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	628	0	0	177	0	649	248	1003	853	184	756	643
V/C Ratio(X)	1.02	0.00	0.00	0.41	0.00	0.04	0.97	0.78	0.03	0.23	0.95	0.00
Avail Cap(c_a), veh/h	628	0	0	177	0	649	248	1094	930	217	846	719
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	45.2	0.0	0.0	34.8	0.0	27.6	40.6	26.4	15.5	48.8	41.1	0.0
Incr Delay (d2), s/veh	42.3	0.0	0.0	1.5	0.0	0.0	48.8	3.5	0.0	0.6	18.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	57.8	0.0	0.0	4.2	0.0	1.3	18.8	34.0	1.0	2.7	40.4	0.0
LnGrp Delay(d),s/veh	87.5	0.0	0.0	36.3	0.0	27.6	89.4	29.9	15.5	49.4	59.8	0.0
LnGrp LOS	F			D		C	F	C	B	D	E	
Approach Vol, veh/h		643			102			1057			761	
Approach Delay, s/veh		87.5			33.8			43.1			59.2	
Approach LOS		F			C			D			E	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		83.1		60.0	19.0	64.1		60.0				
Change Period (Y+Rc), s		6.0		5.0	5.0	6.0		5.0				
Max Green Setting (Gmax), s		84.0		55.0	14.0	65.0		55.0				
Max Q Clear Time (g_c+I1), s		50.3		57.0	15.3	55.3		27.0				
Green Ext Time (p_c), s		4.4		0.0	0.0	2.8		0.5				
Intersection Summary												
HCM 2010 Ctrl Delay			58.7									
HCM 2010 LOS			E									

HCM 2010 Signalized Intersection Summary
2: MD 108 & Hardware Store/Great Star Drive

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣		↰	↰	↱	↰	↑↱		↰	↑↱	
Traffic Volume (veh/h)	5	2	8	151	12	302	14	711	160	282	882	9
Future Volume (veh/h)	5	2	8	151	12	302	14	711	160	282	882	9
Number	7	4	14	3	8	18	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	5	2	8	160	0	302	14	711	160	282	882	9
Adj No. of Lanes	0	1	0	2	0	1	1	2	0	1	2	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	158	80	192	903	0	390	437	1347	303	528	2024	21
Arrive On Green	0.25	0.25	0.23	0.25	0.00	0.25	0.04	0.47	0.44	0.14	0.56	0.53
Sat Flow, veh/h	357	325	780	2798	0	1583	1774	2872	646	1774	3589	37
Grp Volume(v), veh/h	15	0	0	160	0	302	14	438	433	282	435	456
Grp Sat Flow(s),veh/h/ln	1462	0	0	1399	0	1583	1774	1770	1749	1774	1770	1856
Q Serve(g_s), s	0.0	0.0	0.0	2.5	0.0	12.2	0.3	12.0	12.2	4.9	9.8	9.8
Cycle Q Clear(g_c), s	0.5	0.0	0.0	3.0	0.0	12.2	0.3	12.0	12.2	4.9	9.8	9.8
Prop In Lane	0.33		0.53	1.00		1.00	1.00		0.37	1.00		0.02
Lane Grp Cap(c), veh/h	430	0	0	903	0	390	437	830	820	528	998	1047
V/C Ratio(X)	0.03	0.00	0.00	0.18	0.00	0.78	0.03	0.53	0.53	0.53	0.44	0.44
Avail Cap(c_a), veh/h	430	0	0	1029	0	461	900	1313	1297	822	1313	1377
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.9	0.0	0.0	20.6	0.0	24.1	8.8	12.9	13.2	8.4	8.7	8.7
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.1	0.0	6.9	0.0	2.4	2.4	0.8	1.4	1.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.4	0.0	0.0	2.2	0.0	10.0	0.2	10.5	10.5	4.3	8.8	9.1
LnGrp Delay(d),s/veh	19.9	0.0	0.0	20.7	0.0	31.0	8.8	15.3	15.6	9.3	10.0	10.0
LnGrp LOS	B			C		C	A	B	B	A	B	A
Approach Vol, veh/h		15			462			885			1173	
Approach Delay, s/veh		19.9			27.4			15.3			9.8	
Approach LOS		B			C			B			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	6.1	41.8		20.9	12.6	35.2		20.9
Change Period (Y+Rc), s	5.0	6.0		6.0	5.0	6.0		6.0
Max Green Setting (Gmax), s	19.0	48.0		12.0	19.0	48.0		18.0
Max Q Clear Time (g_c+I1), s	2.3	11.8		2.5	6.9	14.2		14.2
Green Ext Time (p_c), s	0.0	15.8		0.0	0.7	15.1		0.7

Intersection Summary	
HCM 2010 Ctrl Delay	15.0
HCM 2010 LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱		↰↑↱		↰	↑↑↱		↰	↑↑↱	
Traffic Volume (veh/h)	24	5	56	47	9	3	193	804	54	8	999	87
Future Volume (veh/h)	24	5	56	47	9	3	193	804	54	8	999	87
Number	7	4	14	3	8	18	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1863	1900	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	24	5	56	47	9	3	193	804	54	8	999	87
Adj No. of Lanes	0	1	1	0	1	0	1	2	0	1	2	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	292	52	250	259	44	11	506	2241	150	531	1985	173
Arrive On Green	0.16	0.16	0.16	0.16	0.16	0.13	0.10	0.67	0.67	0.04	0.60	0.57
Sat Flow, veh/h	1219	328	1583	1025	282	70	1774	3366	226	1774	3295	287
Grp Volume(v), veh/h	29	0	56	59	0	0	193	423	435	8	536	550
Grp Sat Flow(s),veh/h/ln	1547	0	1583	1377	0	0	1774	1770	1823	1774	1770	1812
Q Serve(g_s), s	0.0	0.0	2.0	1.8	0.0	0.0	2.3	6.9	6.9	0.1	11.4	11.5
Cycle Q Clear(g_c), s	0.9	0.0	2.0	2.7	0.0	0.0	2.3	6.9	6.9	0.1	11.4	11.5
Prop In Lane	0.83		1.00	0.80		0.05	1.00		0.12	1.00		0.16
Lane Grp Cap(c), veh/h	344	0	250	315	0	0	506	1178	1213	531	1066	1092
V/C Ratio(X)	0.08	0.00	0.22	0.19	0.00	0.00	0.38	0.36	0.36	0.02	0.50	0.50
Avail Cap(c_a), veh/h	709	0	646	668	0	0	886	1686	1736	1022	1699	1740
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	23.8	0.0	24.3	24.7	0.0	0.0	5.1	4.9	4.9	4.7	7.5	7.6
Incr Delay (d2), s/veh	0.1	0.0	0.4	0.3	0.0	0.0	0.5	0.9	0.8	0.0	1.7	1.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.8	0.0	1.7	1.8	0.0	0.0	2.1	6.4	6.6	0.1	10.0	10.3
LnGrp Delay(d),s/veh	23.9	0.0	24.8	24.9	0.0	0.0	5.6	5.7	5.7	4.7	9.2	9.3
LnGrp LOS	C		C	C			A	A	A	A	A	A
Approach Vol, veh/h		85			59			1051			1094	
Approach Delay, s/veh		24.5			24.9			5.7			9.2	
Approach LOS		C			C			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	9.9	42.8		13.4	5.7	47.0		13.4
Change Period (Y+Rc), s	5.0	* 6		6.0	5.0	6.0		6.0
Max Green Setting (Gmax), s	19.0	* 61		24.0	19.0	60.0		24.0
Max Q Clear Time (g_c+I1), s	4.3	13.5		4.0	2.1	8.9		4.7
Green Ext Time (p_c), s	0.5	23.3		0.2	0.0	17.3		0.1

Intersection Summary	
HCM 2010 Ctrl Delay	8.6
HCM 2010 LOS	A

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

HCM Signalized Intersection Capacity Analysis
4: MD 108 & MD 32 WB Ramps

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↰	↰↑	↱	↰	↑↑			↑↱	
Traffic Volume (vph)	0	0	0	519	0	367	47	733	0	0	931	112
Future Volume (vph)	0	0	0	519	0	367	47	733	0	0	931	112
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				3.0	3.0	3.0	3.0	3.0			3.0	
Lane Util. Factor				0.95	0.95	1.00	1.00	0.95			0.95	
Frt				1.00	1.00	0.85	1.00	1.00			0.98	
Flt Protected				0.95	0.95	1.00	0.95	1.00			1.00	
Satd. Flow (prot)				1681	1681	1583	1770	3539			3482	
Flt Permitted				0.95	0.95	1.00	0.18	1.00			1.00	
Satd. Flow (perm)				1681	1681	1583	335	3539			3482	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	0	0	519	0	367	47	733	0	0	931	112
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	7	0
Lane Group Flow (vph)	0	0	0	259	260	367	47	733	0	0	1036	0
Turn Type				Perm	NA	Perm	custom	NA			NA	
Protected Phases					4		1	1 6			2	
Permitted Phases				4		4	6					
Actuated Green, G (s)				33.6	33.6	33.6	68.4	74.4			60.3	
Effective Green, g (s)				36.6	36.6	36.6	74.4	77.4			63.3	
Actuated g/C Ratio				0.31	0.31	0.31	0.62	0.65			0.53	
Clearance Time (s)				6.0	6.0	6.0	6.0				6.0	
Vehicle Extension (s)				3.0	3.0	3.0	3.0				5.0	
Lane Grp Cap (vph)				512	512	482	340	2282			1836	
v/s Ratio Prot							0.01	c0.21			c0.30	
v/s Ratio Perm				0.15	0.15	c0.23	0.07					
v/c Ratio				0.51	0.51	0.76	0.14	0.32			0.56	
Uniform Delay, d1				34.3	34.3	37.7	20.9	9.5			19.1	
Progression Factor				1.00	1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2				0.8	0.8	7.0	0.2	0.1			1.3	
Delay (s)				35.1	35.1	44.7	21.1	9.6			20.3	
Level of Service				D	D	D	C	A			C	
Approach Delay (s)		0.0			39.1			10.3			20.3	
Approach LOS		A			D			B			C	

Intersection Summary			
HCM 2000 Control Delay	23.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	60.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	62.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			↰↑	↱	↰	↑	↱	↰	↑↑↱	
Traffic Vol, veh/h	11	1	36	25	1	109	17	833	34	51	1073	0
Future Vol, veh/h	11	1	36	25	1	109	17	833	34	51	1073	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	Free	-	-	None
Storage Length	-	-	-	-	-	0	5	-	0	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	73	73	73	73	73	73	73	73	73	73	73	73
Heavy Vehicles, %	0	0	2	2	0	2	0	2	0	2	2	0
Mvmt Flow	15	1	49	34	1	149	23	1141	47	70	1470	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2872	2797	735	2063	2797	1141	1470	0	-	1141	0	0
Stage 1	1610	1610	-	1187	1187	-	-	-	-	-	-	-
Stage 2	1262	1187	-	876	1610	-	-	-	-	-	-	-
Critical Hdwy	7.3	6.5	6.93	7.33	6.5	6.23	4.1	-	-	4.13	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.13	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.53	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.319	3.519	4	3.319	2.2	-	-	2.219	-	-
Pot Cap-1 Maneuver	~ 9	19	363	36	19	243	465	-	0	610	-	-
Stage 1	111	165	-	229	264	-	-	-	0	-	-	-
Stage 2	210	264	-	311	165	-	-	-	0	-	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver	~ 3	16	363	~ 26	16	243	465	-	-	610	-	-
Mov Cap-2 Maneuver	~ 3	16	-	~ 26	16	-	-	-	-	-	-	-
Stage 1	106	146	-	218	251	-	-	-	-	-	-	-
Stage 2	77	251	-	236	146	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	$ 2404.9	141.5	0.3	0.5
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	465	-	13	25	243	610	-	-
HCM Lane V/C Ratio	0.05	-	5.058	1.425	0.614	0.115	-	-
HCM Control Delay (s)	13.2	-	$ 2404.9	$ 563.1	40.9	11.7	-	-
HCM Lane LOS	B	-	F	F	E	B	-	-
HCM 95th %tile Q(veh)	0.2	-	9.3	4.4	3.6	0.4	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s   +: Computation Not Defined   *: All major volume in platoon

Intersection	
Int Delay, s/veh	0.1

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations	↰	↱	↑	↱	↰	↑
Traffic Vol, veh/h	0	17	905	54	0	1145
Future Vol, veh/h	0	17	905	54	0	1145
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	175	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	18	984	59	0	1245

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2229	984	0	0	1043	0
Stage 1	984	-	-	-	-	-
Stage 2	1245	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	47	301	-	-	667	-
Stage 1	362	-	-	-	-	-
Stage 2	271	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	47	301	-	-	667	-
Mov Cap-2 Maneuver	47	-	-	-	-	-
Stage 1	362	-	-	-	-	-
Stage 2	271	-	-	-	-	-

Approach	NW	NE	SW
HCM Control Delay, s	17.7	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NET	NER	NWLn1	NWLn2	SWL	SWT
Capacity (veh/h)	-	-	-	301	667	-
HCM Lane V/C Ratio	-	-	-	0.061	-	-
HCM Control Delay (s)	-	-	0	17.7	0	-
HCM Lane LOS	-	-	A	C	A	-
HCM 95th %tile Q(veh)	-	-	-	0.2	0	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣		↰	↱		↰	↑	↱	↰	↑	↱
Traffic Volume (veh/h)	46	14	182	81	13	20	556	908	27	41	631	60
Future Volume (veh/h)	46	14	182	81	13	20	556	908	27	41	631	60
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1863	1863	1900	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	48	15	192	88	14	22	625	998	29	45	671	0
Adj No. of Lanes	0	1	0	1	1	0	1	1	1	1	1	1
Peak Hour Factor	0.95	0.92	0.95	0.92	0.92	0.92	0.89	0.91	0.92	0.92	0.94	0.65
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	75	29	218	163	120	189	642	1366	1161	258	696	591
Arrive On Green	0.18	0.18	0.18	0.18	0.18	0.18	0.32	0.73	0.73	0.37	0.37	0.00
Sat Flow, veh/h	231	157	1182	1170	654	1028	1774	1863	1583	547	1863	1583
Grp Volume(v), veh/h	255	0	0	88	0	36	625	998	29	45	671	0
Grp Sat Flow(s),veh/h/ln	1570	0	0	1170	0	1681	1774	1863	1583	547	1863	1583
Q Serve(g_s), s	15.9	0.0	0.0	0.9	0.0	2.4	41.0	41.0	0.7	7.5	47.0	0.0
Cycle Q Clear(g_c), s	21.0	0.0	0.0	21.9	0.0	2.4	41.0	41.0	0.7	7.5	47.0	0.0
Prop In Lane	0.19		0.75	1.00		0.61	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	321	0	0	163	0	309	642	1366	1161	258	696	591
V/C Ratio(X)	0.79	0.00	0.00	0.54	0.00	0.12	0.97	0.73	0.02	0.17	0.96	0.00
Avail Cap(c_a), veh/h	501	0	0	308	0	517	642	1383	1176	263	712	606
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	52.9	0.0	0.0	53.9	0.0	45.4	37.9	10.2	4.8	28.5	40.9	0.0
Incr Delay (d2), s/veh	4.7	0.0	0.0	2.8	0.0	0.2	28.9	2.0	0.0	0.3	24.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	14.6	0.0	0.0	5.9	0.0	2.0	36.4	29.2	0.5	2.1	37.9	0.0
LnGrp Delay(d),s/veh	57.6	0.0	0.0	56.6	0.0	45.5	66.7	12.2	4.8	28.8	65.8	0.0
LnGrp LOS	E			E		D	E	B	A	C	E	
Approach Vol, veh/h		255			124			1652			716	
Approach Delay, s/veh		57.6			53.4			32.7			63.5	
Approach LOS		E			D			C			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		8
Phs Duration (G+Y+Rc), s		103.8		29.5	48.0	55.8		29.5
Change Period (Y+Rc), s		6.0		5.0	5.0	6.0		* 5
Max Green Setting (Gmax), s		99.0		40.0	43.0	51.0		* 41
Max Q Clear Time (g_c+I1), s		43.0		23.0	43.0	49.0		23.9
Green Ext Time (p_c), s		6.9		1.5	0.0	0.8		0.4

Intersection Summary	
HCM 2010 Ctrl Delay	44.0
HCM 2010 LOS	D

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑↱		↰	↰↑	↱	↰	↑↱		↰	↑↱	
Traffic Volume (veh/h)	34	16	26	272	20	564	21	1126	254	275	714	17
Future Volume (veh/h)	34	16	26	272	20	564	21	1126	254	275	714	17
Number	7	4	14	3	8	18	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	34	16	26	286	0	564	21	1126	254	275	714	17
Adj No. of Lanes	0	1	0	2	0	1	1	2	0	1	2	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	194	95	124	984	0	476	468	1422	319	341	2032	48
Arrive On Green	0.30	0.30	0.29	0.30	0.00	0.30	0.04	0.49	0.48	0.12	0.58	0.56
Sat Flow, veh/h	480	316	414	2718	0	1583	1774	2875	644	1774	3533	84
Grp Volume(v), veh/h	76	0	0	286	0	564	21	690	690	275	357	374
Grp Sat Flow(s),veh/h/ln	1210	0	0	1359	0	1583	1774	1770	1749	1774	1770	1848
Q Serve(g_s), s	1.3	0.0	0.0	3.5	0.0	31.5	0.6	33.9	34.7	7.9	11.3	11.3
Cycle Q Clear(g_c), s	3.8	0.0	0.0	7.3	0.0	31.5	0.6	33.9	34.7	7.9	11.3	11.3
Prop In Lane	0.45		0.34	1.00		1.00	1.00		0.37	1.00		0.05
Lane Grp Cap(c), veh/h	413	0	0	984	0	476	468	875	865	341	1018	1063
V/C Ratio(X)	0.18	0.00	0.00	0.29	0.00	1.19	0.04	0.79	0.80	0.81	0.35	0.35
Avail Cap(c_a), veh/h	413	0	0	984	0	476	526	911	901	476	1131	1181
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	27.0	0.0	0.0	28.0	0.0	36.7	12.1	22.0	22.5	22.0	11.9	11.9
Incr Delay (d2), s/veh	0.2	0.0	0.0	0.2	0.0	103.1	0.0	7.1	7.6	6.9	1.0	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	3.0	0.0	0.0	5.8	0.0	49.3	0.5	25.2	25.6	13.0	9.7	10.0
LnGrp Delay(d),s/veh	27.2	0.0	0.0	28.2	0.0	139.8	12.1	29.1	30.0	28.9	12.8	12.8
LnGrp LOS	C			C		F	B	C	C	C	B	B
Approach Vol, veh/h		76			850			1401			1006	
Approach Delay, s/veh		27.2			102.3			29.3			17.2	
Approach LOS		C			F			C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	6.6	63.3		35.0	15.0	54.9		35.0
Change Period (Y+Rc), s	4.5	6.0		5.5	4.5	6.0		5.5
Max Green Setting (Gmax), s	5.5	64.0		29.5	18.5	51.0		29.5
Max Q Clear Time (g_c+I1), s	2.6	13.3		5.8	9.9	36.7		33.5
Green Ext Time (p_c), s	0.0	13.8		0.3	0.6	12.2		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	44.2
HCM 2010 LOS	D

Notes

User approved volume balancing among the lanes for turning movement.

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱		↰↑↱		↰	↑↑↱		↰	↑↑↱	
Traffic Volume (veh/h)	117	24	221	72	17	27	125	1237	75	20	960	72
Future Volume (veh/h)	117	24	221	72	17	27	125	1237	75	20	960	72
Number	7	4	14	3	8	18	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1863	1900	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	117	24	221	72	17	27	125	1237	75	20	960	72
Adj No. of Lanes	0	1	1	0	1	0	1	2	0	1	2	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	303	56	349	162	41	43	455	2209	134	337	2076	156
Arrive On Green	0.22	0.22	0.22	0.22	0.22	0.20	0.07	0.65	0.65	0.04	0.62	0.60
Sat Flow, veh/h	1058	254	1583	451	188	194	1774	3391	205	1774	3338	250
Grp Volume(v), veh/h	141	0	221	116	0	0	125	645	667	20	509	523
Grp Sat Flow(s),veh/h/ln	1312	0	1583	833	0	0	1774	1770	1827	1774	1770	1819
Q Serve(g_s), s	0.0	0.0	11.9	6.3	0.0	0.0	2.1	18.7	18.8	0.4	14.3	14.4
Cycle Q Clear(g_c), s	9.0	0.0	11.9	15.3	0.0	0.0	2.1	18.7	18.8	0.4	14.3	14.4
Prop In Lane	0.83		1.00	0.62		0.23	1.00		0.11	1.00		0.14
Lane Grp Cap(c), veh/h	359	0	349	246	0	0	455	1153	1190	337	1100	1131
V/C Ratio(X)	0.39	0.00	0.63	0.47	0.00	0.00	0.27	0.56	0.56	0.06	0.46	0.46
Avail Cap(c_a), veh/h	653	0	676	512	0	0	638	1747	1803	440	1615	1660
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	31.9	0.0	33.1	36.6	0.0	0.0	6.2	9.0	9.0	7.1	9.4	9.5
Incr Delay (d2), s/veh	0.7	0.0	1.9	1.4	0.0	0.0	0.3	2.0	1.9	0.1	1.4	1.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	5.8	0.0	9.1	5.3	0.0	0.0	1.8	14.7	15.1	0.3	11.8	12.1
LnGrp Delay(d),s/veh	32.6	0.0	35.0	38.0	0.0	0.0	6.6	10.9	10.9	7.2	10.8	10.9
LnGrp LOS	C		D	D			A	B	B	A	B	B
Approach Vol, veh/h		362			116			1437			1052	
Approach Delay, s/veh		34.1			38.0			10.5			10.8	
Approach LOS		C			D			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	9.3	60.8		23.6	6.5	63.5		23.6
Change Period (Y+Rc), s	4.5	5.5		6.0	4.5	5.5		6.0
Max Green Setting (Gmax), s	14.5	82.5		37.0	7.5	89.5		37.0
Max Q Clear Time (g_c+I1), s	4.1	16.4		13.9	2.4	20.8		17.3
Green Ext Time (p_c), s	0.2	24.8		1.3	0.0	37.2		0.4

Intersection Summary	
HCM 2010 Ctrl Delay	14.6
HCM 2010 LOS	B

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↰	↰↑	↱	↰	↑↑			↑↱	
Traffic Volume (vph)	0	0	0	951	46	500	73	948	0	0	1059	197
Future Volume (vph)	0	0	0	951	46	500	73	948	0	0	1059	197
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				3.0	3.0	3.0	3.0	3.0			3.0	
Lane Util. Factor				0.95	0.95	1.00	1.00	0.95			0.95	
Frt				1.00	1.00	0.85	1.00	1.00			0.98	
Flt Protected				0.95	0.96	1.00	0.95	1.00			1.00	
Satd. Flow (prot)				1681	1692	1583	1770	3539			3456	
Flt Permitted				0.95	0.96	1.00	0.08	1.00			1.00	
Satd. Flow (perm)				1681	1692	1583	158	3539			3456	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	0	0	951	46	500	73	948	0	0	1059	197
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	9	0
Lane Group Flow (vph)	0	0	0	475	522	500	73	948	0	0	1247	0
Turn Type				Perm	NA	Perm	custom	NA			NA	
Protected Phases					4		1	1 6			2	
Permitted Phases				4		4	6					
Actuated Green, G (s)				54.8	54.8	54.8	77.2	83.2			67.2	
Effective Green, g (s)				57.8	57.8	57.8	83.2	86.2			70.2	
Actuated g/C Ratio				0.39	0.39	0.39	0.55	0.57			0.47	
Clearance Time (s)				6.0	6.0	6.0	6.0				6.0	
Vehicle Extension (s)				3.0	3.0	3.0	3.0				5.0	
Lane Grp Cap (vph)				647	651	609	227	2033			1617	
v/s Ratio Prot							0.03	c0.27			c0.36	
v/s Ratio Perm				0.28	0.31	c0.32	0.15					
v/c Ratio				0.73	0.80	0.82	0.32	0.47			0.77	
Uniform Delay, d1				39.5	41.0	41.4	49.1	18.5			33.2	
Progression Factor				1.00	1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2				4.3	7.1	8.7	0.8	0.2			3.6	
Delay (s)				43.8	48.1	50.2	49.9	18.7			36.8	
Level of Service				D	D	D	D	B			D	
Approach Delay (s)		0.0			47.4			20.9			36.8	
Approach LOS		A			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	36.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	79.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	86.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			↰	↱	↰	↑	↱	↰	↑↑↱	
Traffic Vol, veh/h	16	1	51	28	0	137	42	1378	91	87	770	1
Future Vol, veh/h	16	1	51	28	0	137	42	1378	91	87	770	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	Free	-	-	None
Storage Length	-	-	-	-	-	0	5	-	0	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	73	73	73	73	73	73	73	73	73	73	73	73
Heavy Vehicles, %	0	0	1	6	6	6	0	2	0	6	6	6
Mvmt Flow	22	1	70	38	0	188	58	1888	125	119	1055	1

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	3392	3298	528	2770	3298	1888	1056	0	-	1888	0	0
Stage 1	1294	1294	-	2004	2004	-	-	-	-	-	-	-
Stage 2	2098	2004	-	766	1294	-	-	-	-	-	-	-
Critical Hdwy	7.3	6.5	6.915	7.39	6.59	6.29	4.1	-	-	4.19	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.19	5.59	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.59	5.59	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3095	3.557	4.057	3.357	2.2	-	-	2.257	-	-
Pot Cap-1 Maneuver	~ 4	9	498	~ 10	8	~ 84	667	-	0	302	-	-
Stage 1	175	235	-	74	100	-	-	-	0	-	-	-
Stage 2	69	105	-	355	226	-	-	-	0	-	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver	-	5	498	~ 5	4	~ 84	667	-	-	302	-	-
Mov Cap-2 Maneuver	-	5	-	~ 5	4	-	-	-	-	-	-	-
Stage 1	160	142	-	68	91	-	-	-	-	-	-	-
Stage 2	-	96	-	183	137	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s		$ 1305.3	0.3	2.5
HCM LOS	-	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	667	-	-	5	84	302	-	-
HCM Lane V/C Ratio	0.086	-	-	7.671	2.234	0.395	-	-
HCM Control Delay (s)	10.9	-		$ 4402.9	$ 672.2	24.5	-	-
HCM Lane LOS	B	-	-	F	F	C	-	-
HCM 95th %tile Q(veh)	0.3	-	-	6.4	17.1	1.8	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	0.3

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations	↰	↱	↑	↱	↰	↑
Traffic Vol, veh/h	0	21	1470	54	0	894
Future Vol, veh/h	0	21	1470	54	0	894
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	175	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	23	1598	59	0	972

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2570	1598	0	0	1657	0
Stage 1	1598	-	-	-	-	-
Stage 2	972	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	29	131	-	-	389	-
Stage 1	182	-	-	-	-	-
Stage 2	367	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	29	131	-	-	389	-
Mov Cap-2 Maneuver	29	-	-	-	-	-
Stage 1	182	-	-	-	-	-
Stage 2	367	-	-	-	-	-

Approach	NW	NE	SW
HCM Control Delay, s	38.2	0	0
HCM LOS	E		

Minor Lane/Major Mvmt	NET	NER	NWLn1	NWLn2	SWL	SWT
Capacity (veh/h)	-	-	-	131	389	-
HCM Lane V/C Ratio	-	-	-	0.174	-	-
HCM Control Delay (s)	-	-	0	38.2	0	-
HCM Lane LOS	-	-	A	E	A	-
HCM 95th %tile Q(veh)	-	-	-	0.6	0	-

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↶	↱	↰	↱		↰	↑	↱	↰	↑↑	↱
Traffic Volume (veh/h)	93	14	466	67	11	16	217	703	27	40	658	44
Future Volume (veh/h)	93	14	466	67	11	16	217	703	27	40	658	44
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1863	1863	1863	1900	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	93	15	357	73	12	17	236	764	0	43	715	48
Adj No. of Lanes	0	1	1	1	1	0	1	1	1	1	2	1
Peak Hour Factor	1.00	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	396	64	408	102	40	57	403	831	706	164	1312	587
Arrive On Green	0.26	0.26	0.26	0.06	0.06	0.06	0.10	0.45	0.00	0.03	0.37	0.37
Sat Flow, veh/h	1538	248	1583	1774	699	990	1774	1863	1583	1774	3539	1583
Grp Volume(v), veh/h	108	0	357	73	0	29	236	764	0	43	715	48
Grp Sat Flow(s),veh/h/ln	1786	0	1583	1774	0	1688	1774	1863	1583	1774	1770	1583
Q Serve(g_s), s	4.8	0.0	21.5	4.0	0.0	1.6	7.7	38.4	0.0	1.5	15.9	2.0
Cycle Q Clear(g_c), s	4.8	0.0	21.5	4.0	0.0	1.6	7.7	38.4	0.0	1.5	15.9	2.0
Prop In Lane	0.86		1.00	1.00		0.59	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	460	0	408	102	0	97	403	831	706	164	1312	587
V/C Ratio(X)	0.23	0.00	0.88	0.71	0.00	0.30	0.58	0.92	0.00	0.26	0.54	0.08
Avail Cap(c_a), veh/h	717	0	636	178	0	169	541	1384	1176	204	2167	970
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	29.2	0.0	35.5	46.1	0.0	45.0	17.1	25.9	0.0	23.6	24.7	20.3
Incr Delay (d2), s/veh	0.3	0.0	8.4	8.8	0.0	1.7	1.3	6.3	0.0	0.8	0.4	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.4	0.0	10.4	2.2	0.0	0.8	3.8	21.0	0.0	0.8	7.8	0.9
LnGrp Delay(d),s/veh	29.5	0.0	43.9	54.9	0.0	46.7	18.5	32.2	0.0	24.4	25.1	20.4
LnGrp LOS	C		D	D		D	B	C		C	C	C
Approach Vol, veh/h		465			102			1000			806	
Approach Delay, s/veh		40.5			52.6			29.0			24.8	
Approach LOS		D			D			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	7.8	50.4		30.6	15.3	42.9		10.8
Change Period (Y+Rc), s	5.0	6.0		5.0	5.0	6.0		5.0
Max Green Setting (Gmax), s	5.0	74.0		40.0	18.0	61.0		10.0
Max Q Clear Time (g_c+I1), s	3.5	40.4		23.5	9.7	17.9		6.0
Green Ext Time (p_c), s	0.0	4.1		2.1	0.6	4.0		0.1

Intersection Summary			
HCM 2010 Ctrl Delay			30.8
HCM 2010 LOS			C

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥		↰↰	↰↑	↱	↰	↑↱		↰	↑↱	
Traffic Volume (veh/h)	5	2	8	113	12	302	14	796	160	282	966	9
Future Volume (veh/h)	5	2	8	113	12	302	14	796	160	282	966	9
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	5	2	8	122	0	211	14	796	160	282	966	9
Adj No. of Lanes	0	1	0	2	0	1	1	2	0	1	2	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	21	8	34	663	0	296	384	1419	285	472	2052	19
Arrive On Green	0.04	0.04	0.03	0.19	0.00	0.19	0.04	0.48	0.46	0.13	0.57	0.55
Sat Flow, veh/h	559	224	894	3548	0	1583	1774	2938	590	1774	3593	33
Grp Volume(v), veh/h	15	0	0	122	0	211	14	479	477	282	476	499
Grp Sat Flow(s),veh/h/ln	1677	0	0	1774	0	1583	1774	1770	1759	1774	1770	1857
Q Serve(g_s), s	0.7	0.0	0.0	2.4	0.0	10.6	0.3	16.2	16.4	6.0	13.3	13.3
Cycle Q Clear(g_c), s	0.7	0.0	0.0	2.4	0.0	10.6	0.3	16.2	16.4	6.0	13.3	13.3
Prop In Lane	0.33		0.53	1.00		1.00	1.00		0.34	1.00		0.02
Lane Grp Cap(c), veh/h	63	0	0	663	0	296	384	855	850	472	1011	1061
V/C Ratio(X)	0.24	0.00	0.00	0.18	0.00	0.71	0.04	0.56	0.56	0.60	0.47	0.47
Avail Cap(c_a), veh/h	218	0	0	1596	0	712	463	1403	1394	667	1676	1758
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	39.7	0.0	0.0	28.9	0.0	32.2	10.4	15.5	15.8	11.1	10.6	10.6
Incr Delay (d2), s/veh	1.9	0.0	0.0	0.1	0.0	3.2	0.0	2.7	2.7	1.2	1.6	1.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	0.0	1.2	0.0	4.9	0.2	8.5	8.5	3.1	6.9	7.2
LnGrp Delay(d),s/veh	41.6	0.0	0.0	29.1	0.0	35.4	10.5	18.1	18.4	12.3	12.2	12.1
LnGrp LOS	D			C		D	B	B	B	B	B	B
Approach Vol, veh/h		15			333			970			1257	
Approach Delay, s/veh		41.6			33.1			18.2			12.2	
Approach LOS		D			C			B			B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	13.7	43.8		7.2	6.3	51.3		19.8				
Change Period (Y+Rc), s	5.0	6.0		6.0	5.0	6.0		6.0				
Max Green Setting (Gmax), s	8.0	64.0		9.0	5.0	77.0		36.0				
Max Q Clear Time (g_c+I1), s	8.0	18.4		2.7	2.3	15.3		12.6				
Green Ext Time (p_c), s	0.7	19.4		0.0	0.0	22.1		1.2				
Intersection Summary												
HCM 2010 Ctrl Delay			17.3									
HCM 2010 LOS			B									
Notes												

User approved volume balancing among the lanes for turning movement.

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		✥		↰	↑↱		↰	↑↱	
Traffic Volume (veh/h)	24	5	56	47	9	3	193	889	54	8	1045	87
Future Volume (veh/h)	24	5	56	47	9	3	193	889	54	8	1045	87
Number	7	4	14	3	8	18	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1863	1900	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	24	5	56	47	9	3	193	889	54	8	1045	87
Adj No. of Lanes	0	1	1	0	1	0	1	2	0	1	2	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	267	47	228	234	40	10	492	2359	143	504	2116	176
Arrive On Green	0.14	0.14	0.14	0.14	0.14	0.12	0.09	0.70	0.70	0.04	0.64	0.61
Sat Flow, veh/h	1230	330	1583	1014	279	69	1774	3390	206	1774	3308	275
Grp Volume(v), veh/h	29	0	56	59	0	0	193	464	479	8	559	573
Grp Sat Flow(s),veh/h/ln	1559	0	1583	1361	0	0	1774	1770	1826	1774	1770	1814
Q Serve(g_s), s	0.0	0.0	2.3	2.1	0.0	0.0	2.3	7.9	7.9	0.1	12.2	12.3
Cycle Q Clear(g_c), s	1.0	0.0	2.3	3.1	0.0	0.0	2.3	7.9	7.9	0.1	12.2	12.3
Prop In Lane	0.83		1.00	0.80		0.05	1.00		0.11	1.00		0.15
Lane Grp Cap(c), veh/h	314	0	228	284	0	0	492	1232	1271	504	1132	1160
V/C Ratio(X)	0.09	0.00	0.25	0.21	0.00	0.00	0.39	0.38	0.38	0.02	0.49	0.49
Avail Cap(c_a), veh/h	819	0	776	772	0	0	735	2361	2437	607	2121	2174
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	27.3	0.0	27.9	28.3	0.0	0.0	4.9	4.6	4.6	4.3	7.0	7.1
Incr Delay (d2), s/veh	0.1	0.0	0.6	0.4	0.0	0.0	0.5	0.9	0.9	0.0	1.5	1.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	1.0	1.1	0.0	0.0	1.2	4.2	4.3	0.1	6.4	6.6
LnGrp Delay(d),s/veh	27.5	0.0	28.4	28.7	0.0	0.0	5.4	5.5	5.5	4.3	8.5	8.6
LnGrp LOS	C		C	C			A	A	A	A	A	A
Approach Vol, veh/h		85			59			1136			1140	
Approach Delay, s/veh		28.1			28.7			5.5			8.5	
Approach LOS		C			C			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	9.9	50.0		13.6	5.8	54.1		13.6
Change Period (Y+Rc), s	5.0	6.0		6.0	5.0	6.0		6.0
Max Green Setting (Gmax), s	15.0	85.0		33.0	5.0	95.0		33.0
Max Q Clear Time (g_c+I1), s	4.3	14.3		4.3	2.1	9.9		5.1
Green Ext Time (p_c), s	0.4	29.6		0.2	0.0	22.6		0.1

Intersection Summary	
HCM 2010 Ctrl Delay	8.3
HCM 2010 LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↰	↰	↱	↰	↑↑			↑↱	
Traffic Volume (veh/h)	0	0	0	519	0	406	47	779	0	0	963	126
Future Volume (veh/h)	0	0	0	519	0	406	47	779	0	0	963	126
Number				3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln				1863	1863	1863	1863	1863	0	0	1863	1900
Adj Flow Rate, veh/h				564	0	441	51	847	0	0	1047	137
Adj No. of Lanes				2	0	1	1	2	0	0	2	0
Peak Hour Factor				0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %				2	2	2	2	2	0	0	2	2
Cap, veh/h				1162	0	519	204	1864	0	0	1346	176
Arrive On Green				0.33	0.00	0.33	0.03	0.53	0.00	0.00	0.43	0.43
Sat Flow, veh/h				3548	0	1583	1774	3632	0	0	3241	412
Grp Volume(v), veh/h				564	0	441	51	847	0	0	588	596
Grp Sat Flow(s),veh/h/ln				1774	0	1583	1774	1770	0	0	1770	1790
Q Serve(g_s), s				11.3	0.0	23.2	1.4	13.3	0.0	0.0	25.4	25.5
Cycle Q Clear(g_c), s				11.3	0.0	23.2	1.4	13.3	0.0	0.0	25.4	25.5
Prop In Lane				1.00		1.00	1.00		0.00	0.00		0.23
Lane Grp Cap(c), veh/h				1162	0	519	204	1864	0	0	756	765
V/C Ratio(X)				0.49	0.00	0.85	0.25	0.45	0.00	0.00	0.78	0.78
Avail Cap(c_a), veh/h				2225	0	993	267	3210	0	0	1367	1383
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	1.00	1.00	1.00	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh				24.0	0.0	28.0	17.1	13.1	0.0	0.0	21.9	21.9
Incr Delay (d2), s/veh				0.3	0.0	4.0	0.6	0.2	0.0	0.0	1.8	1.8
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				5.6	0.0	10.6	0.7	6.5	0.0	0.0	12.8	13.0
LnGrp Delay(d),s/veh				24.3	0.0	32.0	17.7	13.3	0.0	0.0	23.7	23.7
LnGrp LOS				C		C	B	B			C	C
Approach Vol, veh/h					1005			898			1184	
Approach Delay, s/veh					27.7			13.6			23.7	
Approach LOS					C			B			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		8
Phs Duration (G+Y+Rc), s		54.0			8.9	45.2		35.3
Change Period (Y+Rc), s		7.0			6.0	7.0		6.0
Max Green Setting (Gmax), s		81.0			6.0	69.0		56.0
Max Q Clear Time (g_c+I1), s		15.3			3.4	27.5		25.2
Green Ext Time (p_c), s		7.5			0.0	10.7		4.1

Intersection Summary	
HCM 2010 Ctrl Delay	22.0
HCM 2010 LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

HCM 2010 Signalized Intersection Summary
6: MD 108 & New Road/Linden Linthicum Lane

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱			↰	↱	↰	↑↑↱		↰	↑↑↱	
Traffic Volume (veh/h)	48	1	68	63	1	109	76	859	34	51	1087	23
Future Volume (veh/h)	48	1	68	63	1	109	76	859	34	51	1087	23
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1900	1863	1863	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	52	1	74	68	1	118	83	934	37	55	1182	25
Adj No. of Lanes	1	1	0	0	1	1	1	2	0	1	2	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	0	0	2	2	2	2	2	2	2
Cap, veh/h	260	4	272	324	4	275	335	1620	64	385	1610	34
Arrive On Green	0.17	0.17	0.17	0.17	0.17	0.17	0.06	0.47	0.47	0.04	0.45	0.45
Sat Flow, veh/h	1268	21	1565	996	21	1583	1774	3471	137	1774	3544	75
Grp Volume(v), veh/h	52	0	75	69	0	118	83	476	495	55	590	617
Grp Sat Flow(s),veh/h/ln	1268	0	1587	1018	0	1583	1774	1770	1838	1774	1770	1850
Q Serve(g_s), s	1.9	0.0	1.9	2.2	0.0	3.2	1.1	9.3	9.3	0.8	13.0	13.0
Cycle Q Clear(g_c), s	6.0	0.0	1.9	4.2	0.0	3.2	1.1	9.3	9.3	0.8	13.0	13.0
Prop In Lane	1.00		0.99	0.99		1.00	1.00		0.07	1.00		0.04
Lane Grp Cap(c), veh/h	260	0	275	327	0	275	335	826	858	385	804	840
V/C Ratio(X)	0.20	0.00	0.27	0.21	0.00	0.43	0.25	0.58	0.58	0.14	0.73	0.73
Avail Cap(c_a), veh/h	575	0	669	656	0	668	609	2798	2907	682	2798	2924
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.7	0.0	17.0	18.8	0.0	17.5	8.1	9.2	9.2	7.1	10.6	10.6
Incr Delay (d2), s/veh	0.4	0.0	0.5	0.3	0.0	1.1	0.4	0.6	0.6	0.2	1.3	1.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	0.9	0.9	0.0	1.5	0.6	4.6	4.8	0.4	6.5	6.8
LnGrp Delay(d),s/veh	21.1	0.0	17.5	19.1	0.0	18.6	8.5	9.9	9.8	7.2	11.9	11.9
LnGrp LOS	C		B	B		B	A	A	A	A	B	B
Approach Vol, veh/h		127			187			1054			1262	
Approach Delay, s/veh		19.0			18.8			9.7			11.7	
Approach LOS		B			B			A			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	7.1	27.2		13.2	7.7	26.6		13.2
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	10.0	75.0		20.0	10.0	75.0		20.0
Max Q Clear Time (g_c+I1), s	2.8	11.3		8.0	3.1	15.0		6.2
Green Ext Time (p_c), s	0.1	4.8		0.3	0.1	6.6		0.6

Intersection Summary	
HCM 2010 Ctrl Delay	11.8
HCM 2010 LOS	B

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↱			↱	↰	↑↑	↱		↑↑	↱
Traffic Vol, veh/h	0	0	14	0	0	17	26	930	54	0	1168	23
Future Vol, veh/h	0	0	14	0	0	17	26	930	54	0	1168	23
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Free	-	-	Free	-	-	Free	-	-	None
Storage Length	-	-	0	-	-	0	150	-	175	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	15	0	0	18	28	1011	59	0	1270	25

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	-	-	-	-	-	-	1295	0	-	-	-	0
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	-	4.14	-	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	-	2.22	-	-	-	-	-
Pot Cap-1 Maneuver	0	0	0	0	0	0	531	-	0	0	-	-
Stage 1	0	0	0	0	0	0	-	-	0	0	-	-
Stage 2	0	0	0	0	0	0	-	-	0	0	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver	-	-	-	-	-	-	531	-	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	0.3	0
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	WBLn1	SBT	SBR
Capacity (veh/h)	531	-	-	-	-	-
HCM Lane V/C Ratio	0.053	-	-	-	-	-
HCM Control Delay (s)	12.2	-	0	0	-	-
HCM Lane LOS	B	-	A	A	-	-
HCM 95th %tile Q(veh)	0.2	-	-	-	-	-

HCM 2010 Signalized Intersection Summary
1: MD 108 & Sheppard Lane

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱	↰	↑↱		↰	↑	↱	↰	↑↑	↱
Traffic Volume (veh/h)	46	14	192	81	13	20	571	945	27	41	655	60
Future Volume (veh/h)	46	14	192	81	13	20	571	945	27	41	655	60
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1863	1863	1863	1900	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	48	15	141	88	14	22	621	1027	0	44	697	64
Adj No. of Lanes	0	1	1	1	1	0	1	1	1	1	2	1
Peak Hour Factor	0.95	0.95	0.95	0.92	0.92	0.92	0.92	0.92	0.92	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	154	48	179	121	44	70	676	1097	932	164	1241	555
Arrive On Green	0.11	0.11	0.11	0.07	0.07	0.07	0.27	0.59	0.00	0.03	0.35	0.35
Sat Flow, veh/h	1367	427	1583	1774	654	1028	1774	1863	1583	1774	3539	1583
Grp Volume(v), veh/h	63	0	141	88	0	36	621	1027	0	44	697	64
Grp Sat Flow(s),veh/h/ln	1794	0	1583	1774	0	1681	1774	1863	1583	1774	1770	1583
Q Serve(g_s), s	3.3	0.0	9.0	5.0	0.0	2.1	22.7	52.4	0.0	1.6	16.5	2.8
Cycle Q Clear(g_c), s	3.3	0.0	9.0	5.0	0.0	2.1	22.7	52.4	0.0	1.6	16.5	2.8
Prop In Lane	0.76		1.00	1.00		0.61	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	203	0	179	121	0	114	676	1097	932	164	1241	555
V/C Ratio(X)	0.31	0.00	0.79	0.73	0.00	0.31	0.92	0.94	0.00	0.27	0.56	0.12
Avail Cap(c_a), veh/h	433	0	382	257	0	243	974	1510	1283	201	1503	672
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	42.3	0.0	44.8	47.4	0.0	46.0	18.0	19.5	0.0	24.6	27.2	22.8
Incr Delay (d2), s/veh	0.9	0.0	7.5	8.1	0.0	1.6	10.2	9.1	0.0	0.9	0.4	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	0.0	4.3	2.7	0.0	1.0	18.8	29.3	0.0	0.8	8.1	1.3
LnGrp Delay(d),s/veh	43.1	0.0	52.3	55.5	0.0	47.6	28.2	28.7	0.0	25.4	27.6	22.9
LnGrp LOS	D		D	E		D	C	C		C	C	C
Approach Vol, veh/h		204			124			1648			805	
Approach Delay, s/veh		49.5			53.2			28.5			27.1	
Approach LOS		D			D			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	7.9	67.0		16.7	32.6	42.3		12.0
Change Period (Y+Rc), s	5.0	6.0		5.0	5.0	6.0		5.0
Max Green Setting (Gmax), s	5.0	84.0		25.0	45.0	44.0		15.0
Max Q Clear Time (g_c+I1), s	3.6	54.4		11.0	24.7	18.5		7.0
Green Ext Time (p_c), s	0.0	6.7		0.7	2.9	3.8		0.2

Intersection Summary			
HCM 2010 Ctrl Delay			30.7
HCM 2010 LOS			C

HCM 2010 Signalized Intersection Summary
2: MD 108 & Hardware Store/Great Star Drive

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥		↰↰	↰↑	↱	↰	↑↑↱		↰	↑↑↱	
Traffic Volume (veh/h)	34	16	26	204	20	564	21	1190	254	275	877	17
Future Volume (veh/h)	34	16	26	204	20	564	21	1190	254	275	877	17
Number	7	4	14	3	8	18	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	34	16	26	218	0	395	21	1190	254	275	877	17
Adj No. of Lanes	0	1	0	2	0	1	1	2	0	1	2	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	52	24	40	906	0	404	350	1304	276	307	1960	38
Arrive On Green	0.07	0.07	0.06	0.26	0.00	0.26	0.03	0.45	0.43	0.13	0.55	0.54
Sat Flow, veh/h	770	362	589	3548	0	1583	1774	2908	616	1774	3551	69
Grp Volume(v), veh/h	76	0	0	218	0	395	21	720	724	275	437	457
Grp Sat Flow(s),veh/h/ln	1720	0	0	1774	0	1583	1774	1770	1754	1774	1770	1851
Q Serve(g_s), s	6.4	0.0	0.0	7.2	0.0	36.8	0.9	56.3	57.7	16.9	21.9	21.9
Cycle Q Clear(g_c), s	6.4	0.0	0.0	7.2	0.0	36.8	0.9	56.3	57.7	16.9	21.9	21.9
Prop In Lane	0.45		0.34	1.00		1.00	1.00		0.35	1.00		0.04
Lane Grp Cap(c), veh/h	116	0	0	906	0	404	350	793	786	307	976	1021
V/C Ratio(X)	0.65	0.00	0.00	0.24	0.00	0.98	0.06	0.91	0.92	0.90	0.45	0.45
Avail Cap(c_a), veh/h	127	0	0	906	0	404	379	797	790	307	976	1021
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	67.8	0.0	0.0	43.9	0.0	54.9	21.1	38.2	38.9	45.5	19.8	19.9
Incr Delay (d2), s/veh	10.1	0.0	0.0	0.1	0.0	38.4	0.1	16.1	17.7	27.0	1.5	1.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.4	0.0	0.0	3.6	0.0	20.4	0.5	31.0	31.8	13.4	11.1	11.6
LnGrp Delay(d),s/veh	77.9	0.0	0.0	44.1	0.0	93.4	21.2	54.3	56.6	72.5	21.3	21.3
LnGrp LOS	E			D		F	C	D	E	E	C	C
Approach Vol, veh/h		76			613			1465			1169	
Approach Delay, s/veh		77.9			75.8			54.9			33.4	
Approach LOS		E			E			D			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	7.6	85.1		14.1	23.0	69.7		42.0
Change Period (Y+Rc), s	5.0	6.0		6.0	5.0	6.0		6.0
Max Green Setting (Gmax), s	5.0	77.0		9.0	18.0	64.0		36.0
Max Q Clear Time (g_c+I1), s	2.9	23.9		8.4	18.9	59.7		38.8
Green Ext Time (p_c), s	0.0	18.5		0.0	0.0	4.0		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	51.7
HCM 2010 LOS	D

Notes

User approved volume balancing among the lanes for turning movement.

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		✥		↰	↑↱		↰	↑↱	
Traffic Volume (veh/h)	117	24	221	72	17	27	125	1301	75	20	1055	72
Future Volume (veh/h)	117	24	221	72	17	27	125	1301	75	20	1055	72
Number	7	4	14	3	8	18	1	6	16	5	2	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1863	1900	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	117	24	155	72	17	27	125	1301	75	20	1055	72
Adj No. of Lanes	0	1	1	0	1	0	1	2	0	1	2	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	291	53	341	155	39	42	413	2233	129	312	2119	145
Arrive On Green	0.22	0.22	0.22	0.22	0.22	0.20	0.07	0.66	0.66	0.04	0.63	0.61
Sat Flow, veh/h	1054	246	1583	456	183	194	1774	3402	196	1774	3362	229
Grp Volume(v), veh/h	141	0	155	116	0	0	125	676	700	20	555	572
Grp Sat Flow(s),veh/h/ln	1300	0	1583	833	0	0	1774	1770	1828	1774	1770	1822
Q Serve(g_s), s	0.0	0.0	8.8	6.8	0.0	0.0	2.3	21.8	21.9	0.4	17.4	17.5
Cycle Q Clear(g_c), s	10.1	0.0	8.8	16.9	0.0	0.0	2.3	21.8	21.9	0.4	17.4	17.5
Prop In Lane	0.83		1.00	0.62		0.23	1.00		0.11	1.00		0.13
Lane Grp Cap(c), veh/h	344	0	341	236	0	0	413	1162	1200	312	1115	1149
V/C Ratio(X)	0.41	0.00	0.45	0.49	0.00	0.00	0.30	0.58	0.58	0.06	0.50	0.50
Avail Cap(c_a), veh/h	550	0	570	431	0	0	588	1670	1725	361	1497	1542
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	35.5	0.0	35.1	40.9	0.0	0.0	7.2	9.8	9.8	7.9	10.2	10.3
Incr Delay (d2), s/veh	0.8	0.0	0.9	1.6	0.0	0.0	0.4	2.1	2.1	0.1	1.6	1.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.6	0.0	3.9	3.2	0.0	0.0	1.2	11.2	11.6	0.2	9.0	9.3
LnGrp Delay(d),s/veh	36.3	0.0	36.0	42.5	0.0	0.0	7.6	11.9	11.9	8.0	11.8	11.9
LnGrp LOS	D		D	D			A	B	B	A	B	B
Approach Vol, veh/h		296			116			1501			1147	
Approach Delay, s/veh		36.2			42.5			11.6			11.8	
Approach LOS		D			D			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	9.9	67.8		25.1	7.2	70.5		25.1
Change Period (Y+Rc), s	5.0	6.0		6.0	5.0	6.0		6.0
Max Green Setting (Gmax), s	15.0	84.0		34.0	5.0	94.0		34.0
Max Q Clear Time (g_c+I1), s	4.3	19.5		12.1	2.4	23.9		18.9
Green Ext Time (p_c), s	0.2	28.4		1.0	0.0	40.6		0.3

Intersection Summary			
HCM 2010 Ctrl Delay			15.2
HCM 2010 LOS			B

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↰	↰	↱	↰	↑↑			↑↱	
Traffic Volume (veh/h)	0	0	0	951	46	529	73	983	0	0	1125	226
Future Volume (veh/h)	0	0	0	951	46	529	73	983	0	0	1125	226
Number				3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln				1863	1863	1863	1863	1863	0	0	1863	1900
Adj Flow Rate, veh/h				984	0	529	73	983	0	0	1125	226
Adj No. of Lanes				2	0	1	1	2	0	0	2	0
Peak Hour Factor				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %				2	2	2	2	2	0	0	2	2
Cap, veh/h				1350	0	602	216	2011	0	0	1455	291
Arrive On Green				0.38	0.00	0.38	0.05	0.57	0.00	0.00	0.49	0.48
Sat Flow, veh/h				3548	0	1583	1774	3632	0	0	3034	588
Grp Volume(v), veh/h				984	0	529	73	983	0	0	675	676
Grp Sat Flow(s),veh/h/ln				1774	0	1583	1774	1770	0	0	1770	1759
Q Serve(g_s), s				32.4	0.0	42.4	2.6	22.6	0.0	0.0	42.4	43.2
Cycle Q Clear(g_c), s				32.4	0.0	42.4	2.6	22.6	0.0	0.0	42.4	43.2
Prop In Lane				1.00		1.00	1.00		0.00	0.00		0.33
Lane Grp Cap(c), veh/h				1350	0	602	216	2011	0	0	876	870
V/C Ratio(X)				0.73	0.00	0.88	0.34	0.49	0.00	0.00	0.77	0.78
Avail Cap(c_a), veh/h				1484	0	662	216	2233	0	0	987	981
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	1.00	1.00	1.00	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh				36.2	0.0	39.3	22.9	17.6	0.0	0.0	28.1	28.6
Incr Delay (d2), s/veh				1.7	0.0	12.1	0.9	0.4	0.0	0.0	4.4	4.6
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				16.2	0.0	20.5	1.3	11.2	0.0	0.0	21.7	22.0
LnGrp Delay(d),s/veh				37.9	0.0	51.3	23.8	18.0	0.0	0.0	32.5	33.2
LnGrp LOS				D		D	C	B			C	C
Approach Vol, veh/h					1513			1056			1351	
Approach Delay, s/veh					42.6			18.4			32.8	
Approach LOS					D			B			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		81.4			10.0	71.4		54.9				
Change Period (Y+Rc), s		7.0			6.0	7.0		6.0				
Max Green Setting (Gmax), s		83.0			4.0	73.0		54.0				
Max Q Clear Time (g_c+I1), s		24.6			4.6	45.2		44.4				
Green Ext Time (p_c), s		19.4			0.0	19.3		4.5				
Intersection Summary												
HCM 2010 Ctrl Delay			32.7									
HCM 2010 LOS			C									
Notes												
User approved volume balancing among the lanes for turning movement.												

HCM 2010 Signalized Intersection Summary
6: MD 108 & New Road/Linden Linthicum Lane

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱			↰	↱	↰	↑↱		↰	↑↱	
Traffic Volume (veh/h)	96	1	117	96	0	137	87	1397	91	87	799	18
Future Volume (veh/h)	96	1	117	96	0	137	87	1397	91	87	799	18
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1900	1863	1863	1900	1863	1900	1863	1864	1900
Adj Flow Rate, veh/h	104	1	127	104	0	149	95	1518	99	95	868	20
Adj No. of Lanes	1	1	0	0	1	1	1	2	0	1	2	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	0	0	0	0	2	0	2	2	2	2	2
Cap, veh/h	208	3	377	304	0	379	411	1812	118	212	1901	44
Arrive On Green	0.24	0.24	0.24	0.24	0.00	0.24	0.04	0.54	0.54	0.04	0.54	0.54
Sat Flow, veh/h	1234	12	1573	907	0	1583	1810	3375	219	1774	3538	82
Grp Volume(v), veh/h	104	0	128	104	0	149	95	793	824	95	434	454
Grp Sat Flow(s),veh/h/ln	1234	0	1585	907	0	1583	1810	1770	1824	1774	1770	1849
Q Serve(g_s), s	6.9	0.0	5.6	6.2	0.0	6.6	1.9	31.3	31.9	2.0	12.6	12.6
Cycle Q Clear(g_c), s	18.7	0.0	5.6	11.8	0.0	6.6	1.9	31.3	31.9	2.0	12.6	12.6
Prop In Lane	1.00		0.99	1.00		1.00	1.00		0.12	1.00		0.04
Lane Grp Cap(c), veh/h	208	0	380	304	0	379	411	950	979	212	951	994
V/C Ratio(X)	0.50	0.00	0.34	0.34	0.00	0.39	0.23	0.83	0.84	0.45	0.46	0.46
Avail Cap(c_a), veh/h	208	0	380	304	0	379	549	1590	1639	347	1591	1662
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	37.1	0.0	26.2	31.1	0.0	26.6	8.9	16.2	16.3	16.5	11.8	11.8
Incr Delay (d2), s/veh	1.9	0.0	0.5	0.7	0.0	0.7	0.3	2.0	2.1	1.5	0.3	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	0.0	2.5	2.2	0.0	2.9	1.0	15.7	16.4	1.2	6.1	6.4
LnGrp Delay(d),s/veh	38.9	0.0	26.8	31.8	0.0	27.3	9.2	18.2	18.4	18.0	12.2	12.2
LnGrp LOS	D		C	C		C	A	B	B	B	B	B
Approach Vol, veh/h		232			253			1712			983	
Approach Delay, s/veh		32.2			29.1			17.8			12.7	
Approach LOS		C			C			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	8.6	49.8		25.0	8.6	49.8		25.0
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	10.0	75.0		20.0	10.0	75.0		20.0
Max Q Clear Time (g_c+I1), s	4.0	33.9		20.7	3.9	14.6		13.8
Green Ext Time (p_c), s	0.1	10.9		0.0	0.1	4.2		0.5

Intersection Summary			
HCM 2010 Ctrl Delay			18.2
HCM 2010 LOS			B

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↱			↱	↰	↑↑	↱		↑↑	↱
Traffic Vol, veh/h	0	0	29	0	0	21	19	1522	54	0	911	17
Future Vol, veh/h	0	0	29	0	0	21	19	1522	54	0	911	17
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Free	-	-	Free	-	-	Free	-	-	None
Storage Length	-	-	0	-	-	0	150	-	175	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	32	0	0	23	21	1654	59	0	990	18

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	-	-	-	-	-	-	1008	0	-	-	-	0
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	-	4.14	-	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	-	2.22	-	-	-	-	-
Pot Cap-1 Maneuver	0	0	0	0	0	0	683	-	0	0	-	-
Stage 1	0	0	0	0	0	0	-	-	0	0	-	-
Stage 2	0	0	0	0	0	0	-	-	0	0	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver	-	-	-	-	-	-	683	-	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	0.1	0
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	WBLn1	SBT	SBR
Capacity (veh/h)	683	-	-	-	-	-
HCM Lane V/C Ratio	0.03	-	-	-	-	-
HCM Control Delay (s)	10.4	-	0	0	-	-
HCM Lane LOS	B	-	A	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	-	-	-

APPENDIX F

Crash Data – MD SHA

MARYLAND STATE HIGHWAY ADMINISTRATION 32454 => 32460

Office of Traffic and Safety – Traffic Development & Support Division

SHA 52.1 - 1.1 (Rev. 6/26/06)

Date : 06/29/2017

To : Mr. Buck Bohmer

Department : Howard County Dept of Public Works

Subject : ***Accident Data / Analysis***

Location (s) :

County : Howard **Town / Place :** Clarksville

Route : MD 108 **Log Mile (s) :** Various

☒ **at** Multiple Locations

☐ **from** ______ **to** ______

Attached is the accident data/analysis you requested in your e-mail of: 06/27/2017 **.**

Specifically, we are providing the following data for the subject location:

☒ Accident Summary	☒ Accident History	☐ Accident Rates
☒ Study Worksheet	☒ Collision/Line Diagram	☐ Other
☐ One Year	☐ Two Years	☐ Three Years
☐ No reported Accidents	☒ 01/01/2013 to 12/31/2016	☒ Combined

Comments:

Should you have any questions, please contact me at (410) 787 - 5842.

Sincerely ,

Robert L. Booker, Jr.

For

Crash Analysis Safety Team
Traffic Development & Support Division

cc's:
Mr. George Miller

#32454
Due 7/19

William Macleod

From: Bohmer, Buck <BUBohmer@howardcountymd.gov>
Sent: Tuesday, June 27, 2017 10:33 AM
To: William Macleod
Cc: John Concannon; Robert Booker; Mark Crampton (SHA); Jagarapu, Krishnakanth; Bowman, Diane J.
Subject: FW: Crash Data Request - MD 108

Bill:

Would you please provide crash data as requested.

Thank you.

Buck Bohmer, BCE, Project Manager

Traffic Engineering Div
Howard County Public Works, Bureau of Highways
9250 Bendix Rd
Columbia, MD 21045

New E-Mail bubohmer@howardcountymd.gov

410-313-2430 (Office)
410-313-5748 (Desk)
410-313-5750 (FAX)

Report a Problem: TellHoCo

From: Carl Wilson [mailto:cwilson@trafficgroup.com]
Sent: Tuesday, June 27, 2017 9:36 AM
To: Jagarapu, Krishnakanth <kjagarapu@howardcountymd.gov>; Bohmer, Buck <BUBohmer@howardcountymd.gov>
Subject: Crash Data Request - MD 108

Kris/Buck-

We are in the process of preparing a Traffic Impact Study within the MD 108 co
for the following intersections:

7/2/15
~~[illegible]~~
27912

* MD 108 at Sheppard Lane Co 80 4.49/E @ 3.73/S
MD 108 at Linden Linthicum Lane
MD 108 at Great Star Drive
MD 108 at Auto Drive
MD 108 at MD 32 Ramps
MD 108 at Ten Oaks Drive

Thank you for your assistance.

2 RLB
to G. MILLER


Sheppard Ln
Clarksville Pike
108
River Hill Garden Center
© 2013 Google
Google earth
feet
500
meters
100

Maryland State Highway Administration
Office of Traffic and Safety - Traffic Development and Support Division
SHA 52.1 ADC Study Worksheet Output rev. 04/2016-1

Name: Robert Booker
Date: 06/28/2017

Location: MD 108 @ SHEPPARD LN
County: Howard, D7
Period: January 01, 2013 To December 31, 2016
Logmiles: 4.49 At 2.73 Radius: 150 ft.
Note: Year 2016 data may be incomplete and unedited

YEAR >>	**2013**	**2014**	**2015**	**2016**	**Total**
Fatal	0	0	0	0	0
No. Killed	0	0	0	0	0
Injury	0	2	0	0	2
No. Injured	0	2	0	0	2
Prop. Damage	1	0	0	1	2
Total Crashes	1	2	0	1	4
Severity Index	1	8	0	1	Avg 3
Opposite Dir.	0	0	0	0	0
Rear End	0	0	0	0	0
Sideswipe	0	0	0	0	0
Left Turn	0	1	0	0	1
Angle	0	1	0	0	1
Pedestrian	0	0	0	0	0
Parked Veh.	0	0	0	0	0
Fixed Object	0	0	0	0	0
Other	1	0	0	1	2
U-Turn	0	0	0	0	0
Backing	1	0	0	1	2
Animal	0	0	0	0	0
Railroad	0	0	0	0	0
Fire / Expl.	0	0	0	0	0
Overturn	0	0	0	0	0
Truck Related	0	0	0	0	0
Night Time	0	1	0	0	1
Wet Surface	0	0	0	0	0
Alcohol	0	0	0	0	0
Intersection	1	2	0	1	4
Total Vehicles	2	4	0	2	8
Total Trucks	0	0	0	0	0
Truck %	0.0	0.0	0.0	0.0	0.0

Comments:

Maryland State Highway Administration
Office of Traffic and Safety - Traffic Development and Support Division
SHA 52.1 ADC Summary Output rev. 04/2016-1

Name: Robert Booker
Date: 06/28/2017

Location: MD 108 @ SHEPPARD LN
County: Howard, D7
Period: January 1, 2013 To December 31, 2016
Logmiles: 4.49 At 2.73 Radius: 150 ft.
Note: Year 2016 data may be incomplete and unedited

SEVERITY	FATAL	INJURY	P-DAMAGE	TOTAL
Accidents		2	2	4
Veh Occ		2		
Pedestrian				

AVG Severity Index: 3

DAY OF THE WEEK

SUN	MON	TUE	WED	THU	FRI	SAT	UNK
			1	2	1		

MONTH OF THE YEAR

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	UNK
1		1			1	1						

CONDITION	DRIVER	PED
Normal:	7	
Alcohol:		
Other:	1	

TIME	12	01	02	03	04	05	06	07	08	09	10	11	UNK
AM:													
PM:	1	1			1					1			

VEHICLES INVOLVED PER ACCIDENT

1	2	3	4	5	6+	UNK	TOTAL
	4						8

VEHICLE TYPE

	Motorcycle/Moped		Tractor Trailer
5	Passenger Vehicle		Passenger Bus
1	Sport Utility Veh		School Bus
1	Pick-Up Truck		Emergency Veh
	Trucks (2+3 axles)	1	Other Types

SURFACE

	Wet
4	Dry
	Sno/Ice
	Mud
	Other

MOVEMENTS

NORTH			SOUTH			EAST			WEST		
LF	ST	RT	LF	ST	RT	LF	ST	RT	LF	ST	RT
				1	1	1	2			1	

OTHER MOVEMENTS 2

PROBABLE CAUSES

	Influence of Drugs		Improper Lane Change
	Influence of Alcohol	1	Improper Backing
	Influence of Medication		Improper Passing
	Influence of Combined Subst.		Improper Signal
	Physical/Mental Difficulty		Improper Parking
	Fell Asleep/Fainted, etc.		Passenger Interfere/Obstruct.
	Fail to give full Attention		Illegally in Roadway
	Lic. Restr. Non-compliance		Bicycle Violation
1	Fail to Drive in Single Lane		Clothing Not Visible
	Improper Right Turn on Red		Sleet, Hail, Freezing Rain
1	Fail to Yield Right-of-way		Severe Crosswinds
	Fail to Obey Stop Sign		Rain, Snow
	Fail to Obey Traffic Signal		Animal
	Fail to Obey Other Control		Vision Obstruction
	Fail to Keep Right of Center		Vehicle Defect
	Fail to Stop for School Bus		Wet
	Wrong Way on One Way		Icy or Snow Covered
	Exceeded Speed Limit		Debris or Obstruction
	Operator Using Cell Phone		Ruts, Holes or Bumps
	Stopping in Lane Roadway		Road Under Construction
	Too Fast for Conditions		Traffic Control Device Inop.
	Followed too Closely		Shoulders Low, Soft or High
	Improper Turn	1	Other or Unknown

WEATHER

4	Clear / Cloudy
	Foggy
	Raining
	Snow / Sleet
	Other

ILLUMINATION

3	Day
	Dawn/Dusk
1	Dark - Lights On
	Dark - No Lights
	Other

TOTALS

13-16	4

COLLISION TYPES		FATAL	INJURY	PROP	TOTAL
Opposite Dir	Related:				
	UnRelated:				
Rear End	Related:				
	UnRelated:				
Sideswipe	Related:				
	UnRelated:				
Left Turn	Related:		1		1
	UnRelated:				
Angle	Related:		1		1
	UnRelated:				
Pedestrian	Related:				
	UnRelated:				
Parked Vehicle	Related:				
	UnRelated:				
Other Collision	Related:			2	2
	UnRelated:				

F	Bridge	01				
I	Building	02				
X	Culvert/Ditch	03				
E	Curb	04				
D	Guardrail/Barrier	05				
	Embankment	06				
O	Fence	07				
B	Light Pole	08				
J	Sign Pole	09				
E	Other Pole	10				
C	Tree/Shrubbery	11				
T	Contr. Barrier	12				
S	Crash Attenuator	13				
	Other Fixed Object				5	

Maryland State Highway Administration

Office of Traffic and Safety - Traffic Development and Support Division

SHA 52.1 ADC History Output rev. 05/2016-1 - Combined Year Listing

Name: Robert Booker

Date: 06/28/2017

Location: MD 108 @ SHEPPARD LN

County: Howard, D7

Period: January 01, 2013 To December 31, 2016

Logmiles: 4.49 At 2.73 Radius: 150 ft.

Note: Year 2016 data may be incomplete and unedited

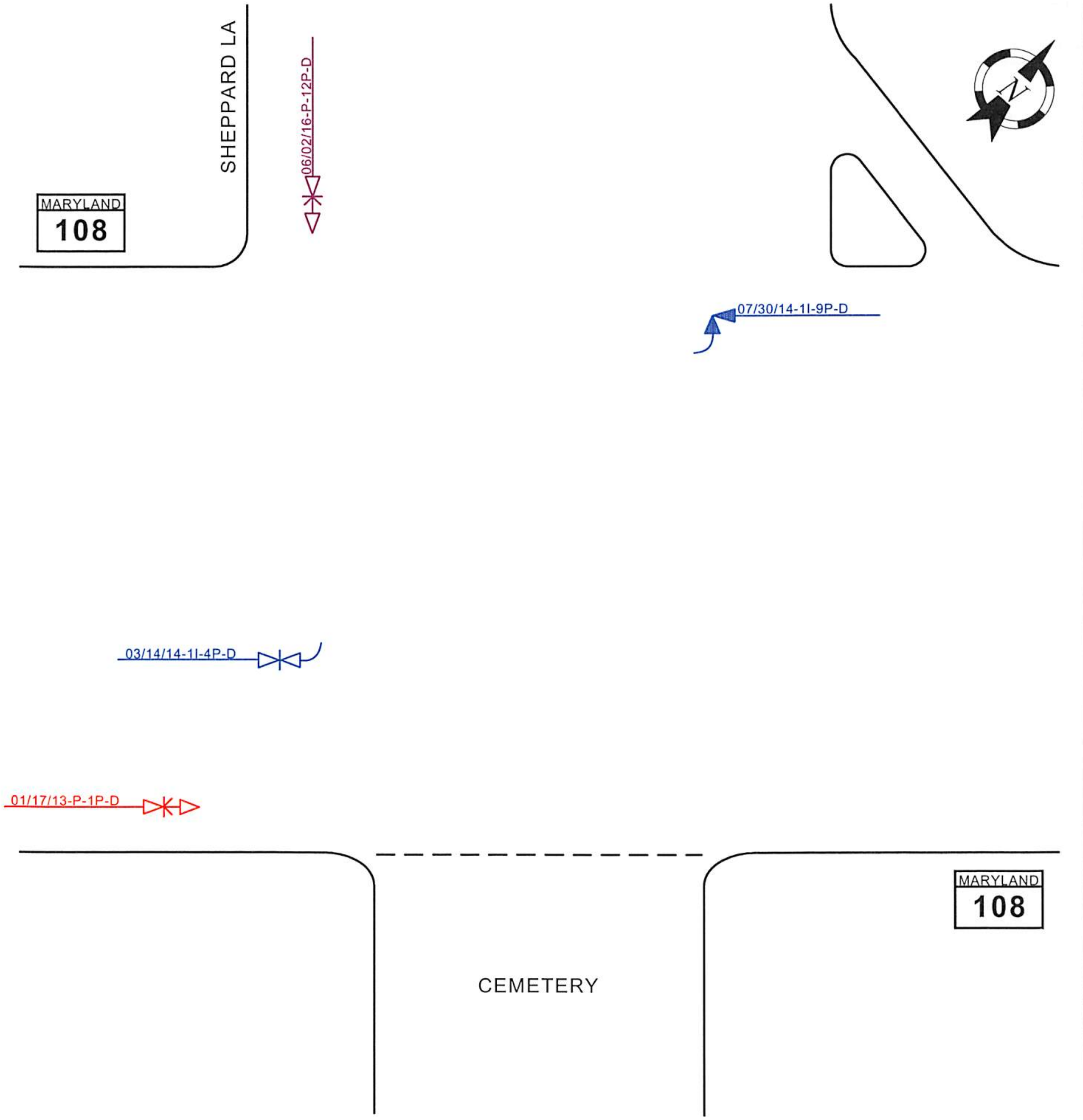
MilePt	Int Rel	Date	Severity	Time	Light	Surface	Alc Rel	FixObj	Collision	Movement V1	Movement V2	Probable Cause
MD0108												
4.490	✓	01172013	Property	01P	Day	Dry			OTHER	Eu	ES	Improper backing
4.490	✓	03142014	1 Injured	04P	Day	Dry			ANGLE	SR	ES	Fail to drive in single lane
4.490	✓	07302014	1 Injured	09P	Night	Dry			LFTRN	EL	WS	Fail to yield right-of-way
CO80												
2.730	✓	06022016	Property	12P	Day	Dry			OTHER	SS	Su	Other or Unknown

Fixed Object: 01 = Bridge 02 = Building 03 = Culvert/Ditch 04 = Curb 05 = Guardrail/Barrier 06 = Embankment 07 = Fence 08 = Light Pole 09 = Sign Post 10 = Other Pole 11 = Tree/Shrubbery 12 = Construction Barrier 13 = Crash Attenuator

6

Office of Traffic & Safety
Traffic Development & Support Division
Crash Analysis Safety Team

Location: MD 108 @ Sheppard Lane
County: HOWARD
Study Period: 01/01/2013 to Approx. 12/31/2016
Analyst: Robert L. Booker, Jr. **Date:** 06/28/2017



DATE-SEVERITY-TIME-SURFCE
NIGHT
ALCOHOL
DRUGS

SEVERITY
F - Fatalities
I - Injured
P - Property Damage Only

SURFACE
D - Dry Surface
W - Wet Surface
I - Icy Surface
S - Snowy Surface

00 - Not Applicable
01 - Bridge or Overpass
02 - Building
03 - Culvert or Ditch
04 - Curb
05 - Guardrail or Barrier
06 - Embankment
07 – Fence
08 - Light Support Pole
09 - Sign Support Pole
10 - Other Pole
11 - Tree Shrubbery
12 - Construction Barrier
13 - Crash Attenuator
88 - Other
99 - Unknown

B - Bicycle
P - Other Pedalcycle
C - Other Conveyance
T - Railway Train
A - Animal
O - Other Object
S - Spilled Cargo
J - Jackknife

U - Units Separated
N - Other Non collision
D - Off Road
R - Downhill Runaway
F - Explosion or Fire
? - Unknown

template 06-27-06

U - TURN
BACKING
OVERTURN
Parked Vehicle
P Pedestrian

#32455
Due 7/19

William Macleod

From: Bohmer, Buck <BUBohmer@howardcountymd.gov>
Sent: Tuesday, June 27, 2017 10:33 AM
To: William Macleod
Cc: John Concannon; Robert Booker; Mark Crampton (SHA); Jagarapu, Krishnakanth; Bowman, Diane J.
Subject: FW: Crash Data Request - MD 108

Bill:

Would you please provide crash data as requested.

Thank you.

Buck Bohmer, BCE, Project Manager

Traffic Engineering Div
Howard County Public Works, Bureau of Highways
9250 Bendix Rd
Columbia, MD 21045

New E-Mail bubohmer@howardcountymd.gov

410-313-2430 (Office)
410-313-5748 (Desk)
410-313-5750 (FAX)

Report a Problem: TellHoCo

From: Carl Wilson [mailto:cwilson@trafficgroup.com]
Sent: Tuesday, June 27, 2017 9:36 AM
To: Jagarapu, Krishnakanth <kjagarapu@howardcountymd.gov>; Bohmer, Buck <BUBohmer@howardcountymd.gov>
Subject: Crash Data Request - MD 108

Kris/Buck-

We are in the process of preparing a Traffic Impact Study within the MD 108 for the following intersections:

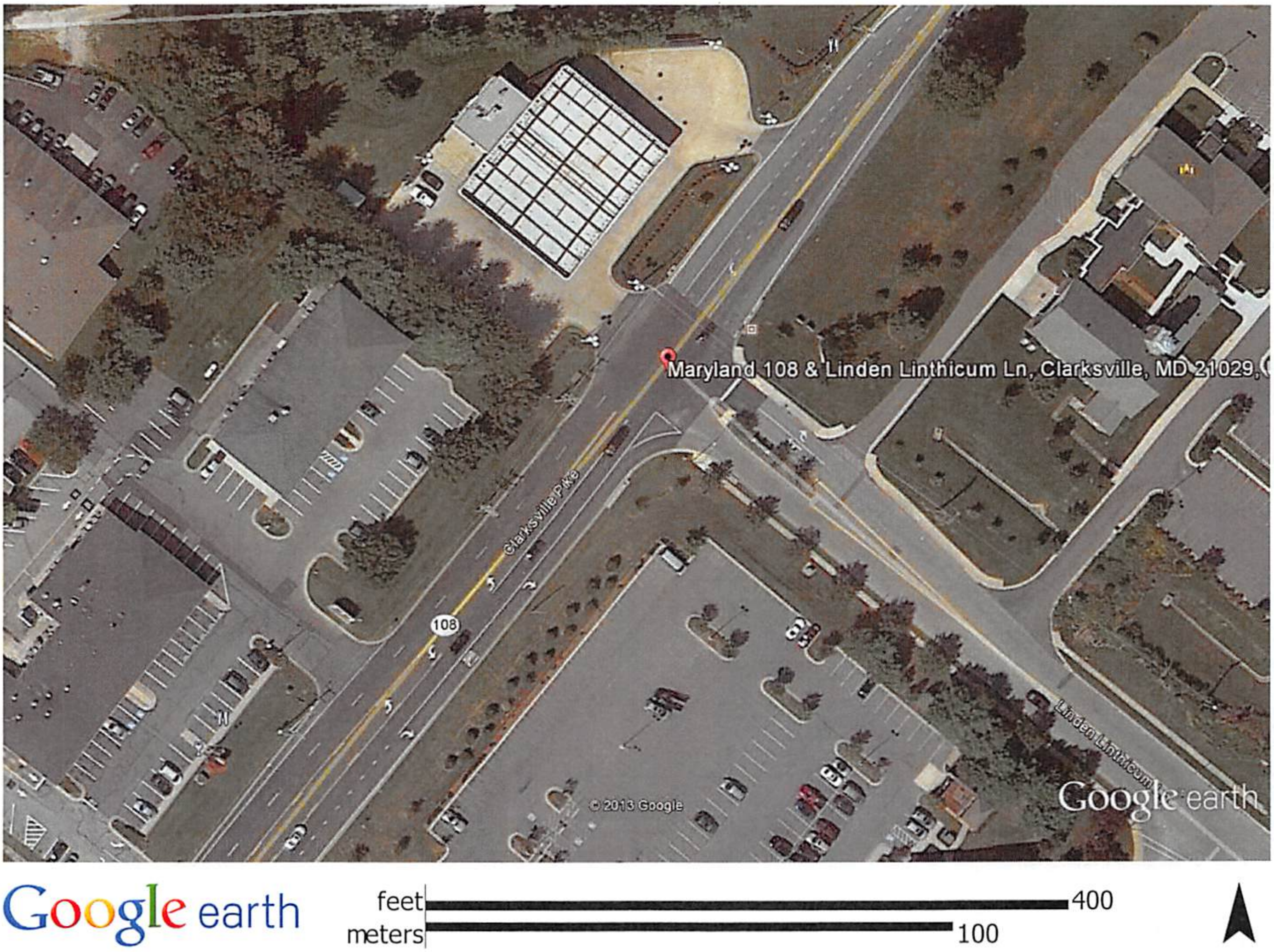
2/25/16
29414

MD 108 at Sheppard Lane
* MD 108 at Linden Linthicum Lane Co2567
MD 108 at Great Star Drive
MD 108 at Auto Drive
MD 108 at MD 32 Ramps
MD 108 at Ten Oaks Drive

4.22E @ 0,000/s

Thank you for your assistance.

RLB
to: G. Miller


Maryland 108 & Linden Linthicum Ln, Clarksville, MD 21029,
Clarksville Pike
108
Linden Linthicum
© 2013 Google
Google earth
Google earth
feet
400
meters
100

Maryland State Highway Administration
Office of Traffic and Safety - Traffic Development and Support Division
SHA 52.1 ADC Study Worksheet Output rev. 04/2016-1

Name: Robert Booker
Date: 06/28/2017

Location: MD 108 @ LINDEN LINTHICUM LN
County: Howard, D7
Period: January 01, 2013 To December 31, 2016
Logmiles: 4.22 At 0 Radius: 150 ft.
Note: Year 2016 data may be incomplete and unedited

YEAR >>	**2013**	**2014**	**2015**	**2016**	**Total**
Fatal	0	0	0	0	0
No. Killed	0	0	0	0	0
Injury	2	0	0	0	2
No. Injured	2	0	0	0	2
Prop. Damage	0	0	0	2	2
Total Crashes	2	0	0	2	4
Severity Index	6	0	0	2	Avg 2
Opposite Dir.	0	0	0	0	0
Rear End	0	0	0	1	1
Sideswipe	0	0	0	0	0
Left Turn	1	0	0	0	1
Angle	0	0	0	1	1
Pedestrian	0	0	0	0	0
Parked Veh.	0	0	0	0	0
Fixed Object	1	0	0	0	1
Other	0	0	0	0	0
U-Turn	0	0	0	0	0
Backing	0	0	0	0	0
Animal	0	0	0	0	0
Railroad	0	0	0	0	0
Fire / Expl.	0	0	0	0	0
Overturn	0	0	0	0	0
Truck Related	0	0	0	0	0
Night Time	0	0	0	0	0
Wet Surface	0	0	0	1	1
Alcohol	0	0	0	0	0
Intersection	2	0	0	2	4
Total Vehicles	3	0	0	5	8
Total Trucks	0	0	0	0	0
Truck %	0.0	0.0	0.0	0.0	0.0

Comments:

Maryland State Highway Administration
Office of Traffic and Safety - Traffic Development and Support Division
SHA 52.1 ADC Summary Output rev. 04/2016-1

Name: Robert Booker
Date: 06/28/2017

Location: MD 108 @ LINDEN LINTHICUM LN
County: Howard, D7
Period: January 1, 2013 To December 31, 2016
Logmiles: 4.22 At 0 Radius: 150 ft.
Note: Year 2016 data may be incomplete and unedited

SEVERITY	FATAL	INJURY	P-DAMAGE	TOTAL
Accidents		2	2	4
Veh Occ		2		
Pedestrian				

AVG Severity Index: 2

DAY OF THE WEEK

SUN	MON	TUE	WED	THU	FRI	SAT	UNK
2		1			1		

MONTH OF THE YEAR

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	UNK
	2				1		1					

CONDITION	DRIVER	PED
Normal:	7	
Alcohol:		
Other:	1	

TIME	12	01	02	03	04	05	06	07	08	09	10	11	UNK
AM:									1	1			
PM:				1		1							

VEHICLES INVOLVED PER ACCIDENT

1	2	3	4	5	6+	UNK	TOTAL
1	2	1					8

VEHICLE TYPE

1	Motorcycle/Moped		Tractor Trailer
5	Passenger Vehicle		Passenger Bus
	Sport Utility Veh	1	School Bus
	Pick-Up Truck		Emergency Veh
	Trucks (2+3 axles)	1	Other Types

SURFACE

1	Wet
3	Dry
	Sno/Ice
	Mud
	Other

MOVEMENTS

NORTH			SOUTH			EAST			WEST		
LF	ST	RT	LF	ST	RT	LF	ST	RT	LF	ST	RT
	1					2	1	1		2	

OTHER MOVEMENTS 1

PROBABLE CAUSES

	Influence of Drugs		Improper Lane Change
	Influence of Alcohol		Improper Backing
	Influence of Medication		Improper Passing
	Influence of Combined Subst.		Improper Signal
	Physical/Mental Difficulty		Improper Parking
	Fell Asleep/Fainted, etc.		Passenger Interfere/Obstruct.
1	Fail to give full Attention		Illegally in Roadway
	Lic. Restr. Non-compliance		Bicycle Violation
	Fail to Drive in Single Lane		Clothing Not Visible
	Improper Right Turn on Red		Sleet, Hail, Freezing Rain
1	Fail to Yield Right-of-way		Severe Crosswinds
	Fail to Obey Stop Sign		Rain, Snow
	Fail to Obey Traffic Signal		Animal
	Fail to Obey Other Control		Vision Obstruction
	Fail to Keep Right of Center		Vehicle Defect
	Fail to Stop for School Bus		Wet
	Wrong Way on One Way		Icy or Snow Covered
	Exceeded Speed Limit		Debris or Obstruction
	Operator Using Cell Phone		Ruts, Holes or Bumps
	Stopping in Lane Roadway		Road Under Construction
	Too Fast for Conditions		Traffic Control Device Inop.
1	Followed too Closely		Shoulders Low, Soft or High
	Improper Turn	1	Other or Unknown

COLLISION TYPES		FATAL	INJURY	PROP	TOTAL
Opposite Dir	Related:				
	UnRelated:				
Rear End	Related:			1	1
	UnRelated:				
Sideswipe	Related:				
	UnRelated:				
Left Turn	Related:		1		1
	UnRelated:				
Angle	Related:			1	1
	UnRelated:				
Pedestrian	Related:				
	UnRelated:				
Parked Vehicle	Related:				
	UnRelated:				
Other Collision	Related:				
	UnRelated:				

FIXED OBJECTS		FATAL	INJURY	PROP	TOTAL
Bridge	01				
Building	02				
Culvert/Ditch	03				
Curb	04		1		1
Guardrail/Barrier	05				
Embankment	06				
Fence	07				
Light Pole	08				
Sign Pole	09				
Other Pole	10				
Tree/Shrubbery	11				
Contr. Barrier	12				
Crash Attenuator	13				
Other Fixed Object				11	

WEATHER

3	Clear / Cloudy
	Foggy
	Raining
	Snow / Sleet
1	Other

ILLUMINATION

4	Day
	Dawn/Dusk
	Dark - Lights On
	Dark - No Lights
	Other

TOTALS

13-16	4

Maryland State Highway Administration
Office of Traffic and Safety - Traffic Development and Support Division
SHA 52.1 ADC History Output rev. 05/2016-1 - Combined Year Listing

Name: Robert Booker
Date: 06/28/2017

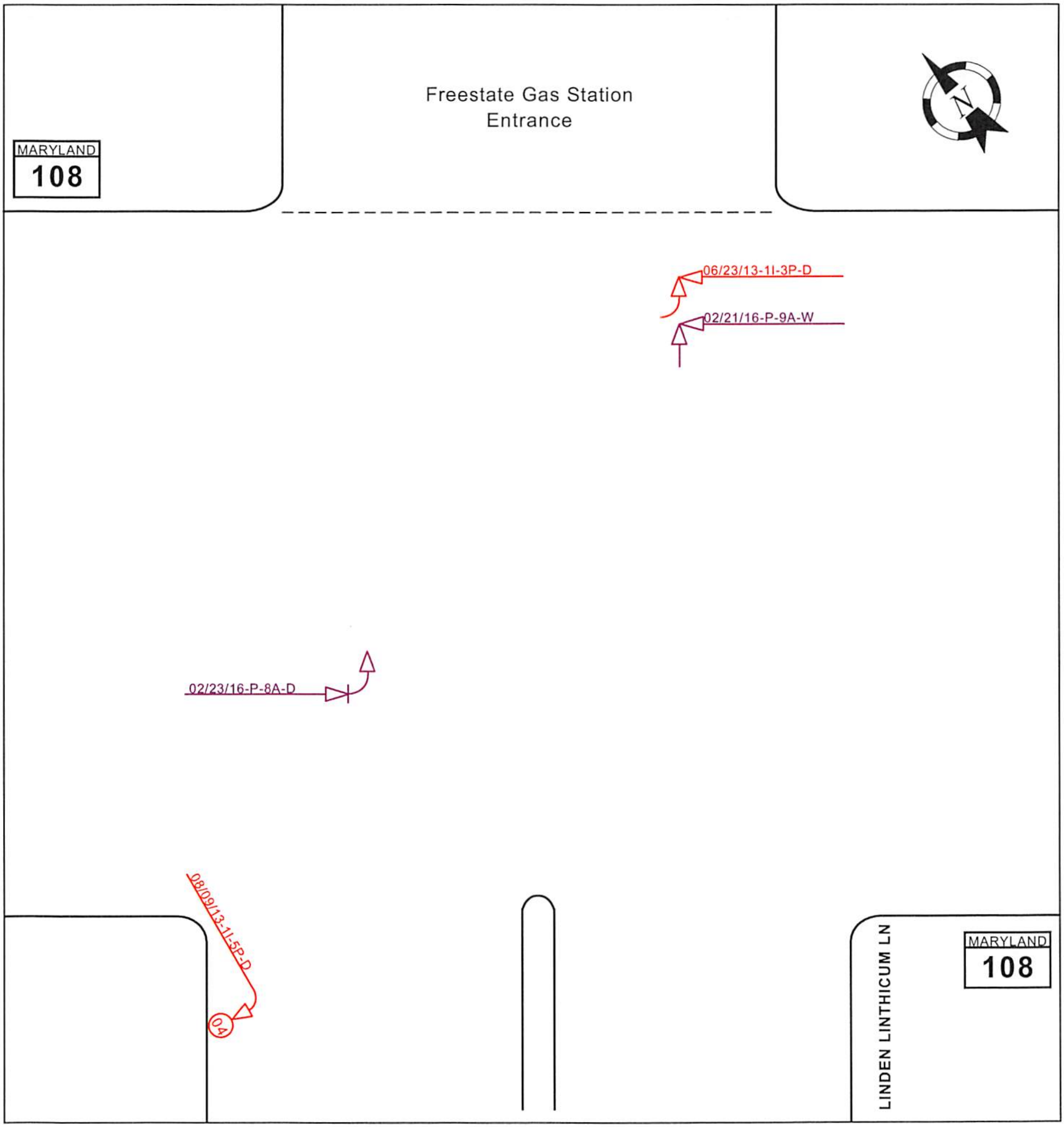
Location: MD 108 @ LINDEN LINTHICUM LN
County: Howard, D7
Period: January 01, 2013 To December 31, 2016
Logmiles: 4.22 At 0 Radius: 150 ft.
Note: Year 2016 data may be incomplete and unedited

MilePt	Int Rel	Date	Severity	Time	Light	Surface	Alc Rel	FixObj	Collision	Movement V1	Movement V2	Probable Cause
MD0108												
4.220	✓	06232013	1 Injured	03P	Day	Dry			LFTRN	EL	WS	Fail to yield right-of-way
MD108												
4.200	✓	02232016	Property	08A	Day	Dry			RREND	ES	EL	Followed too closely
4.220	✓	02212016	Property	09A	Day	Wet			ANGLE	NS	WS	Other or Unknown
CO2567												
0.000	✓	08092013	1 Injured	05P	Day	Dry		04	FXOBJ	ER	--	Fail to give full attention

Fixed Object: 01 = Bridge 02 = Building 03 = Culvert/Ditch 04 = Curb 05 = Guardrail/Barrier 06 = Embankment 07 = Fence
08 = Light Pole 09 = Sign Post 10 = Other Pole 11 = Tree/Shrubbery 12 = Construction Barrier 13 = Crash Attenuator

Office of Traffic & Safety
Traffic Development & Support Division
Crash Analysis Safety Team

Location: MD 108 @ Linden Linthicum Ln
County: HOWARD
Study Period: 01/01/2013 to Approx. 12/31/2016
Analyst: Robert L. Booker, Jr. **Date:** 06/28/2017



DATE-SEVERITY-TIME-SURFECE
NIGHT
ALCOHOL
DRUGS

SEVERITY
F - Fatalities
I - Injured
P - Property Damage Only
SURFACE
D - Dry Surface
W - Wet Surface
I - Icy Surface
S - Snowy Surface

00 - Not Applicable
01 - Bridge or Overpass
02 - Building
03 - Culvert or Ditch
04 - Curb
05 - Guardrail or Barrier
06 - Embankment
07 – Fence

08 - Light Support Pole
09 - Sign Support Pole
10 - Other Pole
11 - Tree Shrubbery
12 - Construction Barrier
13 - Crash Attenuator
88 - Other
99 - Unknown

B - Bicycle
P - Other Pedalcycle
C - Other Conveyance
T - Railway Train
A - Animal
O - Other Object
S - Spilled Cargo
J - Jackknife

U - Units Separated
N - Other Non collision
D - Off Road
R - Downhill Runaway
F - Explosion or Fire
? - Unknown

template 06-27-06

U - TURN
BACKING
OVERTURN
Parked Vehicle
P Pedestrian

#32456

Due 7/19

William Macleod

From: Bohmer, Buck <BUBohmer@howardcountymd.gov>
Sent: Tuesday, June 27, 2017 10:33 AM
To: William Macleod
Cc: John Concannon; Robert Booker; Mark Crampton (SHA); Jagarapu, Krishnakanth; Bowman, Diane J.
Subject: FW: Crash Data Request - MD 108

Bill:

Would you please provide crash data as requested.

Thank you.

Buck Bohmer, BCE, Project Manager

Traffic Engineering Div
Howard County Public Works, Bureau of Highways
9250 Bendix Rd
Columbia, MD 21045

New E-Mail bubohmer@howardcountymd.gov

410-313-2430 (Office)
410-313-5748 (Desk)
410-313-5750 (FAX)

Report a Problem: TellHoCo

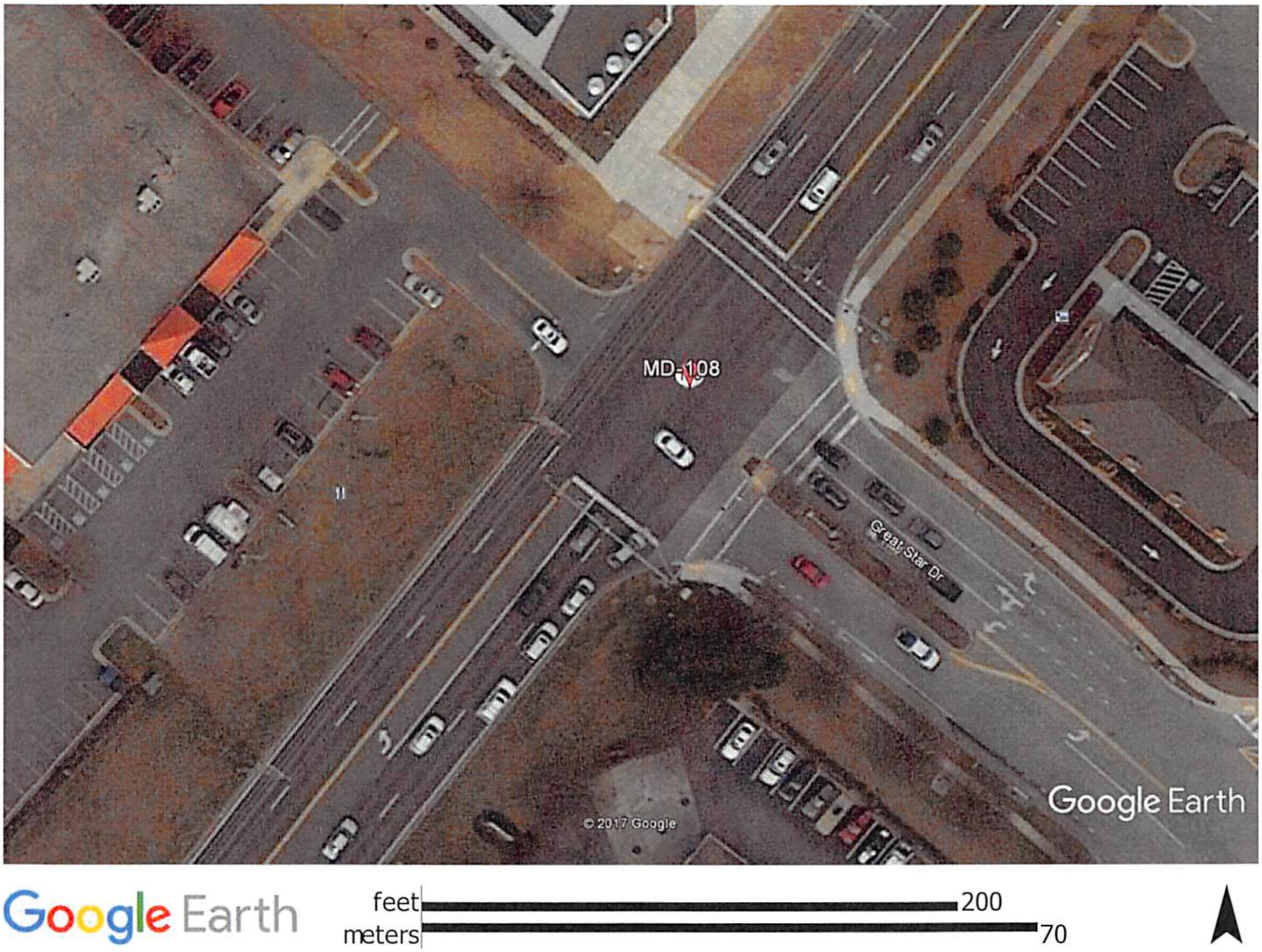
From: Carl Wilson [mailto:cwilson@trafficgroup.com]
Sent: Tuesday, June 27, 2017 9:36 AM
To: Jagarapu, Krishnakanth <kjagarapu@howardcountymd.gov>; Bohmer, Buck <BUBohmer@howardcountymd.gov>
Subject: Crash Data Request - MD 108

Kris/Buck-

We are in the process of preparing a Traffic Impact Study within the MD 108 corridor. Can you please provide crash data for the following intersections:

MD 108 at Sheppard Lane
MD 108 at Linden Linthicum Lane
A MD 108 at Great Star Drive Co2892 3.98/E @ 0,00/S
MD 108 at Auto Drive
MD 108 at MD 32 Ramps
MD 108 at Ten Oaks Drive

Thank you for your assistance.


MD-108
Great Star Dr
© 2017 Google
Google Earth
Google Earth
feet
200
meters
70

Maryland State Highway Administration

Office of Traffic and Safety - Traffic Development and Support Division

SHA 52.1 ADC Study Worksheet Output rev. 04/2016-1

Name: Robert Booker

Date: 06/28/2017

Location: MD 108 @ GREAT STAR DR

County: Howard, D7

Period: January 01, 2013 To December 31, 2016

Logmiles: 3.98 At 0 Radius: 150 ft.

Note: Year 2016 data may be incomplete and unedited

YEAR >>	**2013**	**2014**	**2015**	**2016**	**Total**
Fatal	0	0	0	0	0
No. Killed	0	0	0	0	0
Injury	0	3	0	0	3
No. Injured	0	6	0	0	6
Prop. Damage	2	2	2	5	11
Total Crashes	2	5	2	5	14
Severity Index	2	12	2	5	Avg 5
Opposite Dir.	0	0	0	0	0
Rear End	0	2	1	1	4
Sideswipe	0	0	0	0	0
Left Turn	2	3	1	3	9
Angle	0	0	0	0	0
Pedestrian	0	0	0	0	0
Parked Veh.	0	0	0	0	0
Fixed Object	0	0	0	1	1
Other	0	0	0	0	0
U-Turn	0	0	0	0	0
Backing	0	0	0	0	0
Animal	0	0	0	0	0
Railroad	0	0	0	0	0
Fire / Expl.	0	0	0	0	0
Overturn	0	0	0	0	0
Truck Related	0	0	1	0	1
Night Time	2	1	0	1	4
Wet Surface	1	1	0	2	4
Alcohol	0	0	0	0	0
Intersection	2	5	2	5	14
Total Vehicles	4	13	4	10	31
Total Trucks	0	0	1	0	1
Truck %	0.0	0.0	25.0	0.0	3.2

Comments:

Maryland State Highway Administration
Office of Traffic and Safety - Traffic Development and Support Division
SHA 52.1 ADC Summary Output rev. 04/2016-1

Name: Robert Booker
Date: 06/28/2017

Location: MD 108 @ GREAT STAR DR
County: Howard, D7
Period: January 1, 2013 To December 31, 2016
Logmiles: 3.98 At 0 Radius: 150 ft.
Note: Year 2016 data may be incomplete and unedited

SEVERITY	FATAL	INJURY	P-DAMAGE	TOTAL
Accidents		3	11	14
Veh Occ		6		
Pedestrian				

AVG Severity Index: 5

DAY OF THE WEEK

SUN	MON	TUE	WED	THU	FRI	SAT	UNK
1		2	6	2		3	

MONTH OF THE YEAR

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	UNK
1		2	1	3		1	2	2	1		1	

CONDITION	DRIVER	PED
Normal:	26	
Alcohol:		
Other:	5	

TIME	12	01	02	03	04	05	06	07	08	09	10	11	UNK
AM:								2		1			
PM:	2		1	1	1	1	1	1	1		2		

VEHICLES INVOLVED PER ACCIDENT

1	2	3	4	5	6+	UNK	TOTAL
1	11	1		1			31

VEHICLE TYPE

	Motorcycle/Moped		Tractor Trailer
18	Passenger Vehicle		Passenger Bus
5	Sport Utility Veh		School Bus
2	Pick-Up Truck		Emergency Veh
1	Trucks (2+3 axles)	6	Other Types

SURFACE

4	Wet
10	Dry
	Sno/Ice
	Mud
	Other

MOVEMENTS

NORTH			SOUTH			EAST			WEST		
LF	ST	RT	LF	ST	RT	LF	ST	RT	LF	ST	RT
	3	1					11	1	9	2	

OTHER MOVEMENTS 4

PROBABLE CAUSES

	Influence of Drugs		Improper Lane Change
	Influence of Alcohol		Improper Backing
	Influence of Medication		Improper Passing
	Influence of Combined Subst.		Improper Signal
	Physical/Mental Difficulty		Improper Parking
	Fell Asleep/Fainted, etc.		Passenger Interfere/Obstruct.
2	Fail to give full Attention		Illegally in Roadway
	Lic. Restr. Non-compliance		Bicycle Violation
	Fail to Drive in Single Lane		Clothing Not Visible
	Improper Right Turn on Red		Sleet, Hail, Freezing Rain
3	Fail to Yield Right-of-way		Severe Crosswinds
	Fail to Obey Stop Sign		Rain, Snow
	Fail to Obey Traffic Signal		Animal
	Fail to Obey Other Control		Vision Obstruction
	Fail to Keep Right of Center		Vehicle Defect
	Fail to Stop for School Bus		Wet
	Wrong Way on One Way		Icy or Snow Covered
	Exceeded Speed Limit		Debris or Obstruction
	Operator Using Cell Phone		Ruts, Holes or Bumps
	Stopping in Lane Roadway		Road Under Construction
1	Too Fast for Conditions		Traffic Control Device Inop.
1	Followed too Closely		Shoulders Low, Soft or High
1	Improper Turn	6	Other or Unknown

WEATHER

11	Clear / Cloudy
	Foggy
2	Raining
	Snow / Sleet
1	Other

ILLUMINATION

10	Day
	Dawn/Dusk
4	Dark - Lights On
	Dark - No Lights
	Other

TOTALS

13-16	14

COLLISION TYPES		FATAL	INJURY	PROP	TOTAL
Opposite Dir	Related:				
	UnRelated:				
Rear End	Related:		2	2	4
	UnRelated:				
Sideswipe	Related:				
	UnRelated:				
Left Turn	Related:		1	8	9
	UnRelated:				
Angle	Related:				
	UnRelated:				
Pedestrian	Related:				
	UnRelated:				
Parked Vehicle	Related:				
	UnRelated:				
Other Collision	Related:				
	UnRelated:				

F	Bridge	01			
I	Building	02			
X	Culvert/Ditch	03			
E	Curb	04			
D	Guardrail/Barrier	05			
	Embankment	06			
O	Fence	07			
B	Light Pole	08			
J	Sign Pole	09			
E	Other Pole	10			
C	Tree/Shrubbery	11			
T	Contr. Barrier	12			
S	Crash Attenuator	13			
	Other Fixed Object	17		1	1

Maryland State Highway Administration
Office of Traffic and Safety - Traffic Development and Support Division
SHA 52.1 ADC History Output rev. 05/2016-1 - Combined Year Listing

Name: Robert Booker
Date: 06/28/2017

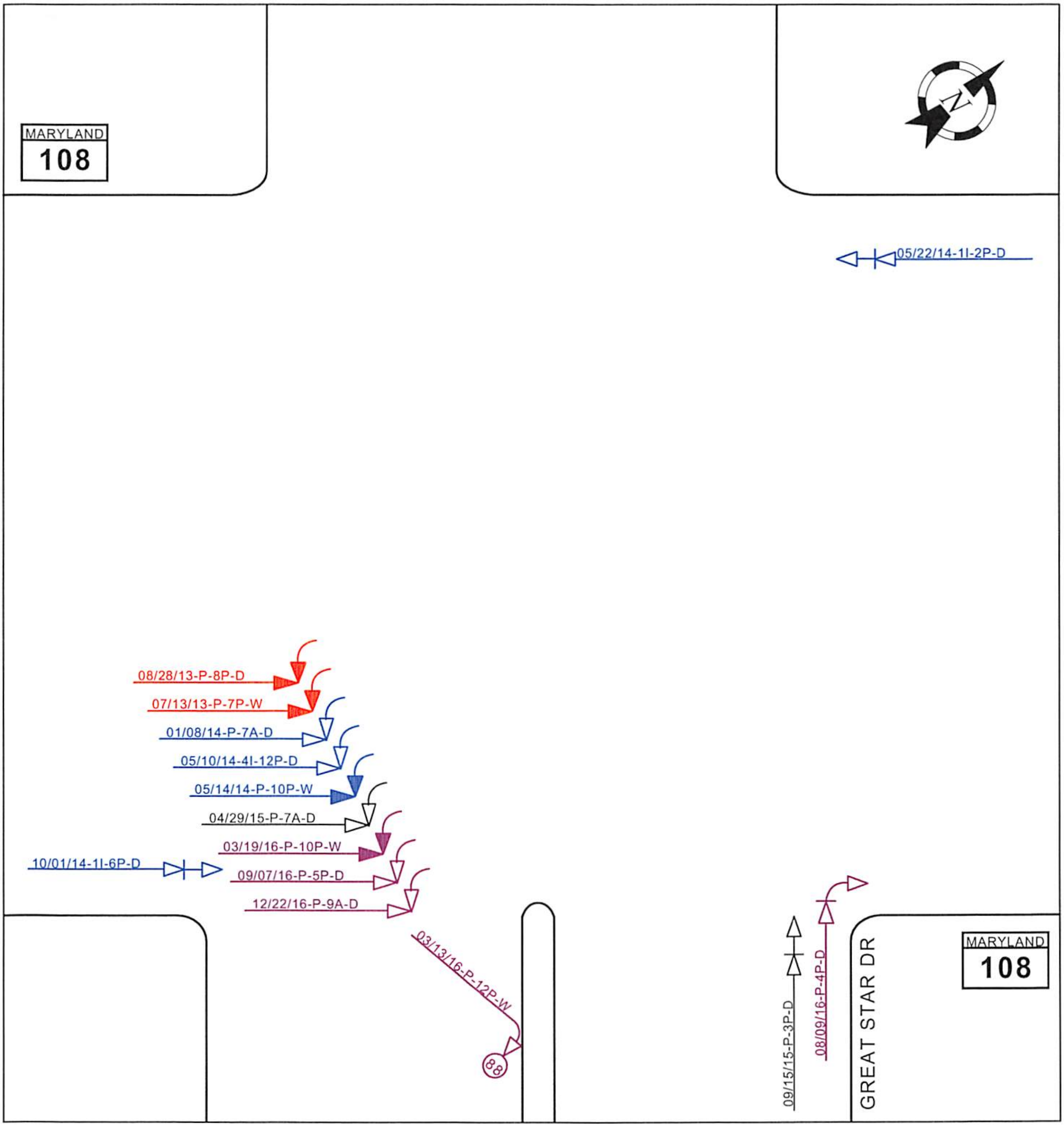
Location: MD 108 @ GREAT STAR DR
County: Howard, D7
Period: January 01, 2013 To December 31, 2016
Logmiles: 3.98 At 0 Radius: 150 ft.
Note: Year 2016 data may be incomplete and unedited

MilePt	Int Rel	Date	Severity	Time	Light	Surface	Alc Rel	FixObj	Collision	Movement V1	Movement V2	Probable Cause
MD108												
3.980	✓	07132013	Property	07P	Night	Wet			LFTRN	ES	WL	Other or Unknown
3.980	✓	08282013	Property	08P	Night	Dry			LFTRN	WL	ES	Improper turn
3.980	✓	01082014	Property	07A	Day	Dry			LFTRN	WL	ES	Fail to yield right-of-way
3.980	✓	05102014	4 Injured	12P	Day	Dry			LFTRN	WL	ES	Fail to yield right-of-way
3.980	✓	05142014	Property	10P	Night	Wet			LFTRN	ES	WL	Other or Unknown
3.980	✓	05222014	1 Injured	02P	Day	Dry			RREND	WS	WS	Other or Unknown
3.980	✓	10012014	1 Injured	06P	Day	Dry			RREND	ES	ES	Followed too closely
3.980	✓	04292015	Property	07A	Day	Dry			LFTRN	WL	ES	Other or Unknown
3.980	✓	03192016	Property	10P	Night	Wet			LFTRN	WL	ES	Other or Unknown
3.980	✓	09072016	Property	05P	Day	Dry			LFTRN	WL	ES	Fail to give full attention
3.980	✓	12222016	Property	09A	Day	Dry			LFTRN	WL	ES	Fail to yield right-of-way
CO2892												
0.000	✓	09152015	Property	03P	Day	Dry			RREND	NS	NS	Other or Unknown
0.000	✓	03132016	Property	12P	Day	Wet		88	FXOBJ	ER	--	Too fast for conditions
0.000	✓	08092016	Property	04P	Day	Dry			RREND	NS	NR	Fail to give full attention

Fixed Object: 01 = Bridge 02 = Building 03 = Culvert/Ditch 04 = Curb 05 = Guardrail/Barrier 06 = Embankment 07 = Fence
08 = Light Pole 09 = Sign Post 10 = Other Pole 11 = Tree/Shrubbery 12 = Construction Barrier 13 = Crash Attenuator

Office of Traffic & Safety
Traffic Development & Support Division
Crash Analysis Safety Team

Location: MD 108 @ Great Star Dr
County: HOWARD
Study Period: 01/01/2013 to Approx. 12/31/2016
Analyst: Robert L. Booker, Jr. **Date:** 06/28/2017



DATE-SEVERITY-TIME-SURFCE
NIGHT
ALCOHOL
DRUGS

SEVERITY
F - Fatalities
I - Injured
P - Property Damage Only

SURFACE
D - Dry Surface
W - Wet Surface
I - Icy Surface
S - Snowy Surface

00 - Not Applicable
01 - Bridge or Overpass
02 - Building
03 - Culvert or Ditch
04 - Curb
05 - Guardrail or Barrier
06 - Embankment
07 – Fence
08 - Light Support Pole
09 - Sign Support Pole
10 - Other Pole
11 - Tree Shrubbery
12 - Construction Barrier
13 - Crash Attenuator
88 - Other
99 - Unknown

B - Bicycle
P - Other Pedalcycle
C - Other Conveyance
T - Railway Train
A - Animal
O - Other Object
S - Spilled Cargo
J - Jackknife

U - Units Separated
N - Other Non collision
D - Off Road
R - Downhill Runaway
F - Explosion or Fire
? - Unknown

template 06-27-06

U - TURN
BACKING
OVERTURN
Parked Vehicle
P Pedestrian

#32457

Due 7/19

William Macleod

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Bill:

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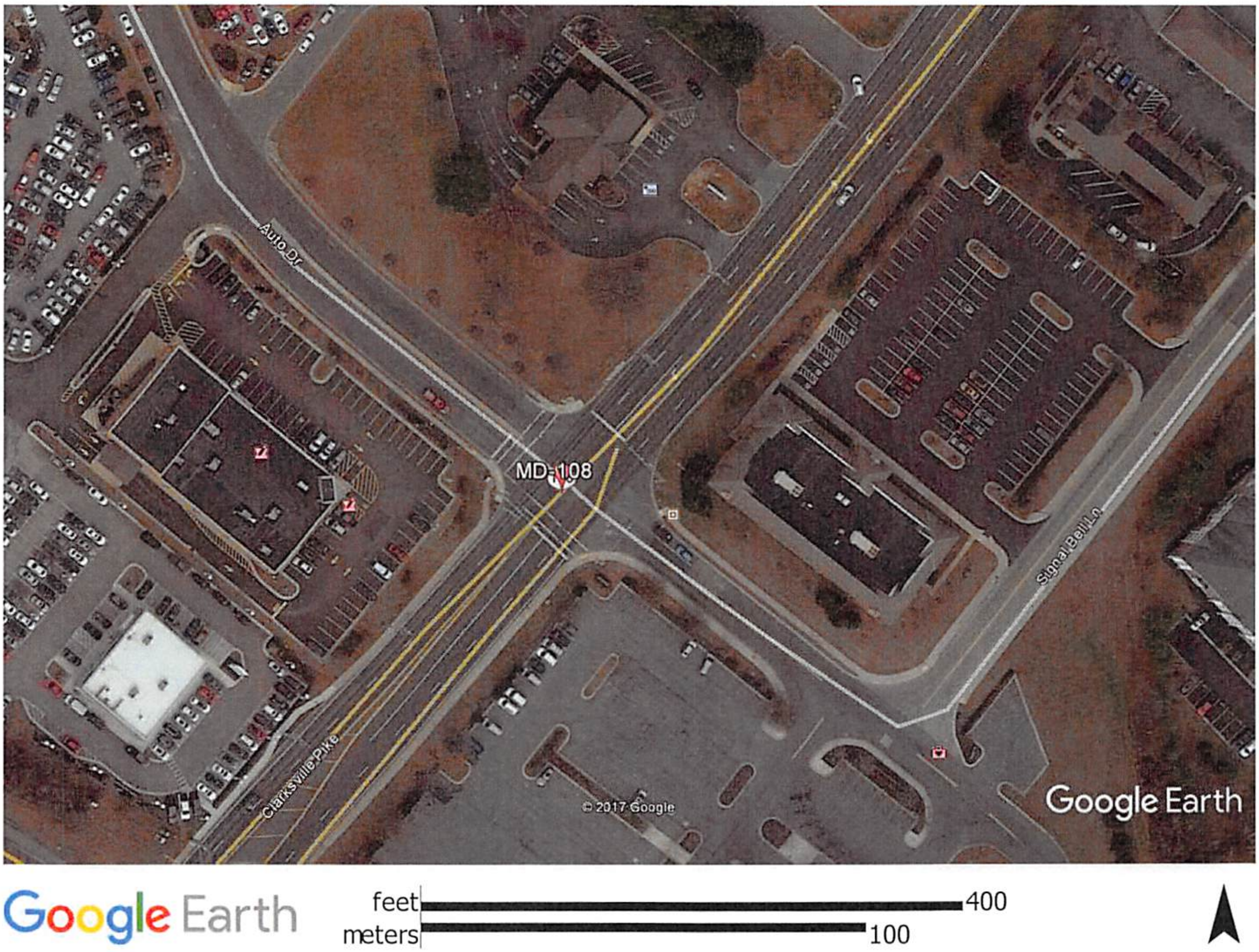
MD 108 at Sheppard Lane
MD 108 at Linden Linthicum Lane
MD 108 at Great Star Drive
#-MD 108 at Auto Drive Co 2744 3.85/E @ 0.00/N & 0.00/S
MD 108 at MD 32 Ramps Co 3046
MD 108 at Ten Oaks Drive Signal Bell Ln

Thank you for your assistance.


Auto Dr
MD-108
Clarksville Pike
Signal Bell Ln
© 2017 Google
Google Earth
Google Earth
feet
400
meters
100

Maryland State Highway Administration
Office of Traffic and Safety - Traffic Development and Support Division
SHA 52.1 ADC Study Worksheet Output rev. 04/2016-1

Name: Robert Booker
Date: 06/28/2017

Location: MD 108 @ AUTO DR & SIGNAL BELL LN
County: Howard, D7
Period: January 01, 2013 To December 31, 2016
Logmiles: 3.85 At 0 Radius: 150 ft.
Note: Year 2016 data may be incomplete and unedited

YEAR >>	**2013**	**2014**	**2015**	**2016**	**Total**
Fatal	0	0	0	0	0
No. Killed	0	0	0	0	0
Injury	2	2	0	0	4
No. Injured	4	2	0	0	6
Prop. Damage	0	0	0	1	1
Total Crashes	2	2	0	1	5
Severity Index	9	6	0	1	Avg 4
Opposite Dir.	0	0	0	0	0
Rear End	1	1	0	0	2
Sideswipe	0	0	0	0	0
Left Turn	1	1	0	0	2
Angle	0	0	0	1	1
Pedestrian	0	0	0	0	0
Parked Veh.	0	0	0	0	0
Fixed Object	0	0	0	0	0
Other	0	0	0	0	0
U-Turn	0	0	0	0	0
Backing	0	0	0	0	0
Animal	0	0	0	0	0
Railroad	0	0	0	0	0
Fire / Expl.	0	0	0	0	0
Overturn	0	0	0	0	0
Truck Related	0	0	0	0	0
Night Time	0	0	0	0	0
Wet Surface	1	0	0	0	1
Alcohol	0	0	0	0	0
Intersection	2	2	0	1	5
Total Vehicles	4	5	0	2	11
Total Trucks	0	0	0	0	0
Truck %	0.0	0.0	0.0	0.0	0.0

Comments:

Maryland State Highway Administration
Office of Traffic and Safety - Traffic Development and Support Division
SHA 52.1 ADC Summary Output rev. 04/2016-1

Name: Robert Booker
Date: 06/28/2017

Location: MD 108 @ AUTO DR & SIGNAL BELL LN
County: Howard, D7
Period: January 1, 2013 To December 31, 2016
Logmiles: 3.85 At 0 Radius: 150 ft.
Note: Year 2016 data may be incomplete and unedited

SEVERITY	FATAL	INJURY	P-DAMAGE	TOTAL
Accidents		4	1	5
Veh Occ		6		
Pedestrian				

AVG Severity Index: 4

DAY OF THE WEEK

SUN	MON	TUE	WED	THU	FRI	SAT	UNK
1		2		2			

MONTH OF THE YEAR

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	UNK
1							1		3			

CONDITION	DRIVER	PED
Normal:	9	
Alcohol:		
Other:	1	

TIME	12	01	02	03	04	05	06	07	08	09	10	11	UNK
AM:											1	1	
PM:					1		1	1					

VEHICLES INVOLVED PER ACCIDENT

1	2	3	4	5	6+	UNK	TOTAL
	4	1					11

VEHICLE TYPE			
	Motorcycle/Moped		Tractor Trailer
7	Passenger Vehicle		Passenger Bus
	Sport Utility Veh		School Bus
	Pick-Up Truck	1	Emergency Veh
	Trucks (2+3 axles)	3	Other Types

SURFACE	
1	Wet
4	Dry
	Sno/Ice
	Mud
	Other

MOVEMENTS

NORTH LF	NORTH ST	NORTH RT	SOUTH LF	SOUTH ST	SOUTH RT	EAST LF	EAST ST	EAST RT	WEST LF	WEST ST	WEST RT
1	2					1	2		1	3	

OTHER MOVEMENTS 1

PROBABLE CAUSES			
	Influence of Drugs		Improper Lane Change
	Influence of Alcohol		Improper Backing
	Influence of Medication		Improper Passing
	Influence of Combined Subst.		Improper Signal
	Physical/Mental Difficulty		Improper Parking
	Fell Asleep/Fainted, etc.		Passenger Interfere/Obstruct.
1	Fail to give full Attention		Illegally in Roadway
	Lic. Restr. Non-compliance		Bicycle Violation
	Fail to Drive in Single Lane		Clothing Not Visible
	Improper Right Turn on Red		Sleet, Hail, Freezing Rain
1	Fail to Yield Right-of-way		Severe Crosswinds
	Fail to Obey Stop Sign		Rain, Snow
	Fail to Obey Traffic Signal		Animal
	Fail to Obey Other Control		Vision Obstruction
	Fail to Keep Right of Center		Vehicle Defect
	Fail to Stop for School Bus		Wet
	Wrong Way on One Way		Icy or Snow Covered
	Exceeded Speed Limit		Debris or Obstruction
	Operator Using Cell Phone		Ruts, Holes or Bumps
	Stopping in Lane Roadway		Road Under Construction
1	Too Fast for Conditions		Traffic Control Device Inop.
1	Followed too Closely		Shoulders Low, Soft or High
	Improper Turn	1	Other or Unknown

WEATHER	
4	Clear / Cloudy
	Foggy
1	Raining
	Snow / Sleet
	Other

ILLUMINATION	
5	Day
	Dawn/Dusk
	Dark - Lights On
	Dark - No Lights
	Other

TOTALS	
13-16	5

COLLISION TYPES		FATAL	INJURY	PROP	TOTAL
Opposite Dir	Related:				
	UnRelated:				
Rear End	Related:		2		2
	UnRelated:				
Sideswipe	Related:				
	UnRelated:				
Left Turn	Related:		2		2
	UnRelated:				
Angle	Related:			1	1
	UnRelated:				
Pedestrian	Related:				
	UnRelated:				
Parked Vehicle	Related:				
	UnRelated:				
Other Collision	Related:				
	UnRelated:				

FIXED OBJECTS			
F	Bridge	01	
I	Building	02	
X	Culvert/Ditch	03	
E	Curb	04	
D	Guardrail/Barrier	05	
	Embankment	06	
O	Fence	07	
B	Light Pole	08	
J	Sign Pole	09	
E	Other Pole	10	
C	Tree/Shrubbery	11	
T	Contr. Barrier	12	
S	Crash Attenuator	13	
	Other Fixed Object		23

Maryland State Highway Administration
Office of Traffic and Safety - Traffic Development and Support Division
SHA 52.1 ADC History Output rev. 05/2016-1 - Combined Year Listing

Name: Robert Booker
Date: 06/28/2017

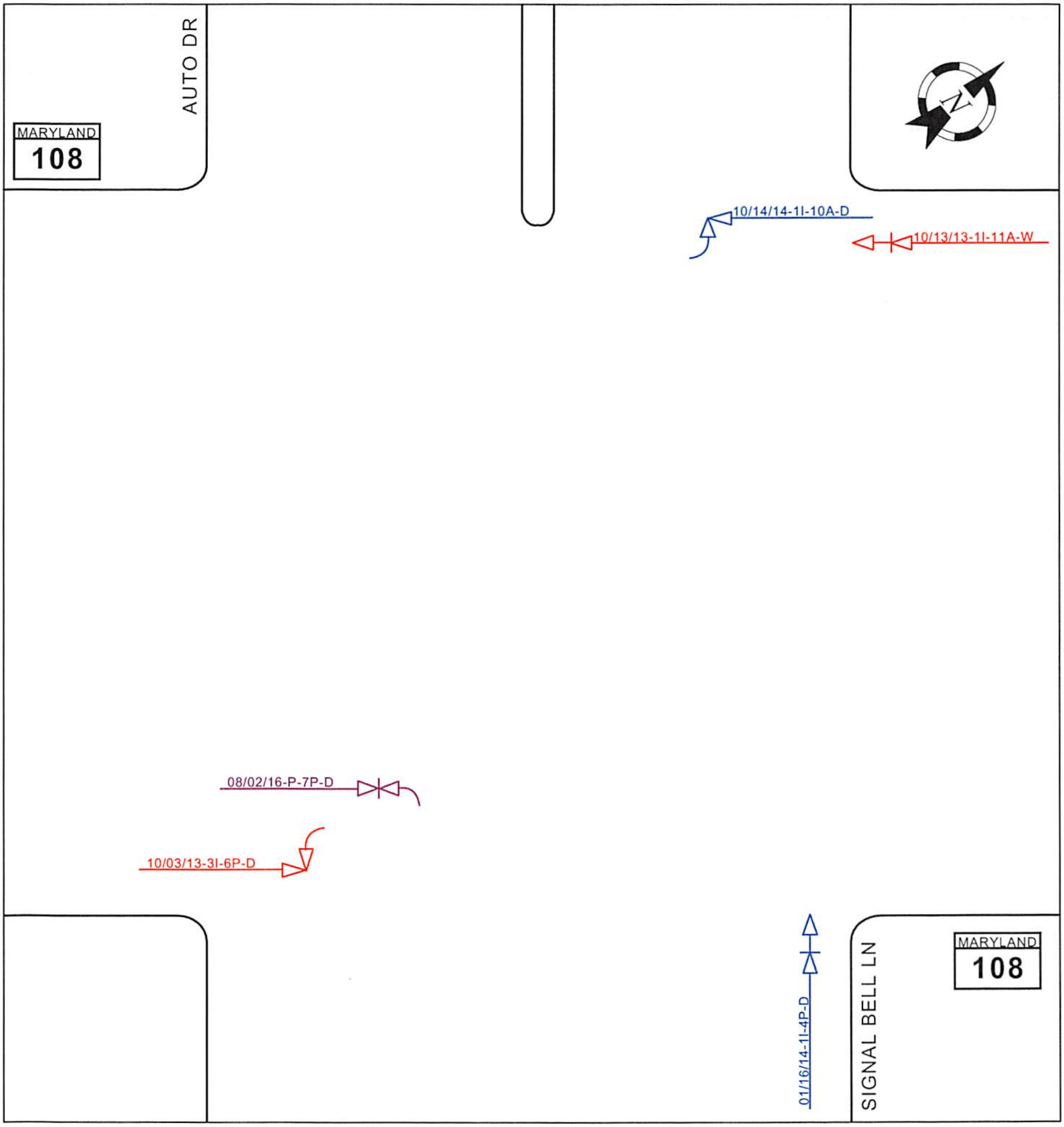
Location: MD 108 @ AUTO DR & SIGNAL BELL LN
County: Howard, D7
Period: January 01, 2013 To December 31, 2016
Logmiles: 3.85 At 0 Radius: 150 ft.
Note: Year 2016 data may be incomplete and unedited

										Movement		
MilePt	**Int Rel**	**Date**	**Severity**	**Time**	**Light**	**Surface**	**Alc Rel**	**FixObj**	**Collision**	**V1**	**V2**	**Probable Cause**
MD108												
3.850	✓	10032013	3 Injured	06P	Day	Dry			LFTRN	WL	ES	Fail to yield right-of-way
3.850	✓	10142014	1 Injured	10A	Day	Dry			LFTRN	EL	WS	Fail to give full attention
3.850	✓	08022016	Property	07P	Day	Dry			ANGLE	ES	NL	Other or Unknown
3.880	✓	10132013	1 Injured	11A	Day	Wet			RREND	WS	WS	Too fast for conditions
CO3046												
0.000	✓	01162014	1 Injured	04P	Day	Dry			RREND	NS	NS	Followed too closely

Fixed Object: 01 = Bridge 02 = Building 03 = Culvert/Ditch 04 = Curb 05 = Guardrail/Barrier 06 = Embankment 07 = Fence 08 = Light Pole 09 = Sign Post 10 = Other Pole 11 = Tree/Shrubbery 12 = Construction Barrier 13 = Crash Attenuator

Office of Traffic & Safety
Traffic Development & Support Division
Crash Analysis Safety Team

Location: MD 108 ~ Auto Dr & Signal Bell Ln
County: HOWARD
Study Period: 01/01/2013 to Approx. 12/31/2016
Analyst: Robert L. Booker, Jr. **Date:** 06/28/2017



◁ DATE-SEVERITY-TIME-SURFCE
◀ NIGHT
◁ ALCOHOL X
◁ DRUGS ⊗

SEVERITY
F - Fatalities
I - Injured
P - Property Damage Only
SURFACE
D - Dry Surface
W - Wet Surface
I - Icy Surface
S - Snowy Surface

00 - Not Applicable
01 - Bridge or Overpass
02 - Building
03 - Culvert or Ditch
04 - Curb
05 - Guardrail or Barrier
06 - Embankment
07 – Fence

08 - Light Support Pole
09 - Sign Support Pole
10 - Other Pole
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13 - Crash Attenuator
88 - Other
99 - Unknown

B - Bicycle
P - Other Pedalcycle
C - Other Conveyance
T - Railway Train
A - Animal
O - Other Object
S - Spilled Cargo
J - Jackknife

U - Units Separated
N - Other Non collision
D - Off Road
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F - Explosion or Fire
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template 06-27-06

U - TURN
BACKING
OVERTURN
▨ Parked Vehicle
P Pedestrian

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MD 108 at Great Star Drive
MD 108 at Auto Drive
X MD 108 at MD 32 Ramps 4/6 3.69
MD 108 at Ten Oaks Drive

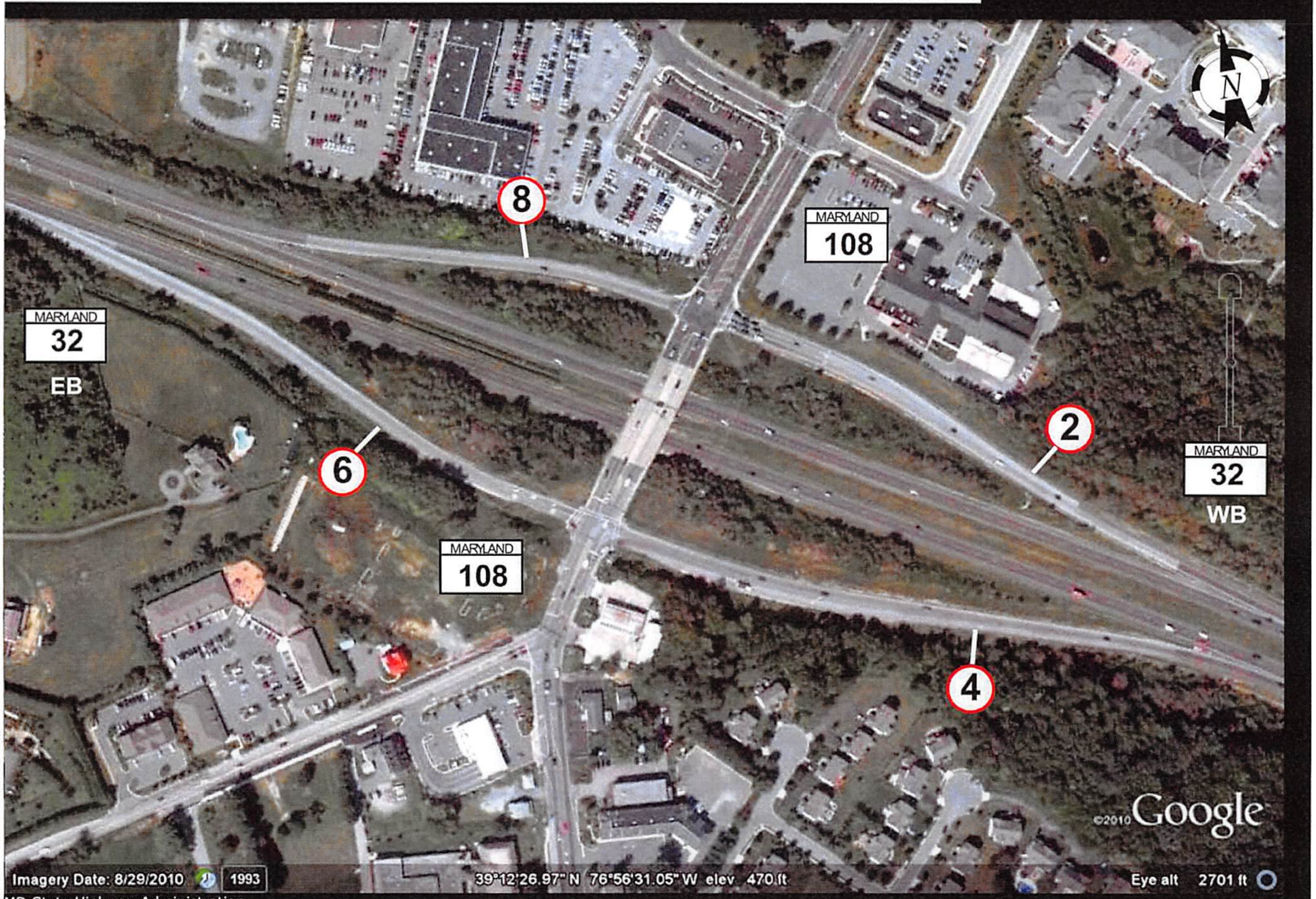
Thank you for your assistance.

Howard County

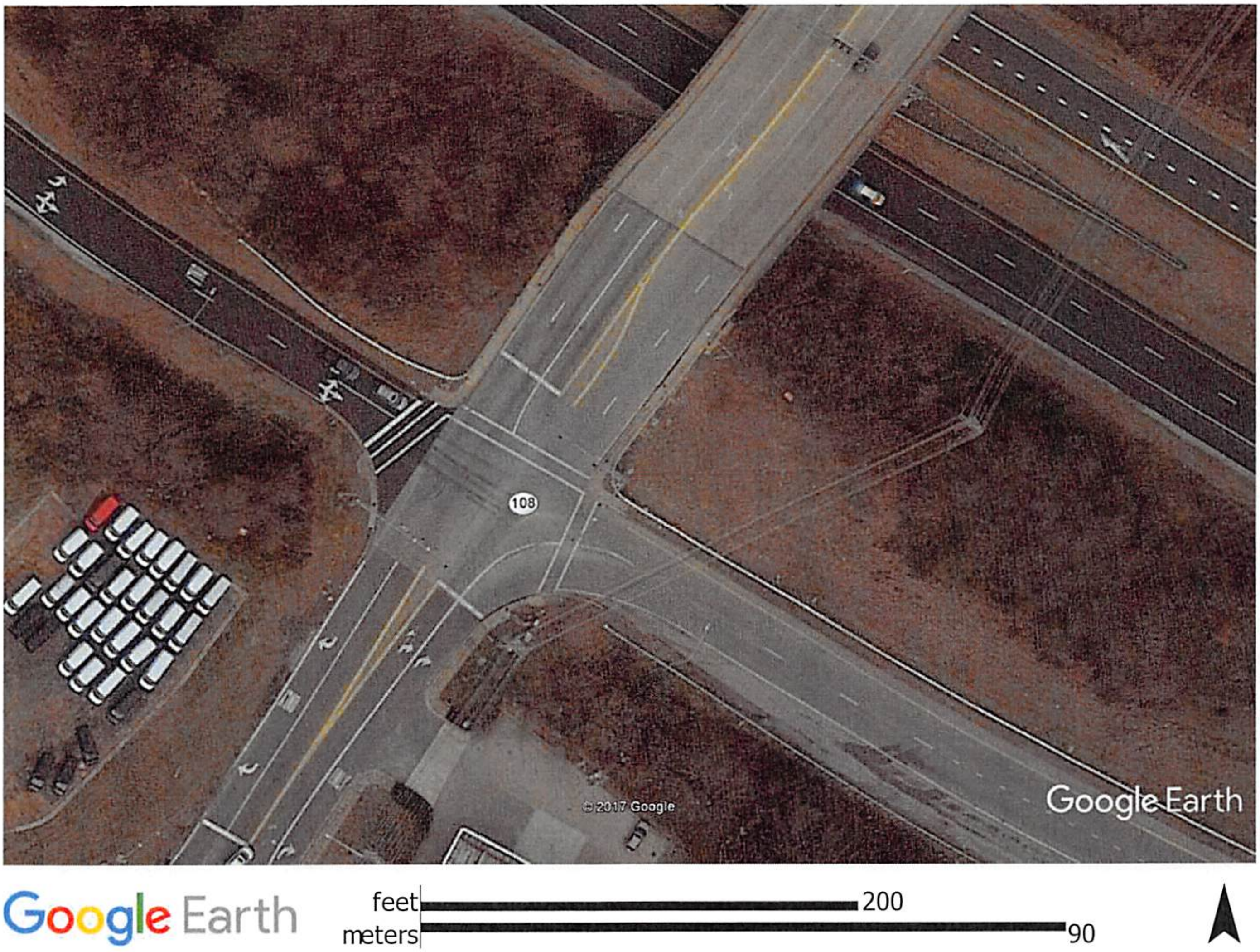
Photo: 2010

MD32 At:
MD108 Clarksville Pike

IC: 1319
Return to Index



MD State Highway Administration
Traffic Development Support Division


108
© 2017 Google
Google Earth
Google Earth
feet
200
meters
90

Maryland State Highway Administration
Office of Traffic and Safety - Traffic Development and Support Division
SHA 52.1 ADC Study Worksheet Output rev. 04/2016-1

Name: Robert Booker
Date: 06/29/2017

Location: IC #1319; MD 32 @ MD 108, Rps 4 & 6
County: Howard, D7
Period: January 01, 2013 To December 31, 2016
Logmiles: 3.69 At -1 Radius: 500 ft.
Note: Year 2016 data may be incomplete and unedited

YEAR >>	**2013**	**2014**	**2015**	**2016**	**Total**
Fatal	0	0	0	0	0
No. Killed	0	0	0	0	0
Injury	1	0	1	0	2
No. Injured	1	0	3	0	4
Prop. Damage	2	0	0	1	3
Total Crashes	3	0	1	1	5
Severity Index	4	0	4	1	Avg 2
Opposite Dir.	0	0	0	0	0
Rear End	0	0	0	0	0
Sideswipe	1	0	0	0	1
Left Turn	2	0	1	1	4
Angle	0	0	0	0	0
Pedestrian	0	0	0	0	0
Parked Veh.	0	0	0	0	0
Fixed Object	0	0	0	0	0
Other	0	0	0	0	0
U-Turn	0	0	0	0	0
Backing	0	0	0	0	0
Animal	0	0	0	0	0
Railroad	0	0	0	0	0
Fire / Expl.	0	0	0	0	0
Overturn	0	0	0	0	0
Truck Related	0	0	0	0	0
Night Time	1	0	0	0	1
Wet Surface	2	0	0	0	2
Alcohol	0	0	0	0	0
Intersection	3	0	1	1	5
Total Vehicles	6	0	2	2	10
Total Trucks	0	0	0	0	0
Truck %	0.0	0.0	0.0	0.0	0.0

Comments:

Maryland State Highway Administration
Office of Traffic and Safety - Traffic Development and Support Division
SHA 52.1 ADC Summary Output rev. 04/2016-1

Name: Robert Booker
Date: 06/29/2017

Location: IC #1319; MD 32 @ MD 108, Rps 4 & 6
Logmiles: 3.69 At -1 Radius: 500 ft.
County: Howard, D7
Period: January 1, 2013 To December 31, 2016
Note: Year 2016 data may be incomplete and unedited

SEVERITY	FATAL	INJURY	P-DAMAGE	TOTAL
Accidents		2	3	5
Veh Occ		4		
Pedestrian				

AVG Severity Index: 2

DAY OF THE WEEK

SUN	MON	TUE	WED	THU	FRI	SAT	UNK
1			3		1		

MONTH OF THE YEAR

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	UNK
		1	1	1					1		1	

CONDITION	DRIVER	PED
Normal:	10	
Alcohol:		
Other:		

TIME	12	01	02	03	04	05	06	07	08	09	10	11	UNK
AM:								1	1		1		
PM:								1	1				

VEHICLES INVOLVED PER ACCIDENT

1	2	3	4	5	6+	UNK	TOTAL
	5						10

VEHICLE TYPE

	Motorcycle/Moped		Tractor Trailer
8	Passenger Vehicle		Passenger Bus
1	Sport Utility Veh		School Bus
1	Pick-Up Truck		Emergency Veh
	Trucks (2+3 axles)		Other Types

SURFACE

2	Wet
3	Dry
	Sno/Ice
	Mud
	Other

MOVEMENTS

NORTH			SOUTH			EAST			WEST		
LF	ST	RT	LF	ST	RT	LF	ST	RT	LF	ST	RT
	5	1	4								

OTHER MOVEMENTS

PROBABLE CAUSES

	Influence of Drugs		Improper Lane Change
	Influence of Alcohol		Improper Backing
	Influence of Medication		Improper Passing
	Influence of Combined Subst.		Improper Signal
	Physical/Mental Difficulty		Improper Parking
	Fell Asleep/Fainted, etc.		Passenger Interfere/Obstruct.
	Fail to give full Attention		Illegally in Roadway
	Lic. Restr. Non-compliance		Bicycle Violation
1	Fail to Drive in Single Lane		Clothing Not Visible
	Improper Right Turn on Red		Sleet, Hail, Freezing Rain
2	Fail to Yield Right-of-way		Severe Crosswinds
	Fail to Obey Stop Sign		Rain, Snow
	Fail to Obey Traffic Signal		Animal
1	Fail to Obey Other Control		Vision Obstruction
	Fail to Keep Right of Center		Vehicle Defect
	Fail to Stop for School Bus		Wet
	Wrong Way on One Way		Icy or Snow Covered
	Exceeded Speed Limit		Debris or Obstruction
	Operator Using Cell Phone		Ruts, Holes or Bumps
	Stopping in Lane Roadway		Road Under Construction
	Too Fast for Conditions		Traffic Control Device Inop.
	Followed too Closely		Shoulders Low, Soft or High
1	Improper Turn		Other or Unknown

COLLISION TYPES		FATAL	INJURY	PROP	TOTAL
Opposite Dir	Related:				
	UnRelated:				
Rear End	Related:				
	UnRelated:				
Sideswipe	Related:			1	1
	UnRelated:				
Left Turn	Related:		2	2	4
	UnRelated:				
Angle	Related:				
	UnRelated:				
Pedestrian	Related:				
	UnRelated:				
Parked Vehicle	Related:				
	UnRelated:				
Other Collision	Related:				
	UnRelated:				

F	Bridge	01	
I	Building	02	
X	Culvert/Ditch	03	
E	Curb	04	
D	Guardrail/Barrier	05	
	Embankment	06	
O	Fence	07	
B	Light Pole	08	
J	Sign Pole	09	
E	Other Pole	10	
C	Tree/Shrubbery	11	
T	Contr. Barrier	12	
S	Crash Attenuator	13	
	Other Fixed Object		30

WEATHER

3	Clear / Cloudy
	Foggy
1	Raining
	Snow / Sleet
1	Other

ILLUMINATION

4	Day
	Dawn/Dusk
1	Dark - Lights On
	Dark - No Lights
	Other

TOTALS

13-16	5

Maryland State Highway Administration

Office of Traffic and Safety - Traffic Development and Support Division

SHA 52.1 ADC History Output rev. 05/2016-1 - Combined Year Listing

Name: Robert Booker

Date: 06/29/2017

Location: IC #1319; MD 32 @ MD 108, Rps 4 & 6

County: Howard, D7

Period: January 01, 2013 To December 31, 2016

Logmiles: 3.69 At -1 Radius: 500 ft.

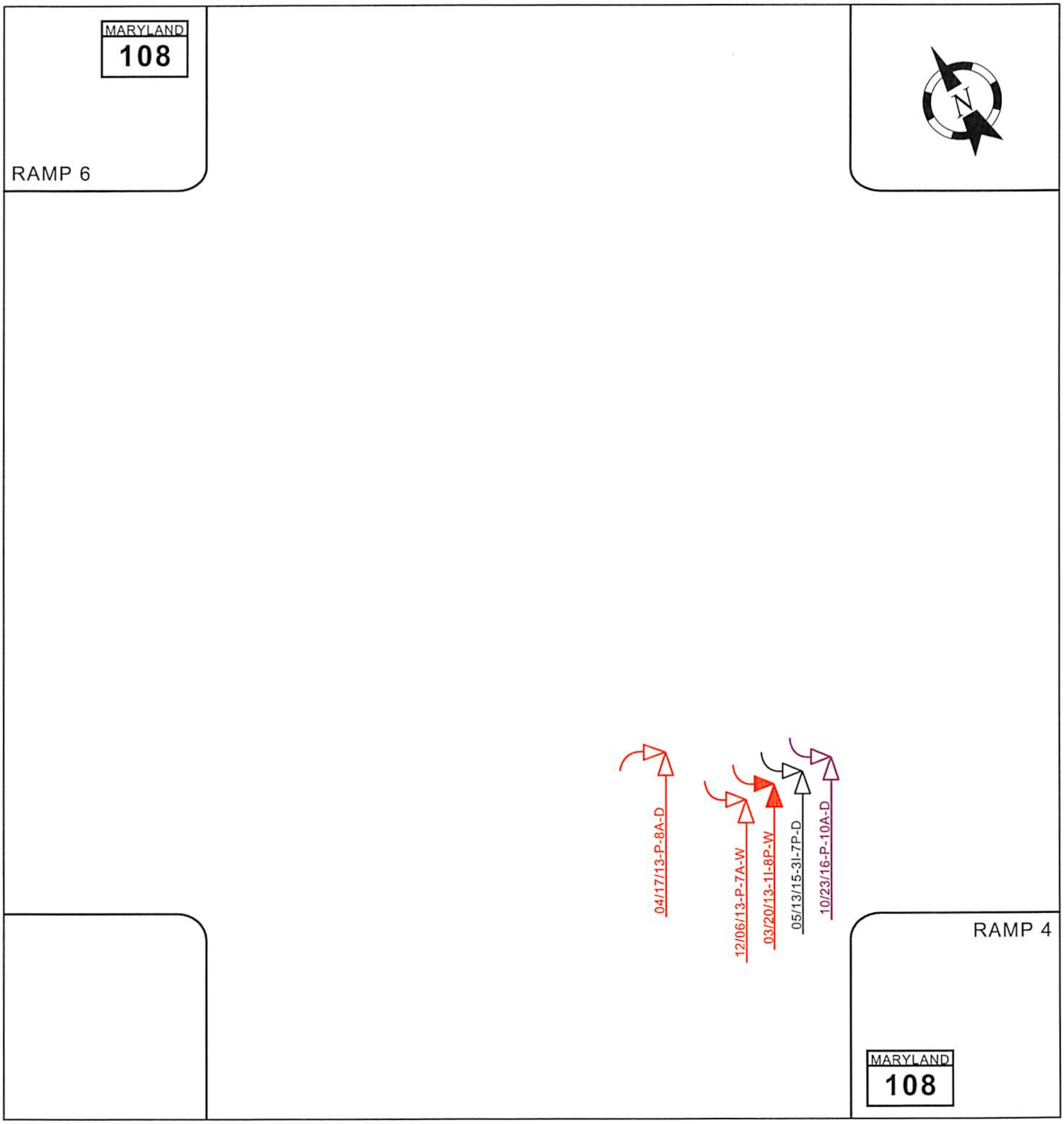
Note: Year 2016 data may be incomplete and unedited

MilePt	Int Rel	Date	Severity	Time	Light	Surface	Alc Rel	FixObj	Collision	Movement V1	V2	Probable Cause
MD108												
3.690	✓	03202013	1 Injured	08P	Night	Wet			LFTRN	SL	NS	Improper turn
3.690	✓	12062013	Property	07A	Day	Wet			LFTRN	SL	NS	Fail to obey other control
3.690	✓	05132015	3 Injured	07P	Day	Dry			LFTRN	SL	NS	Fail to yield right-of-way
3.740	✓	04172013	Property	08A	Day	Dry			SDSWP	NR	NS	Fail to drive in single lane
3.740	✓	10232016	Property	10A	Day	Dry			LFTRN	SL	NS	Fail to yield right-of-way

Fixed Object: 01 = Bridge 02 = Building 03 = Culvert/Ditch 04 = Curb 05 = Guardrail/Barrier 06 = Embankment 07 = Fence 08 = Light Pole 09 = Sign Post 10 = Other Pole 11 = Tree/Shrubbery 12 = Construction Barrier 13 = Crash Attenuator

Office of Traffic & Safety
Traffic Development & Support Division
Crash Analysis Safety Team

Location: IC #1319; MD 32 @ MD 108, Rps 4 & 6
County: HOWARD
Study Period: 01/01/2013 to Approx. 12/31/2016
Analyst: Robert L. Booker, Jr. **Date:** 06/29/2017



~~DATE-SEVERITY-TIME-SURFCE~~
~~NIGHT~~
~~ALCOHOL~~ X
~~DRUGS~~ ⊗

SEVERITY
F - Fatalities
I - Injured
P - Property Damage Only
SURFACE
D - Dry Surface
W - Wet Surface
I - Icy Surface
S - Snowy Surface

00 - Not Applicable
01 - Bridge or Overpass
02 - Building
03 - Culvert or Ditch
04 - Curb
05 - Guardrail or Barrier
06 - Embankment
07 – Fence

08 - Light Support Pole
09 - Sign Support Pole
10 - Other Pole
11 - Tree Shrubbery
12 - Construction Barrier
13 - Crash Attenuator
88 - Other
99 - Unknown

B - Bicycle
P - Other Pedalcycle
C - Other Conveyance
T - Railway Train
A - Animal
O - Other Object
S - Spilled Cargo
J - Jackknife

U - Units Separated
N - Other Non collision
D - Off Road
R - Downhill Runaway
F - Explosion or Fire
? - Unknown

template 06-27-06

~~U - TURN~~
~~BACKING~~
~~OVERTURN~~
▨ Parked Vehicle
P Pedestrian

32459
Dec 17/19

William Macleod

From:	Bohmer, Buck <BUBohmer@howardcountymd.gov>
Sent:	Tuesday, June 27, 2017 10:33 AM
To:	William Macleod
Cc:	John Concannon; Robert Booker; Mark Crampton (SHA); Jagarapu, Krishnakanth; Bowman, Diane J.
Subject:	FW: Crash Data Request - MD 108

Bill:

Would you please provide crash data as requested.

Thank you.

Buck Bohmer, BCE, Project Manager

Traffic Engineering Div
Howard County Public Works, Bureau of Highways
9250 Bendix Rd
Columbia, MD 21045

New E-Mail bubohmer@howardcountymd.gov

410-313-2430 (Office)
410-313-5748 (Desk)
410-313-5750 (FAX)

Report a Problem: TellHoCo

From: Carl Wilson [mailto:cwilson@trafficgroup.com]
Sent: Tuesday, June 27, 2017 9:36 AM
To: Jagarapu, Krishnakanth <kjagarapu@howardcountymd.gov>; Bohmer, Buck <BUBohmer@howardcountymd.gov>
Subject: Crash Data Request - MD 108

Kris/Buck-

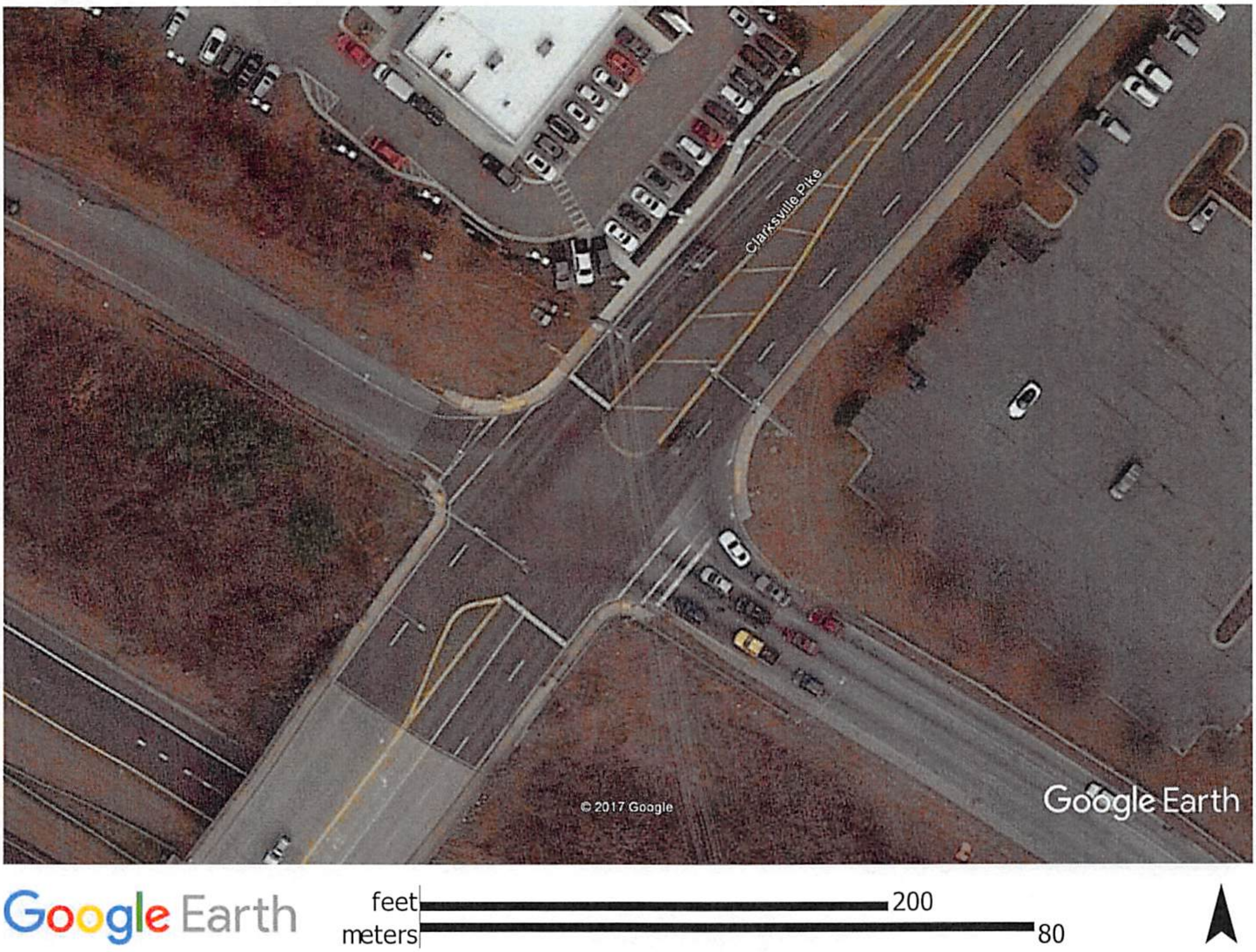
We are in the process of preparing a Traffic Impact Study within the MD 108 corridor. Can you please provide crash data for the following intersections:

MD 108 at Sheppard Lane
MD 108 at Linden Linthicum Lane
MD 108 at Great Star Drive
MD 108 at Auto Drive
x MD 108 at MD 32 Ramps 2/8 3.78
MD 108 at Ten Oaks Drive

Thank you for your assistance.

Howard County **MD32 At:** **IC: 1319**

Photo: 2010 **MD108 Clarksville Pike** Return to Index


Clarksville Pike
© 2017 Google
Google Earth
Google Earth
feet
200
meters
80

Maryland State Highway Administration

Office of Traffic and Safety - Traffic Development and Support Division

SHA 52.1 ADC Study Worksheet Output rev. 04/2016-1

Name: Robert Booker

Date: 06/29/2017

Location: IC #1319; MD 32 @ MD 108; Rps 2 & 8

County: Howard, D7

Period: January 01, 2013 To December 31, 2016

Logmiles: 3.78 At -1 Radius: 500 ft.

Note: Year 2016 data may be incomplete and unedited

YEAR >>	2013	2014	2015	2016	Total
Fatal	0	0	0	0	0
No. Killed	0	0	0	0	0
Injury	2	0	1	0	3
No. Injured	3	0	1	0	4
Prop. Damage	1	1	1	1	4
Total Crashes	3	1	2	1	7
Severity Index	7	1	3	1	Avg 3
Opposite Dir.	0	0	0	0	0
Rear End	0	0	0	0	0
Sideswipe	0	0	0	0	0
Left Turn	1	1	1	0	3
Angle	2	0	1	1	4
Pedestrian	0	0	0	0	0
Parked Veh.	0	0	0	0	0
Fixed Object	0	0	0	0	0
Other	0	0	0	0	0
U-Turn	0	0	0	0	0
Backing	0	0	0	0	0
Animal	0	0	0	0	0
Railroad	0	0	0	0	0
Fire / Expl.	0	0	0	0	0
Overturn	0	0	0	0	0
Truck Related	0	0	0	0	0
Night Time	3	0	1	0	4
Wet Surface	1	0	1	1	3
Alcohol	0	0	0	0	0
Intersection	3	1	2	1	7
Total Vehicles	6	2	4	2	14
Total Trucks	0	0	0	0	0
Truck %	0.0	0.0	0.0	0.0	0.0

Comments:

Maryland State Highway Administration
Office of Traffic and Safety - Traffic Development and Support Division
SHA 52.1 ADC Summary Output rev. 04/2016-1

Name: Robert Booker
Date: 06/29/2017

Location: IC #1319; MD 32 @ MD 108; Rps 2 & 8
County: Howard, D7
Period: January 1, 2013 To December 31, 2016
Logmiles: 3.78 At -1 Radius: 500 ft.
Note: Year 2016 data may be incomplete and unedited

SEVERITY	FATAL	INJURY	P-DAMAGE	TOTAL
Accidents		3	4	7
Veh Occ		4		
Pedestrian				

AVG Severity Index: 3

DAY OF THE WEEK

SUN	MON	TUE	WED	THU	FRI	SAT	UNK
2	1	1	1	1	1		

MONTH OF THE YEAR

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	UNK
	1	2		1	1					1	1	

CONDITION	DRIVER	PED
Normal:	13	
Alcohol:		
Other:		

TIME	12	01	02	03	04	05	06	07	08	09	10	11	UNK
AM:		1						1					
PM:				1				1	1	1	1		

VEHICLES INVOLVED PER ACCIDENT

1	2	3	4	5	6+	UNK	TOTAL
	7						14

VEHICLE TYPE

	Motorcycle/Moped		Tractor Trailer
13	Passenger Vehicle		Passenger Bus
	Sport Utility Veh		School Bus
	Pick-Up Truck	1	Emergency Veh
	Trucks (2+3 axles)		Other Types

SURFACE

3	Wet
4	Dry
	Sno/Ice
	Mud
	Other

MOVEMENTS

NORTH			SOUTH			EAST			WEST		
LF	ST	RT	LF	ST	RT	LF	ST	RT	LF	ST	RT
3	3			4					3	1	

OTHER MOVEMENTS

PROBABLE CAUSES

	Influence of Drugs		Improper Lane Change
	Influence of Alcohol		Improper Backing
	Influence of Medication		Improper Passing
	Influence of Combined Subst.		Improper Signal
	Physical/Mental Difficulty		Improper Parking
	Fell Asleep/Fainted, etc.		Passenger Interfere/Obstruct.
	Fail to give full Attention		Illegally in Roadway
	Lic. Restr. Non-compliance		Bicycle Violation
	Fail to Drive in Single Lane		Clothing Not Visible
	Improper Right Turn on Red		Sleet, Hail, Freezing Rain
2	Fail to Yield Right-of-way		Severe Crosswinds
	Fail to Obey Stop Sign		Rain, Snow
1	Fail to Obey Traffic Signal		Animal
2	Fail to Obey Other Control		Vision Obstruction
	Fail to Keep Right of Center		Vehicle Defect
	Fail to Stop for School Bus		Wet
	Wrong Way on One Way		Icy or Snow Covered
	Exceeded Speed Limit		Debris or Obstruction
	Operator Using Cell Phone		Ruts, Holes or Bumps
	Stopping in Lane Roadway		Road Under Construction
	Too Fast for Conditions		Traffic Control Device Inop.
	Followed too Closely		Shoulders Low, Soft or High
1	Improper Turn	1	Other or Unknown

WEATHER

3	Clear / Cloudy
	Foggy
2	Raining
1	Snow / Sleet
1	Other

ILLUMINATION

2	Day
1	Dawn/Dusk
4	Dark - Lights On
	Dark - No Lights
	Other

TOTALS

13-16	7

COLLISION TYPES		FATAL	INJURY	PROP	TOTAL
Opposite Dir	Related:				
	UnRelated:				
Rear End	Related:				
	UnRelated:				
Sideswipe	Related:				
	UnRelated:				
Left Turn	Related:		1	2	3
	UnRelated:				
Angle	Related:		2	2	4
	UnRelated:				
Pedestrian	Related:				
	UnRelated:				
Parked Vehicle	Related:				
	UnRelated:				
Other Collision	Related:				
	UnRelated:				

F	Bridge	01	
I	Building	02	
X	Culvert/Ditch	03	
E	Curb	04	
D	Guardrail/Barrier	05	
	Embankment	06	
O	Fence	07	
B	Light Pole	08	
J	Sign Pole	09	
E	Other Pole	10	
C	Tree/Shrubbery	11	
T	Contr. Barrier	12	
S	Crash Attenuator	13	
	Other Fixed Object		37

Maryland State Highway Administration

Office of Traffic and Safety - Traffic Development and Support Division

SHA 52.1 ADC History Output rev. 05/2016-1 - Combined Year Listing

Name: Robert Booker

Date: 06/29/2017

Location: IC #1319; MD 32 @ MD 108; Rps 2 & 8

County: Howard, D7

Period: January 01, 2013 To December 31, 2016

Logmiles: 3.78 At -1 Radius: 500 ft.

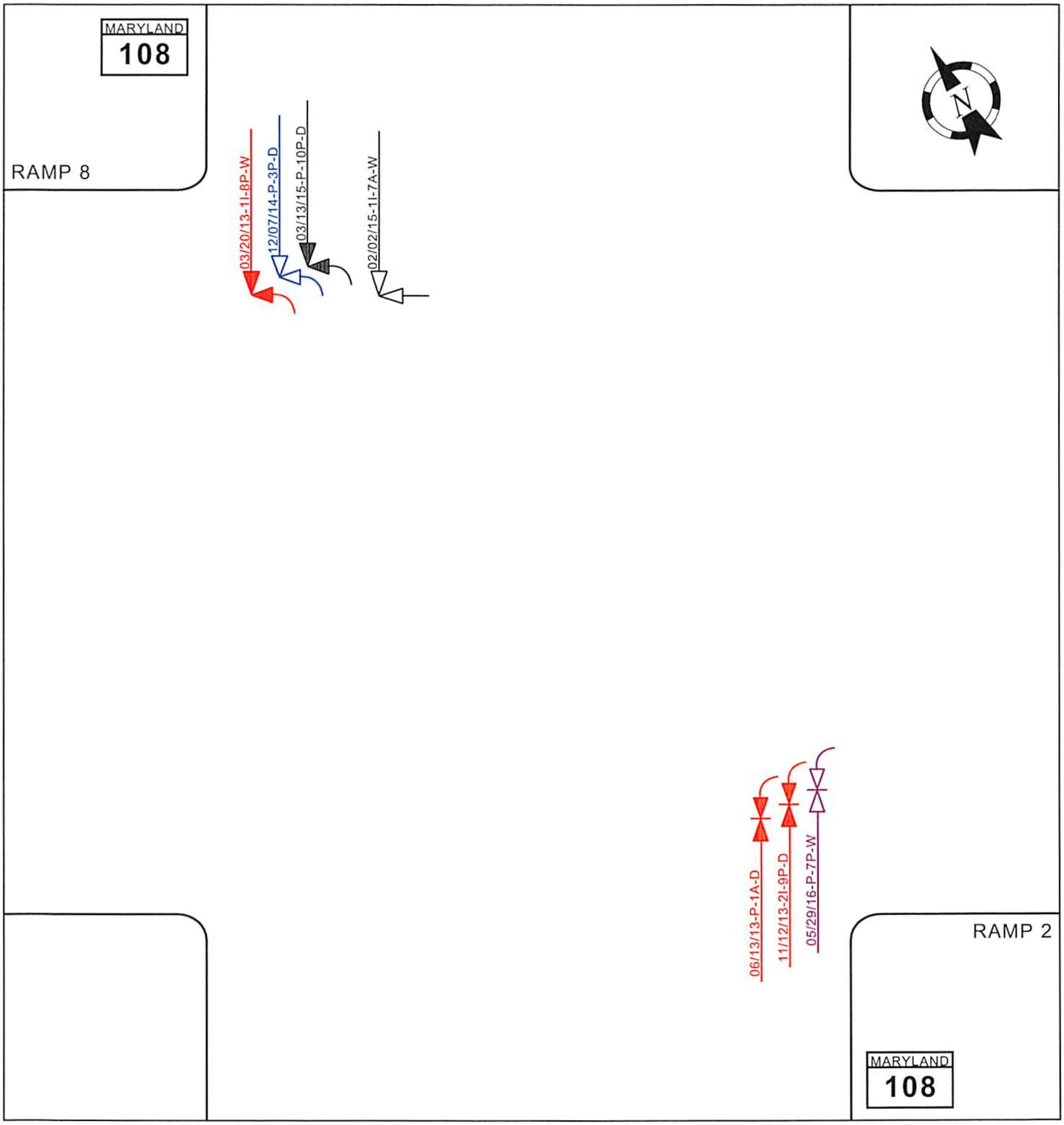
Note: Year 2016 data may be incomplete and unedited

										Movement		
MilePt	**Int Rel**	**Date**	**Severity**	**Time**	**Light**	**Surface**	**Alc Rel**	**FixObj**	**Collision**	**V1**	**V2**	**Probable Cause**
MD108												
3.690	✓	03202013	1 Injured	08P	Night	Wet			LFTRN	NL	SS	Improper turn
3.740	✓	06132013	Property	01A	Night	Dry			ANGLE	NS	WL	Fail to obey other control
3.740	✓	11122013	2 Injured	09P	Night	Dry			ANGLE	NS	WL	Fail to obey other control
3.780	✓	12072014	Property	03P	Day	Dry			LFTRN	NL	SS	Fail to obey traffic signal
3.780	✓	02022015	1 Injured	07A	Day	Wet			ANGLE	SS	WS	Fail to yield right-of-way
3.780	✓	03132015	Property	10P	Night	Dry			LFTRN	NL	SS	Fail to yield right-of-way
3.780	✓	05292016	Property	07P	Day	Wet			ANGLE	NS	WL	Other or Unknown

Fixed Object: 01 = Bridge 02 = Building 03 = Culvert/Ditch 04 = Curb 05 = Guardrail/Barrier 06 = Embankment 07 = Fence
08 = Light Pole 09 = Sign Post 10 = Other Pole 11 = Tree/Shrubbery 12 = Construction Barrier 13 = Crash Attenuator

Office of Traffic & Safety
Traffic Development & Support Division
Crash Analysis Safety Team

Location: IC #1319; MD 32 @ MD 108, Rps 2 & 8
County: HOWARD
Study Period: 01/01/2013 to Approx. 12/31/2016
Analyst: Robert L. Booker, Jr. **Date:** 06/29/2017



~~DATE-SEVERITY-TIME-SURFCE~~
~~NIGHT~~
~~ALCOHOL~~ X
~~DRUGS~~ ⊗

SEVERITY
F - Fatalities
I - Injured
P - Property Damage Only

SURFACE
D - Dry Surface
W - Wet Surface
I - Icy Surface
S - Snowy Surface

00 - Not Applicable
01 - Bridge or Overpass
02 - Building
03 - Culvert or Ditch
04 - Curb
05 - Guardrail or Barrier
06 - Embankment
07 – Fence
08 - Light Support Pole
09 - Sign Support Pole
10 - Other Pole
11 - Tree Shrubbery
12 - Construction Barrier
13 - Crash Attenuator
88 - Other
99 - Unknown

B - Bicycle
P - Other Pedalcycle
C - Other Conveyance
T - Railway Train
A - Animal
O - Other Object
S - Spilled Cargo
J - Jackknife

U - Units Separated
N - Other Non collision
D - Off Road
R - Downhill Runaway
F - Explosion or Fire
? - Unknown

template 06-27-06

U - TURN
BACKING
OVERTURN
▨ Parked Vehicle
P Pedestrian

32460
Due: 7/19

William Macleod

From: Bohmer, Buck <BUBohmer@howardcountymd.gov>
Sent: Tuesday, June 27, 2017 10:33 AM
To: William Macleod
Cc: John Concannon; Robert Booker; Mark Crampton (SHA); Jagarapu, Krishnakanth; Bowman, Diane J.
Subject: FW: Crash Data Request - MD 108

Bill:

Would you please provide crash data as requested.

Thank you.

Buck Bohmer, BCE, Project Manager

Traffic Engineering Div
Howard County Public Works, Bureau of Highways
9250 Bendix Rd
Columbia, MD 21045

New E-Mail bubohmer@howardcountymd.gov

410-313-2430 (Office)
410-313-5748 (Desk)
410-313-5750 (FAX)

Report a Problem: TellHoCo

From: Carl Wilson [mailto:cwilson@trafficgroup.com]
Sent: Tuesday, June 27, 2017 9:36 AM
To: Jagarapu, Krishnakanth <kjagarapu@howardcountymd.gov>; Bohmer, Buck <BUBohmer@howardcountymd.gov>
Subject: Crash Data Request - MD 108

Kris/Buck-

We are in the process of preparing a Traffic Impact Study within the MD 108 for the following intersections:

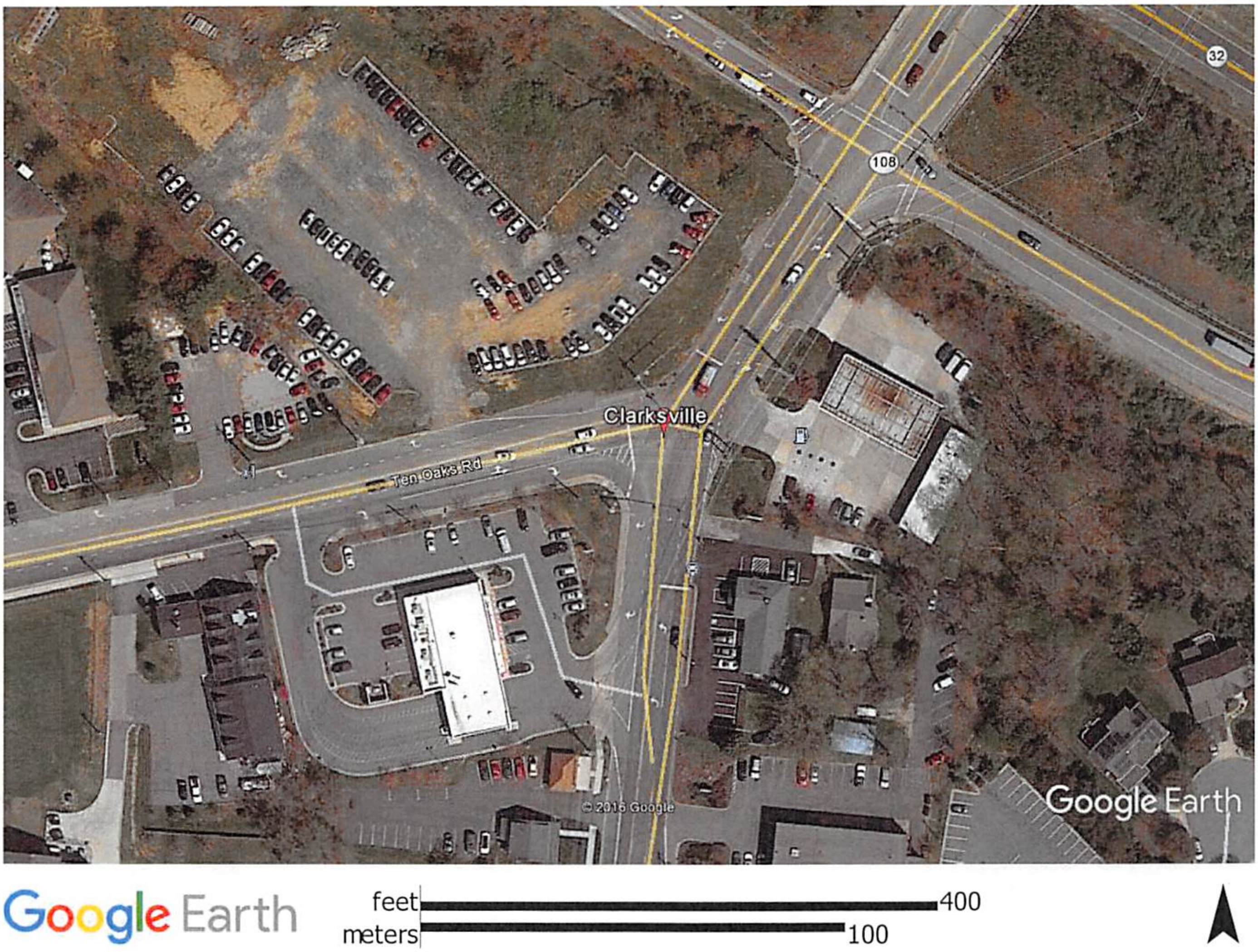
12/20/16
31635

MD 108 at Sheppard Lane
MD 108 at Linden Linthicum Lane
MD 108 at Great Star Drive
MD 108 at Auto Drive
MD 108 at MD 32 Ramps
X MD 108 at Ten Oaks ~~Drive~~ Rd C0558

3.65/E @ 0.00/N

Thank you for your assistance.

RCB
to M. KIM


32
108
Clarksville
Ten Oaks Rd
© 2016 Google
Google Earth
Google Earth
feet
400
meters
100

Maryland State Highway Administration
Office of Traffic and Safety - Traffic Development and Support Division
SHA 52.1 ADC Study Worksheet Output rev. 04/2016-1

Name: Robert Booker
Date: 06/29/2017

Location: MD 108 @ TEN OAKS RD
County: Howard, D7
Period: January 01, 2013 To December 31, 2016
Logmiles: 3.65 At 0 Radius: 150 ft.
Note: Year 2016 data may be incomplete and unedited

YEAR >>	2013	2014	2015	2016	Total
Fatal	0	0	0	0	0
No. Killed	0	0	0	0	0
Injury	0	0	0	1	1
No. Injured	0	0	0	1	1
Prop. Damage	1	0	1	0	2
Total Crashes	1	0	1	1	3
Severity Index	1	0	1	2	Avg 1
Opposite Dir.	0	0	0	0	0
Rear End	1	0	1	0	2
Sideswipe	0	0	0	0	0
Left Turn	0	0	0	0	0
Angle	0	0	0	1	1
Pedestrian	0	0	0	0	0
Parked Veh.	0	0	0	0	0
Fixed Object	0	0	0	0	0
Other	0	0	0	0	0
U-Turn	0	0	0	0	0
Backing	0	0	0	0	0
Animal	0	0	0	0	0
Railroad	0	0	0	0	0
Fire / Expl.	0	0	0	0	0
Overturn	0	0	0	0	0
Truck Related	0	0	0	0	0
Night Time	0	0	0	0	0
Wet Surface	1	0	0	0	1
Alcohol	0	0	0	0	0
Intersection	1	0	1	1	3
Total Vehicles	2	0	4	2	8
Total Trucks	0	0	0	0	0
Truck %	0.0	0.0	0.0	0.0	0.0

Comments:

Maryland State Highway Administration
Office of Traffic and Safety - Traffic Development and Support Division
SHA 52.1 ADC Summary Output rev. 04/2016-1

Name: Robert Booker
Date: 06/29/2017

Location: MD 108 @ TEN OAKS RD
Logmiles: 3.65 At 0 Radius: 150 ft.
County: Howard, D7
Period: January 1, 2013 To December 31, 2016
Note: Year 2016 data may be incomplete and unedited

SEVERITY	FATAL	INJURY	P-DAMAGE	TOTAL
Accidents		1	2	3
Veh Occ		1		
Pedestrian				

AVG Severity Index: 1

DAY OF THE WEEK

SUN	MON	TUE	WED	THU	FRI	SAT	UNK
1		1			1		

MONTH OF THE YEAR

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	UNK
			1					1	1			

CONDITION	DRIVER	PED
Normal:	5	
Alcohol:		
Other:	3	

TIME	12	01	02	03	04	05	06	07	08	09	10	11	UNK
AM:								1					
PM:				1			1						

VEHICLES INVOLVED PER ACCIDENT

1	2	3	4	5	6+	UNK	TOTAL
	2		1				8

VEHICLE TYPE

	Motorcycle/Moped		Tractor Trailer
5	Passenger Vehicle		Passenger Bus
1	Sport Utility Veh		School Bus
	Pick-Up Truck		Emergency Veh
	Trucks (2+3 axles)	2	Other Types

SURFACE

1	Wet
2	Dry
	Sno/Ice
	Mud
	Other

MOVEMENTS

NORTH			SOUTH			EAST			WEST		
LF	ST	RT	LF	ST	RT	LF	ST	RT	LF	ST	RT
	1						4			1	

OTHER MOVEMENTS 2

PROBABLE CAUSES

	Influence of Drugs		Improper Lane Change
	Influence of Alcohol		Improper Backing
	Influence of Medication		Improper Passing
	Influence of Combined Subst.		Improper Signal
	Physical/Mental Difficulty		Improper Parking
1	Fell Asleep/Fainted, etc.		Passenger Interfere/Obstruct.
1	Fail to give full Attention		Illegally in Roadway
	Lic. Restr. Non-compliance		Bicycle Violation
	Fail to Drive in Single Lane		Clothing Not Visible
	Improper Right Turn on Red		Sleet, Hail, Freezing Rain
	Fail to Yield Right-of-way		Severe Crosswinds
	Fail to Obey Stop Sign		Rain, Snow
1	Fail to Obey Traffic Signal		Animal
	Fail to Obey Other Control		Vision Obstruction
	Fail to Keep Right of Center		Vehicle Defect
	Fail to Stop for School Bus		Wet
	Wrong Way on One Way		Icy or Snow Covered
	Exceeded Speed Limit		Debris or Obstruction
	Operator Using Cell Phone		Ruts, Holes or Bumps
	Stopping in Lane Roadway		Road Under Construction
	Too Fast for Conditions		Traffic Control Device Inop.
	Followed too Closely		Shoulders Low, Soft or High
	Improper Turn		Other or Unknown

WEATHER

2	Clear / Cloudy
	Foggy
1	Raining
	Snow / Sleet
	Other

ILLUMINATION

2	Day
1	Dawn/Dusk
	Dark - Lights On
	Dark - No Lights
	Other

TOTALS	
13-16	3

COLLISION TYPES		FATAL	INJURY	PROP	TOTAL
Opposite Dir	Related:				
	UnRelated:				
Rear End	Related:			2	2
	UnRelated:				
Sideswipe	Related:				
	UnRelated:				
Left Turn	Related:				
	UnRelated:				
Angle	Related:		1		1
	UnRelated:				
Pedestrian	Related:				
	UnRelated:				
Parked Vehicle	Related:				
	UnRelated:				
Other Collision	Related:				
	UnRelated:				

F	Bridge	01	
I	Building	02	
X	Culvert/Ditch	03	
E	Curb	04	
D	Guardrail/Barrier	05	
	Embankment	06	
O	Fence	07	
B	Light Pole	08	
J	Sign Pole	09	
E	Other Pole	10	
C	Tree/Shrubbery	11	
T	Contr. Barrier	12	
S	Crash Attenuator	13	
	Other Fixed Object		43

Maryland State Highway Administration
Office of Traffic and Safety - Traffic Development and Support Division
SHA 52.1 ADC History Output rev. 05/2016-1 - Combined Year Listing

Name: Robert Booker
Date: 06/29/2017

Location: MD 108 @ TEN OAKS RD
County: Howard, D7
Period: January 01, 2013 To December 31, 2016
Logmiles: 3.65 At 0 Radius: 150 ft.
Note: Year 2016 data may be incomplete and unedited

MilePt	Int Rel	Date	Severity	Time	Light	Surface	Alc Rel	FixObj	Collision	Movement V1	Movement V2	Probable Cause
MD108												
3.650	✓	04122013	Property	07A	Day	Wet			RREND	ES	ES	Fell asleep, fainted, etc.
3.650	✓	09012015	Property	03P	Day	Dry			RREND	ES	ES	Fail to give full attention
3.650	✓	10162016	1 Injured	06P	Day	Dry			ANGLE	WS	NS	Fail to obey traffic signal

Fixed Object: 01 = Bridge 02 = Building 03 = Culvert/Ditch 04 = Curb 05 = Guardrail/Barrier 06 = Embankment 07 = Fence
08 = Light Pole 09 = Sign Post 10 = Other Pole 11 = Tree/Shrubbery 12 = Construction Barrier 13 = Crash Attenuator

SUMMARY EVALUATION

FISCAL AND ECONOMIC EFFECTS

ERICKSON LIVING AT LIMESTONE VALLEY

BY

ERICKSON LIVING

IN

HOWARD COUNTY, MARYLAND

Richard B. Reading Associates
Princeton, New Jersey

June 27, 2018

EXHIBIT
E

TABLE OF CONTENTS

FISCAL IMPACT SUMMARY

- Erickson Living proposes to develop a campus style Continuing Care Retirement Community (CCRC) a 61.0+/- acre tract of land in Howard County, Maryland. The proposed CCRC would contain independent living, assisted living and skilled nursing units in a series of linked neighborhoods/facilities consisting of multiple mid-rise residential buildings which will surround shared community buildings.

- Projections prepared by the Maryland Department of Planning and adopted by Howard County indicate a significant future increase in the number of persons aged 65 or older living in the County. As of the Census of 2010 were 29,045 persons aged 65 or older living in the County, with projected increases to 50,050 persons in 2020 and 72,330 persons in 2030. The 2030 projected total of 72,330 persons aged 65 or older is nearly four times the total number of persons in that age group living in the County in 2000, and the anticipated rate of population growth for this group from 2010 to 2030 is 2,164 persons per year, a level 2.8 times the rate recorded from 1980 to 2010.

- Approximately 1,200 independent living units are to be built within the proposed CCRC and will include one-bedroom and two-bedroom units. In addition to the independent living units, the campus will also contain assisted living, skilled nursing, and memory care units. This portion of the community is to be built in phases based upon the need for assisted living, skilled nursing, and memory care units. It is expected that at build-out, there will be approximately 240 assisted living units and skilled nursing beds, including specialized units to care for Alzheimer's patients. At completion the proposed development would be expected to have a resident population of approximately 1,700 persons.

- An assessed value of $260,400,000 is estimated for the proposed retirement community, equal to a 0.49 percent increase in Howard County's current total real property valuation of $53.1 billion.

- Erickson Living will provide a full range of services for the residents of the proposed development, including first response/medical aid, security, road maintenance, street lighting and social services, all of which are services which are typically provided by local or regional government units for the benefit of their respective constituents. The self contained nature of the development coupled with the broad range of services provided within the community will minimize the reliance by the residents of the proposed development upon the resources of Howard County.

- The methodology used in preparing this fiscal evaluation assumes that the proposed development was complete, in operation, assessed and taxed during the most recent calendar year. This assumption hypothesizes that the development had been in place during 2018. By preparing this analysis on a current (2018) basis, actual cost and revenue data for Howard County may be utilized, and many factors subject to speculation, such as future property values, future tax rates, future County government and school appropriations and the influence of other prospective developments in the County may be avoided.

- Utilizing the proportional appropriations observed in Howard County, local tax supported costs of between $1,481,600 and $2,755,610 have been allocated to the proposed development. The upper limit of the estimated added costs of $2,755,610 would indicate that County appropriations would be expected to increase by less than 0.25 percent in order to maintain the same level and quality of services to the County's existing properties. This information is further detailed on pages 24-29 of this analysis.

- The tax revenues which the County would have received for local purposes had the proposed development been completed and occupied during 2018 have been calculated to amount to $6,870,588. The anticipated revenues resulting from the proposed CCRC ($6,870,588) are 2.5 times the anticipated annual service costs ($2,755,610), and yield an annual revenue surplus of $4,114,978. This information is further detailed on pages 29-31 of this analysis.

- The proposed CCRC is a retirement community with residents in their 60's and older. Accordingly, the proposed CCRC will not generate children to be educated by the County's public schools or place demands on the County's park and recreation facilities to the degree that traditional family housing would.

INTRODUCTION

The ensuing Summary Evaluation has been undertaken on behalf of Erickson Living to provide an assessment of the anticipated fiscal and economic effects resulting from the development of a Continuing Care Retirement Community (CCRC) on a 61.0+/- acre tract of land situated in the south-central (Clarksville) portion of Howard County in central Maryland. The data and evaluations contained on the following pages describe the nature and magnitude of the planned development and calculate the added cost of tax supported services resulting from the new development as well as the additional tax revenues expected to be generated by the project.

The research and analysis undertaken herein provide information whereby changes in services and facilities necessitated by the proposed community can be accomplished smoothly, with foresight, and without interruption of existing operations. Of particular concern in the following evaluation is detailed information pertaining to:

a) the economic base and fiscal infrastructure of Howard County;

b) the nature, scope and magnitude of the proposed development; and

c) the fiscal impact of the development upon County government and school operations.

ECONOMIC BASE AND FISCAL TRENDS

Before proceeding to the project description and the estimate of the net fiscal impact associated with the development and occupancy of the proposed CCRC, a review of the existing economic base and fiscal structure of the County will provide a useful insight into the cost/revenue relationships to be assessed. The County is centrally located within Maryland and is part of the greater Washington, DC-Baltimore metropolitan area, and is surrounded by the Maryland counties of Anne Arundel, Baltimore, Carroll, Frederick, Montgomery, and Prince George's. Howard County's location within Maryland as well as the immediately surrounding area is shown on Figure 1.

Howard County includes approximately 253 square miles of land area, and as such is the second smallest of Maryland's twenty-three counties, though it is the fifth most populous of the State's counties. A very significant portion of the County's land area and housing base is located within Columbia, a planned community developed by the Rouse Company dating back fifty years. The proposed CCRC is to be located in the unincorporated Clarksville section of Howard County. It is the County government that provides essential government services and public school education to the residents and businesses in Howard County. The County also implements long range planning initiatives that coordinate the County's planning, zoning, facilities, open space and other cultural and historic plans and programs.

Howard County was established in 1851 when the former Howard District, a governmental part of Anne Arundel County, became a separate county. Several small towns were established within Howard County during the 19th century but development remained sparse through the 1960's when the Rouse Company assembled several land parcels and began developing its master planned development of Columbia. During the past several decades the County has been in transition with significant increases in population and development occurring as a result of developing commutation patterns and the suburbanization of the Washington -Baltimore metropolitan area.

FIGURE 1

Howard County, Maryland

Population and Housing

In 1900, the County contained a total population of 16,715 persons, a figure that increased only moderately over the next half century with a population total of 23,119 persons reported in 1950. By 1960, the County's population amounted to 36,152 persons and since 1960 the County's population base has increased significantly while the County has increased its share of the state's resident population. Population totals for Howard County were 61,911 persons in 1970; 118,572 persons in 1980; 187,328 persons in 1990, 247,842 persons in 2000 and 287,085 persons in 2010. The significant population increases in the County in recent years are expected to continue for the immediate future. Recent projections prepared by the Maryland Department of Planning and provided by the Maryland State Data Center indicate the anticipation of significant population increases in the next few decades with an anticipated 2020 population within the County of 332,250 persons and with further increases to 357,100 persons by 2030 and 366,350 persons by 2040. It is projected that there will be nearly three times as many people living in the County in 2020 as there were in 1980. These trends and projections are set forth below.

Howard County Population Trends and Projections

1900	16,715	1970	61,611
1910	16,106	1980	118,572
1920	15,826	1990	187,328
1930	16,169	2000	247,842
1940	17,185	2010	287,085
1950	23,119	*2020*	*332,250*
1960	36,152	*2030*	*357,100*
		2040	*366,350*

As may be determined from the table above, the rate of population growth in the County was 56.4 percent during the 1960's, and amounted to 70.4 percent in the 1970's, 95.5 percent in the 1980's, 58.0 percent in the 1990's, 32.3 percent in the 2000's, and 15.8 percent during the 2010's. Since 1980 the County has averaged a net annual population increase of 4,213 persons and is expected to increase by 3,501 persons per year from 2010 to 2030. The average household size in Howard County has decreased over time, averaging 2.97 persons per household in 1980 and 2.74 persons per household in 2015.

At the time of the 2010 Census, there were 287,085 persons living in Howard County including 284,763 persons living in 104,749 of the County's 109,282 total housing units and 2,332 persons living in group quarters. Owner occupancy was the dominant form of tenure, with an estimated 105,360 (73.6 percent) homes being owner occupied while 24.6 percent were renter-occupied. Single family "detached" housing units represented 53.8 percent of all housing units within Howard County with single family "attached" homes representing an additional 19.9 percent of the County's housing units. The median housing value of owner occupied housing units in the County was $415,400, a level 37.8 percent higher than the Maryland median housing value of $301,400. Of the County's 104,749 occupied housing units at the time of the 2010 Census, it is estimated that 42.5 percent of all households had been moved into by their residents since 2005 and 62.3 percent of the homes in the County had moved into by the householder since 2000. Detailed 2010 Census population data for the county is provided as Table 1, and detailed 2010 Census housing data for the county is provided as Table 2. Comparable date for the State is provided as Tables 3 and 4.

At the time of the 1970 Census, the portion of the County's total population represented by persons aged 65 and older was 5.4 percent with a total of 3,327 persons in that age cohort. By 1980 the number of persons aged 65 or older in Howard County had nearly doubled to 6,081 persons representing 5.1 percent of the County's total population. This age group was reported to have increased to a total of 11,330 persons in 1990 with an additional increase to 18,468 persons by 2000 when persons aged 65 or older represented 7.5 percent of the total population of Howard County. The 2010 Census reports a total of 29,045 persons aged 65 or older living in Howard County, representing 10.0 percent of the County's population. From 1970 to 2010 the number of persons aged 65 or older living in Howard County increased nearly ninefold and increased as a share of the total population from 5.4 percent to 10.0 percent. Projections prepared by the Maryland Department of Planning in its July 2014 Demographic and Socio-Economic Outlook indicate the expectation of a significant increase in the number of persons aged 65 or older living in the County.

HOWARD COUNTY, MARYLAND
2010 CENSUS

TABLE 1

Subject	Number	Percent
SEX AND AGE		
Total population	287,085	100.0
Under 5 years	17,363	6.0
5 to 9 years	20,557	7.2
10 to 14 years	22,451	7.8
15 to 19 years	20,352	7.1
20 to 24 years	14,727	5.1
25 to 29 years	17,729	6.2
30 to 34 years	17,632	6.1
35 to 39 years	19,716	6.9
40 to 44 years	23,157	8.1
45 to 49 years	26,164	9.1
50 to 54 years	23,421	8.2
55 to 59 years	19,178	6.7
60 to 64 years	15,593	5.4
65 to 69 years	10,770	3.8
70 to 74 years	6,846	2.4
75 to 79 years	4,823	1.7
80 to 84 years	3,454	1.2
85 years and over	3,152	1.1
Median age (years)	38.4	(X)
16 years and over	221,949	77.3
18 years and over	212,421	74.0
21 years and over	203,788	71.0
62 years and over	38,123	13.3
65 years and over	29,045	10.1

HOUSEHOLDS BY TYPE		
Total households	104,749	100.0
Family households (families) [7]	76,333	72.9
With own children under 18 years	38,764	37.0
Husband-wife family	61,671	58.9
With own children under 18 years	30,677	29.3
Male householder, no wife present	3,639	3.5
With own children under 18 years	1,756	1.7
Female householder, no husband present	11,023	10.5
With own children under 18 years	6,331	6.0
Nonfamily households [7]	28,416	27.1
Householder living alone	22,903	21.9
Male	9,640	9.2
65 years and over	1,810	1.7
Female	13,263	12.7
65 years and over	4,944	4.7
Households with individuals under 18 years	41,154	39.3
Households with individuals 65 years and over	21,144	20.2
Average household size	2.72	(X)
Average family size [7]	3.2	(X)

HOWARD COUNTY, MARYLAND
2010 CENSUS

TABLE 2

HOUSING OCCUPANCY		
Total housing units	109,282	100.0
Occupied housing units	104,749	95.9
Vacant housing units	4,533	4.1
For rent	1,779	1.6
Rented, not occupied	107	0.1
For sale only	949	0.9
Sold, not occupied	336	0.3
For seasonal, recreational, or occasional use	418	0.4
All other vacants	944	0.9

HOUSING TENURE		
Occupied housing units	104,749	100.0
Owner-occupied housing units	77,193	73.7
Population in owner-occupied housing units	220,400	
Average household size of owner-occupied units	2.86	
Renter-occupied housing units	27,556	26.3
Population in renter-occupied housing units	64,363	
Average household size of renter-occupied units	2.34	

MARYLAND
2010 CENSUS

TABLE 3

Subject	Number	Percent
SEX AND AGE		
Total population	5,773,552	100.0
Under 5 years	364,488	6.3
5 to 9 years	366,868	6.4
10 to 14 years	379,029	6.6
15 to 19 years	406,241	7.0
20 to 24 years	393,698	6.8
25 to 29 years	393,548	6.8
30 to 34 years	368,494	6.4
35 to 39 years	377,409	6.5
40 to 44 years	418,163	7.2
45 to 49 years	461,585	8.0
50 to 54 years	440,619	7.6
55 to 59 years	377,989	6.5
60 to 64 years	317,779	5.5
65 to 69 years	226,596	3.9
70 to 74 years	159,761	2.8
75 to 79 years	124,579	2.2
80 to 84 years	98,580	1.7
85 years and over	98,126	1.7
Median age (years)	38	(X)
16 years and over	4,584,109	79.4
18 years and over	4,420,588	76.6
21 years and over	4,175,913	72.3
62 years and over	890,542	15.4
65 years and over	707,642	12.3

HOUSEHOLDS BY TYPE		
Total households	2,156,411	100.0
Family households (families) [7]	1,447,002	67.1
With own children under 18 years	651,028	30.2
Husband-wife family	1,026,739	47.6
With own children under 18 years	439,471	20.4
Male householder, no wife present	104,375	4.8
With own children under 18 years	47,191	2.2
Female householder, no husband present	315,888	14.6
With own children under 18 years	164,366	7.6
Nonfamily households [7]	709,409	32.9
Householder living alone	563,003	26.1
Male	234,157	10.9
65 years and over	53,018	2.5
Female	328,846	15.2
65 years and over	135,362	6.3
Households with individuals under 18 years	738,706	34.3
Households with individuals 65 years and over	516,358	23.9
Average household size	2.61	(X)
Average family size [7]	3.15	(X)

MARYLAND
2010 CENSUS

TABLE 4

HOUSING OCCUPANCY		
Total housing units	2,378,814	100.0
Occupied housing units	2,156,411	90.7
Vacant housing units	222,403	9.3
For rent	61,874	2.6
Rented, not occupied	3,742	0.2
For sale only	32,883	1.4
Sold, not occupied	6,586	0.3
For seasonal, recreational, or occasional use	55,786	2.3
All other vacants	61,532	2.6

Homeowner vacancy rate (percent) [8]	2.2	(X)
Rental vacancy rate (percent) [9]	8.1	(X)

HOUSING TENURE		
Occupied housing units	2,156,411	100.0
Owner-occupied housing units	1,455,775	67.5
Population in owner-occupied housing units	3,940,520	
Average household size of owner-occupied units	2.71	
Renter-occupied housing units	700,636	32.5
Population in renter-occupied housing units	1,694,657	
Average household size of renter-occupied units	2.42	

By 2020, it is projected that there will be 50,050 persons aged 65 or older living in the County, with further increases to 72,330 persons in 2030 and 83,570 persons in 2040. The 2020 projected total of 50,050 persons aged 65 or older is nearly three times the total number of persons in that age group living in the County in 2000, and the anticipated rate of population growth for this group from 2010 to 2030 is 2,165 persons per year, a level 2.8 times the 765 persons per year average rate recorded from 1980 to 2010. It is projected that by 2030, 20.3 percent of the County's total population will be age 65 or older, representing one of every 4.9 persons living in the county. This information is further detailed on Table 5.

Howard County has established an Office on Aging and Independence which has produced a "Master Plan for the Aging Population" in order to anticipate and prepare for the "types of services, programs and facilities" associated with the rapidly expanding 65+ portion of the County's population. The County expects that from 2020 to 2040 the number of persons living in he county younger than age 65 will remain relatively constant, while the 65+ portion of the population is expected to increase by 44 percent during the 2020's and an additional 15 percent during the 2030's. Part of the Master Plan is comprised of a list of the apartments, assisted living facilities, retirement communities, etc. that presently provide age and need appropriate housing opportunities for the senior portion of the population. That senior (65+) portion of the population is expected to more than double in number between 2015 and 2040, with some portion of that age cohort in need of a different form of housing.

School Enrollments

The significant increase in population within Howard County during the past decades has been accompanied by a corresponding increase in the County's school enrollments. During 1980, the Howard County Public School System (HCPSS), serving all of Howard County, reported a total enrollment of 25,228 students. Between 1980 and 1990, the number of students in the HCPSS increased by 18.9 percent to a total of 30,002 students and further increased to a total of 44,525 students in 2000. Between 2000 and 2010, the number of students in the County increased by 12.3 percent to a total of 49,991 students and further increased to a total of 55,638 students in 2017. The average annual increase in student enrollment from 2000 to 2017 was 654 net new students per year,

Howard County

DEMOGRAPHIC AND SOCIO-ECONOMIC OUTLOOK

TABLE 5

	Historical					Projected					
	1970	1980	1990	2000	2010 *	2015	2020	2025	2030	2035	2040
Population Characteristics:											
Total Population	61,911	118,572	187,328	247,842	287,085	309,050	332,250	346,500	357,100	363,500	366,350
Male	31,173	59,244	93,249	121,774	140,593	151,490	162,870	169,720	174,820	177,980	179,700
Female	30,738	59,328	94,079	126,068	146,492	157,560	169,390	176,780	182,290	185,510	186,640
Non-Hispanic White **	N/A	100,311	153,552	180,800	169,972	169,380	164,590	156,960	149,660	142,470	133,940
All Other **	N/A	18,261	33,776	67,042	117,113	139,670	167,670	189,540	207,450	221,020	232,400
Selected Age Groups:											
0-4	5,702	8,224	15,352	18,248	17,363	17,950	19,720	20,940	21,320	20,510	19,490
5-19	19,961	31,791	37,275	55,837	63,360	64,470	65,540	65,830	66,730	67,390	66,620
20-44	21,894	52,064	88,243	96,212	92,961	97,220	106,260	111,100	112,620	112,290	107,760
45-64	11,027	20,412	35,128	59,077	84,356	90,250	90,690	87,380	84,110	83,680	88,920
65+	3,327	6,081	11,330	18,468	29,045	39,150	50,050	61,260	72,330	79,640	83,570
Total	61,911	118,572	187,328	247,842	287,085	309,050	332,250	346,500	357,100	363,500	366,350
Total Household Population	60,673	117,467	185,371	244,224	284,763	306,492	329,396	343,312	353,506	359,454	361,894
Total Households	16,880	39,989	68,337	90,043	104,750	112,850	123,325	130,475	137,275	141,475	144,550
Average Household Size	3.59	2.94	2.71	2.71	2.72	2.72	2.67	2.63	2.58	2.54	2.50
Labor Force:											
Total Population 16+	40,346	86,969	143,338	185,381	221,950	243,430	263,890	276,290	285,590	292,410	297,090
In Labor Force	25,042	63,233	113,580	139,885	163,520	174,290	185,070	189,300	191,350	192,160	192,960
% in Labor Force *	62.1	72.7	79.2	75.5	73.7	71.6	70.1	68.5	67.0	65.7	65.0
Male Population 16+	20,141	42,990	70,462	89,426	107,100	117,660	127,490	133,460	138,020	141,520	144,200
In Labor Force	16,704	36,166	60,947	73,844	85,510	91,560	97,130	99,690	101,270	102,300	103,360
% in Labor Force *	82.9	84.1	86.5	82.6	79.8	77.8	76.2	74.7	73.4	72.3	71.7
Female Population 16+	20,205	43,979	72,876	95,955	114,850	125,770	136,400	142,830	147,570	150,890	152,890
In Labor Force	8,338	27,067	52,633	66,041	78,010	82,730	87,940	89,610	90,080	89,860	89,600
% in Labor Force *	41.3	61.5	72.2	68.8	67.9	65.8	64.5	62.7	61.0	59.6	58.6
Jobs by Place of Work :	22,397	56,654	105,751	159,188	189,573	216,100	235,200	247,000	258,200	269,300	281,000
Personal Income :											
Total (million of constant 2009$)	$1,617.5	$4,120.2	$7,924.1	$13,578.9	$18,412.2	$20,940.9	$24,796.8	$27,506.6	$29,635.7	$31,511.8	$33,231.6
Per Capita (constant 2009$)	$25,386	$34,377	$41,845	$54,405	$63,825	$67,759	$74,633	$79,384	$82,990	$86,690	$90,710

** For 2010 to 2040 non-hispanic white population is equal to "non-hispanic white alone", and all other population is equal to "all other races", alone and two or more races.

* Labor force participation rates for 2010 are estimates based on the 2008-2012 American Community Survey. These participation rates are applied to the Census 2010 population by age/sex to yield labor force estimates.

SOURCE: Projections prepared by the Maryland Department of Planning, July 2014. Population and houshold data from 1970 thru 2010 are from the U.S. Census Bureau, as is the labor force data from 1970 thru 2000. Labor force participation rate data for 2010 is an estimate by the Maryland Department of Planning based on 2008-2012 American Community Survey data. 1990 race and sex population is from modified age, race, sex data (MARS) and 2000 race and sex population from modified race data, both from the U.S. Census Bureau. Historical jobs, total personal income and per capita personal income data are from the U.S. Bureau of Economic Analysis.

Projections are rounded, therefore numbers may not add to totals.

and the 2017 enrollment of 55,638 students is 1.25 times the 2000 public school enrollment total of 44,525 students and 2.2 times the 1980 enrollment total of 25,228 students. The average number of public school children (PSC) per household in Howard County has decreased from 0.63 PSC per household in 1980 to an average of 0.49 PSC per household in 2015.

The 2018 school budget's general operating fund budget, encompassing salary and benefits plus transportation, utilities, supplies, non-public school placements, technology services and maintenance, totaled $819,106,284, indicating an average general operating fund expenditure of $14,421 per student. The HCPSS total expenditure budget of $1,079,753,831, which in addition to the foregoing costs includes grant programs, food and nutrition, wastewater treatment, theater, school construction, printing, technology, health, and other separately funded programs equates to a total expenditure of $19,407 per student. School district enrollments are expected to increase to 57,942 students by the 2019 school year, with a school district budget of $1,134,416,060, yielding an average per pupil cost (total budget) of $19,578. Historic enrollments and recent budgets are summarized below.

Howard County Public School Enrollments

School Fiscal year	1990	1995	2000	2010	2017	2018	2019
Fall Enrollment	30,002	37,323	44,525	49,991	55,638	56,799	57,942

Howard County School District
Projected Enrollments and Expenditures

2017/18-2019/20

School Year	2017/18	2018/19	2019/20
General Fund Budget ($)	798,418,984	819,106,284	850,682,321
Total School Budget ($)	1,077,630,676	1,079,753,831	1,134,416,060
Projected Enrollment	55,638	56,799	57,942
Projected General Cost ($)/Student	14,350	14,421	14,682
Projected Total Cost ($)/Student	19,368	19,407	19,578

The Howard County Public Schools include 41 elementary schools (grades Pre-K to 5), 20 middle schools(grades 6,7,and 8); 12 high schools (Grades 9-12); as well as 3 additional special schools.

Commercial Development

In addition to the County's increasing residential base, the commercial component of the County's property base has also increased in magnitude in the past several years. In recent decades the focus and concentration of economic activities in Howard County has shifted from the its former agricultural and light manufacturing base to a more diversified base reflective of a developing suburban area. According to data provided by the Bureau of the Census, during 1990 there were 5,384 businesses within the County with employment totaling 90,310 persons and payrolls of $2.250 billion. By 1995, there were 6,374 businesses reported within the County with 97,851 employees. A continued expansion of the local economy resulted in a total of 8,163 businesses with 145,239 employees and aggregate payrolls of $7.138 billion in 2005. By 2010 these totals had increased to 8,581 establishments, 150,997 employees, and payrolls of $8.627 billion. The most recent date provided by the Census indicates a 2016 total of 9,374 businesses with 176,059 employees and payrolls of $10.814 billion. The number of businesses within the County increased by 74.1 percent from 1990 to 2016 and the number of employees within the county increased by nearly 95 percent. During 2016, the professional, scientific and technical services sector of the economy accounted for the greatest number of jobs within the county, with a total of 42,102 jobs representing 23.9 percent of the county's employment base. This information is further detailed below.

US Bureau of the Census
County Business Patterns
Howard County, Maryland

	Employees	Payroll $000	Establishments	Average Payroll $	Employee/ Establishment
1990	90,310	2,250,520	5,384	24,920	16.8
1995[1]	97,851	3,057,697	6,374	31,248	15.4
2005	145,239	7,138,245	8,163	49,148	17.8
2010	150,997	8,627,141	8,581	57,135	17.6
2011	152,384	8,905,019	8,547	58,438	17.8
2012	157,128	9,256,223	8,745	58,909	18.0
2013	165,518	9,724,038	8,946	58,749	18.5
2014	168,040	10,046,930	9,139	59,789	18.4
2015	168,100	10,513,964	9,225	62,546	18.2
2016	176,059	10,814,141	9,374	61,423	18.8

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[1] Estimated payroll

During 2016, a majority of the business establishments in Howard County employed fewer than 10 employees. There were 4,902 Howard County businesses with one to four employees and 1,584 Howard County businesses with five to nine employees for a total of 6,486 businesses with fewer than 10 employees representing 69.2 percent of all businesses operating within the county.

RATABLE BASE AND TAX RATE

The economic and demographic characteristics of Howard County are reflected in the County's ratable base, and changes in the County's household base and commercial development may be examined in terms of the per parcel and total valuations (assessments) of the taxable properties in the County.

Ratable Base

In the State of Maryland, real properties are assessed at full market value and applicable State and local taxes are applied to the property's assessed value. The actual value used for assessment purposes is the market value of the property as determined by either replacement costs, comparable sales or capitalization of income. The property tax revenues generated through the imposition of the tax rates fund the various operations provided to property owners by the county government and all local taxing authorities, including schools, roads, fire protection, police protection, and other local services. Revenues generated within a County stay within the County, and in general are not used to fund state supplied services. As of mid year 2017, the total combined taxable real property valuation in Howard County amounted to $53.118 billion. This information, which is provided by the Maryland State Department of Assessment and Taxation, is summarized below:

HOWARD COUNTY PROPERTY ASSESSMENTS-2017

	Parcels	Value $	Value/Parcel $
Agricultural	1,131	424,789,070	375,587
Country Clubs	1	4,302,433	4,302,433
Residential	64,910	29,197,172,188	449,810
Condominiums	8,392	1,531,105,154	182,448
Residential Commercial	17	9,586,300	563,900
Commercial	1,799	4,544,601,155	2,526,182
Industrial	809	3,489,216,695	4,313,000
Commercial Condo	1,400	630,521,979	450,373
Apartments	152	2,324,481,198	15,292,639
Commercial Residential	149	45,323,934	304,187
Townhouses	24,326	7,458,252,853	306,596
Partial Exempt	0	299,656,353	0
Exempt	3,477	3,158,502,912	908,399
TOTAL	106,563	53,117,512,224	498,461

County Expenditures

The Howard County budget as presented is comprised of two broad sections. The General Fund budget includes general use tax revenues, including property taxes and income taxes, and expenditures such as education, police, snow removal and libraries. The General Fund budget receives 92.0 percent of its funding from various taxes collected within the county, and comprises slightly less than seventy percent of the total Howard County budget. Added expenditures included within the All Funds Budget are represented by restricted funds which are dedicated for specific purposes. Included within the All Funds Budget is the cost of Fire and Rescue Services, which amounts to $104,170,763 and is supported by a local tax. While it is a dedicated fund, it may be more appropriate to include that cost in the General Fund Budget, as it is a tax supported expense item.

During fiscal year 1995, the total budget (All Funds Budget) for Howard County operations was $323.6 million. Since then the County budget increased to $669.3 million in 2000, $911.5 million in 2005, and to $1.248 billion in 2010. During 2016 the cost of governmental operations reflected in the County budget totaled $1.397 billion. The County's 2018 budget indicates an increase in expenditures to $1.582 billion. Educational expenses are by far the single largest expense, totaling $627,146,166, chiefly comprised of HCPSS and the Howard County Community College. Education expenditures accounts for 57.1 percent of the County's General Fund budget and for 39.6 percent of the total (all funds) Howard County budget.

Real Estate Tax Rates

Within Howard County, there are no distinct municipal subdivisions, and the individual properties within Howard County are all subject to the same tax rates from the County taxing authority. All land is unincorporated and as such no Howard County properties are subject to distinct municipal taxes, only the County tax rates are applied. These taxes include property (both real property and business personal property), fire and rescue, recordation, mobile home, admission and amusement, local income, hotel and motel, and transfer. Educational costs within Howard County, which comprise 57.1 percent of the general fund budget and 39.6 percent of the total budget are paid for out of the County's general funds, with no dedicated school/education tax within the general tax rate. The most significant tax authority within the county is the Howard County government operations including school operations. The taxing district where the property that is the subject of this analysis is located has a combined (all sources) total tax rate of $1.382 per $100 of valuation. Additional taxes are collected on business personal property assessments for the County and for fire services. The tax rates in Howard County are set forth below.

Tax Authority Name/No.	Tax Rate
Howard County Government	1.014
Maryland State Tax	0.112
Fire District	0.176
Ad Valorem	0.080
Total Property Tax	1.382
Business Property	
County	2.535
Fire	0.440

OPTIONS FOR SENIOR LIVING

Erickson Living proposes to develop a full-service, campus style, Continuing Care Retirement Community (CCRC) on the subject property in the Clarksville section of Howard County. The proposed CCRC will contain independent, assisted living, skilled nursing and memory care units.

During the past several decades, several forms of housing, some of which include varying levels of household assistance or medical care have been developed that address the changing needs of homeowners as those homeowners age. There is an increasing level of service and care provided for persons as their individual needs change. These specialized housing types include:

Active Adult Communities- Similar in form to residential subdivisions with the exception that occupancy is limited to persons age 55 years or older.

Independent Living Facilities- Provide housing with a minimum of ancillary services, generally limited to one meal per day in a common facility. Other amenities may include basic shopping and house-keeping.

Assisted Living Facilities- Provide assistance for residents with requirements of daily living, including bathing, dressing, and basic medical and health care needs.

Continuing Care Retirement Communities- Generally provide a range of housing types and care levels ranging from independent living level to full, on-site, medical care. Residents are able to increase the level of care received as their individual needs increase, up to and including on-site skilled nursing care.

These forms of housing and housing occupancy reflect changes that occur throughout life as an individual, or a family's housing needs change. When needs change, presently occupied homes often become unsuitable for the residents of the home. As a family transits to a new home that is suitable for the family's needs, the previously occupied home becomes available for another family for whom it would be appropriate.

Project Description

The property that is the subject of this evaluation is a 61+/- acre tract of vacant land located at the intersection of Route 108 (Clarksville Pike) and Sheppard Lane in the Clarksville section of Howard County, Maryland. Erickson Living proposes to develop a Continuing Care Retirement Community on this land. The site, which is currently undeveloped with the exception of a Freestate Gas Station is surrounded by a mix of land uses including agricultural, residential, retail, commercial, open space and conservation areas. Erickson Living proposes to develop the subject property for a campus style Continuing Care Retirement Community containing approximately 1,200 independent living units in approximately fifteen (15) multi- story mid-rise residential buildings which will surround shared community buildings, courtyards and forest preservation areas.

The community buildings will contain the common facilities for the neighborhoods, including the dining room and commercial kitchen, public activity areas, classrooms, crafts rooms, beauty salons, stores, banks, pharmacy and central heating and cooling equipment. Certain spaces that are shared by all of the campus residents such as a fully staffed medical clinic, an inter-faith worship center, library, an indoor aquatics center, an auditorium, conference center, and other recreational spaces such as wood shops, hobby rooms, computer labs, etc, are also contained within the various community buildings. The campus will contain a health club and an indoor aquatics center for the use of the community's residents. Climate controlled corridors and pedestrian bridges will inter-connect each of the buildings to other buildings within the overall campus. The intent is to provide for the day-to-day as well as long-term health care needs of the residents.

In addition to the independent living units, the campus will also contain assisted living, skilled nursing and memory care units. This facility will be built in phases based upon the demand for assisted living, skilled care and memory care units. It is expected that at build-out, there will be approximately 240 assisted living and skilled nursing beds, all in private rooms. At completion the proposed development would be expected to have a resident population of approximately 1,700 persons. The campus will be built in phases over a period of time with completion dependent upon market absorption.

The proposed CCRC will include extensive on-site medical services to provide for the ongoing medical needs of the community's residents, including full-time doctors with specialization in geriatric medicine, as well as additional medical personnel including cardiologists, dentists, podiatrists, ophthalmologists, gastroenterologists and other specialists on an as-needed basis. Medical services are augmented by trained on-site emergency first responders who will be available 24 hours a day. According to estimates provided by Erickson Living and based upon past experience with operating facilities, it is estimated that the proposed CCRC would employ approximately 650 Full Time Equivalent (FTE) employees. Staggered shifts will be implemented in an effort to avoid any increases in traffic volume during peak rush hour commuting periods. It is expected that the proposed development would be the 15th largest employer within Howard County.

The CCRC is to be operated as a self sufficient, controlled access residential community with security personnel patrolling the property and monitoring the vehicular access to and about the site. The buildings will be fully sprinklered. The maintenance, repair and snow removal of all on-site roadways, as well as the street lighting systems will be the responsibility of Erickson Living. Comparable projects completed by Erickson Living typically contain a mix of sizes for independent living units, ranging from one bedroom units to two-bedroom units. The fair market value of the proposed development has been estimated based upon the equalized value of other comparably sized communities developed by Erickson in recent years. For the proposed CCRC, an average assessed value of $181,000[2] per living unit is estimated, resulting in an estimated completed project assessed value of $260,640,000. The proposed development would represent a 0.49 percent increase in Howard County's current total real property valuation of $53.1 billion.

Added Services

In terms of the range of services provided to the community at large, and specifically, to the proposed development, Howard County is typical of suburban areas where a broad range of services and facilities are provided primarily for the benefit of household residents. The proposed CCRC will, itself, provide an extensive range of on-site services to its residents. The services to be provided by Erickson Living include first response medical service, transportation and paratransit (transportation for those with limited mobility), security, on-site roadway maintenance and street

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[2] Assessed value estimate based upon capitalization of anticipated net operating income. May be compared to nearby Belmont Station apartments assessment of $180,640 per unit and Roberts property anticipated assessment of $191,211 per unit.

lighting, and social services. Automated fire suppression systems will be installed in all of the buildings and facilities. The self contained nature of the development, coupled with the range of services to be provided limit the dependence upon Howard County for services. The services to be provided by Howard County to the planned CCRC are considered to be comparable to those furnished to other low-intensity commercial developments and are quite different from the range of governmental and school services provided to typical residential sub-divisions and individual properties. In many respects, the local services cost generation of a CCRC may be compared to a major hotel or hospital operation. Some would assume a heightened need for emergency services with a community of persons aged 65 years and older. That assumption is mitigated by several factors. Most significantly, the community is staffed with health care professionals who will serve as the first responders to emergencies. Residents in need of immediate care will pull a chain on their wall or press a button to summon help rather than dialing 911. Further, residents who do have significant health issues may be attended to within the community's assisted living, skilled nursing and memory care units. Residents of those units are already receiving a heightened level of daily medical attention and are less likely to be in need of emergency services than the general population.

IMPACT ANALYSIS

Fiscal Impact

The fiscal impact resulting from the development of the subject property for the proposed CCRC is related to the costs incurred by the County in providing the various services required by the project. The determination of the fiscal impact of the proposed development involved the use of an econometric model which is generally referred to as the "proportional valuation method". This method (proportional valuation) is considered to be the most appropriate, and is a widely used cost/revenue analysis tool. The "proportional valuation method" constructs an econometric model of the actual appropriations and revenues in the subject governing district (Howard County) and allocates these costs and revenues into residential and non-residential categories. An adjustment is made in the "proportional valuation method" to reflect the fact that commercial/non-residential ratables typically maintain a significantly higher valuation in comparison to the average value of all properties. This adjustment is made on an inversely proportional basis whereby the higher the average value of non-residential parcels, relative to all parcels, the greater the downward adjustment the proportional allocated cost will be.[2] The rationale for this adjustment is that, on a direct valuation basis, non-residential properties would otherwise be allocated more than their appropriate share of costs simply because of their higher average valuation. Within income producing (commercial) developments it is the anticipated employment that is expected to be generated by the proposed development that represents the key determining components in estimating the costs associated with the proposed development.

In preparing the cost/revenue allocations in this fiscal evaluation, it is assumed that the proposed development was complete, in operation, assessed and taxed during the most recent calendar year. In this instance, this assumption hypothesizes the development had been in place during 2018. By preparing this analysis on a current basis, actual cost and revenue data for Howard County may be utilized, and many factors subject to speculation, such as future property values, prospective tax rates, future distributions of appropriations and the influence of other prospective developments in the County may be avoided. Utilizing the aforedescribed methodology and assumptions, the overall impact of the new development can be quantified through a cost/revenue

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[2] The Fiscal Impact Handbook, Burchell and Listokin, Rutgers University.

analysis of its effect upon the major sources of services furnished to property owners and residents in Howard County.

Assumptions, Conditions and Qualifications

The preparation of a cost/revenue analysis which measures the overall and specific impacts resulting from the development and occupancy of the proposed project necessarily requires that certain empirical assumptions be made:

1) All dollars are 2018 dollars--the fiscal impact shown reflects the forecasted impact as if the development were completed and fully operational in 2018;

2) Other growth or changes (demographic/economic) occurring in Howard County during the development phases of the project may well have their own impact on fiscal matters, but are not included within the scope of this study in order to empirically assess the direct impact of the CCRC;

3) Base fiscal data for revenue impact analysis was based upon the current tax rates utilized by taxing bodies within Howard County;

4) The proportional valuation methodology assumes that current average operating costs within Howard County are adequate and may serve as a reasonably accurate indicator of added service levels continued at the same relative scale; and

5) The current distribution of expenditures among the various sectors of County service will remain constant in the short term and will serve as the primary indicator of the way in which additional expenditures will be subsequently allocated.

Utilizing the aforedescribed methodology and assumptions, the ultimate impact of the completion and occupancy of the proposed development can be determined through a cost/revenue analysis of the major taxing sources impacted by the new development.

COUNTY IMPACT

The fiscal effects anticipated to result from the construction and occupancy of the proposed CCRC in Howard County, Maryland shall be analyzed in this section in terms of the added costs expected to be incurred by the County providing services to the property. An evaluation of the added tax revenues and other revenues expected to accompany the proposed development shall also be provided.

County Costs

Insofar as the costs of the services now being provided by the County is the statistical foundation for the costs to be generated by the new development, an analysis of existing service/cost relationships has been undertaken. In examining the services which will be provided by the County and, hence affected by the proposed development, it is apparent that the overwhelming proportion of the local services furnished, the facilities utilized, and the personnel required by Howard County are involved in serving the needs of the County's resident population, with commercial properties, particularly large self contained office complexes, industrial sites, and others creating a limited demand for local governmental services.

The anticipated fiscal impact of the proposed development has been estimated based upon the use of the proportional valuation method. Proportional valuation is considered to be the most appropriate, widely used cost/revenue analysis tool and has been accepted by the Urban Land Institute in its Development Impact Assessment Handbook for determining the fiscal impacts of new developments. Costs and revenues are divided into residential, non-residential categories and other and an adjustment is made in the "proportional valuation method" to reflect the fact that commercial/non-residential ratables typically maintain a significantly higher valuation in comparison to the average value of all properties. The rationale for this adjustment is that, on a direct valuation basis, non-residential properties would otherwise be allocated more than their appropriate share of costs simply because of their higher average valuation. Within income producing (commercial) developments it is the anticipated employment that is expected to be generated by the proposed development that represents the key determining components in estimating the costs associated with the proposed development. Costs associated with residential developments are determined on a per capita and/or per school student basis.

A summary of the County's current (2018) General Fund budget revenues and expenditures, as presented in Table 6, provides a useful profile for the determination of the fiscal impact attributable to the proposed development. As may be seen on Table 6, the County's school expenditure is the single largest cost item, totaling $627.1 million in 2018, equal to 39.6 percent of the County's total expenditures of $1,581,936,633 and 57.1 percent of the Howard County general (92.0 percent tax funded) budget of $1,098,746,451. The most significant funding sources within the General Fund Budget are Property Taxes and Income Taxes which together account for 88.8 percent of the General Fund Budget. Due to the nature of the proposed development, no added school children are expected to enroll in the Howard County school district as a direct result of the construction and occupancy of the proposed CCRC and no added school costs are anticipated.

Residential Costs- Before the data and relationships indicated in Table 6 may be utilized, certain adjustments must be made to separate its residential and non-residential components. The County's residential properties, which include properties classified as Residential, Condominium, Commercial Residential, Apartments, and Townhouses represent 91.91 percent of the County's total properties and 76.37 percent of the total valuation, which averages to 84.14 percent of parcels/valuation representation. Under the proportional valuation methodology, 84.14 percent of the County's total tax-supported costs would be assigned to the County's residential properties. Of the County's current non-education, general fund budget appropriations of $575,771,048[4], 84.14 percent, or $484,453,760 would be assigned to the County's estimated population of 323,220 persons, yielding a per-capita, tax supported cost of $1,499. The proposed CCRC is a self contained community where the majority of the needs of the residents will be addressed by the employees and the services provided by Erickson Living, with many of those services replacing services that would typically be provided by the County. Despite the inherent efficiency associated with the nature of the development and the level of on-site services, the cost assigned to the anticipated total of 1,700 residents of Erickson Living at Limestone Valley have been estimated utilizing the calculated County

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[4] Total Howard County 2018 General Fund expenditures of $1,098,746,451 minus educational expenses of $627,146,166 plus Fire and Rescue Services expense of $104,170,763 equals $575,771,048.

average cost of $1,499 per person. Accepting this present cost allocation with no allowance for marginal costing or services provided on site that would replace County provided services, the resulting county cost associated with the 1,700 residents of the proposed development would amount to $2,548,020 (1,700 persons x $1,499 per person = $2,548,020). If some level of efficiency is assumed in adding 1,700 new residents of the CCRC to a present community of nearly 325,000 persons and considering the concentrated, higher-density nature of this controlled access community where many services are provided by the property owner through the 650 on site employees of the CCRC it would not be unreasonable to assume that the residents would be expected to have a lower assignment of costs than the general population of Howard County. If that efficiency results in a cost level of fifty percent of the average, then the allocated use of county services occasioned by the development of the proposed CCRC would be estimated to total $1,274,010.

Commercial Costs- In addition to the allocated municipal cost of services associated with the resident population of the proposed CCRC, there would also be an allocation of costs to the anticipated total of 650 employees who will eventually be employed by the CCRC. Commercial and industrial properties in Howard County, which include Commercial, Industrial, Country Clubs and Commercial Condominiums properties represent 3.76 percent of all properties and 16.32 percent of the County's total assessed valuation, which averages to 10.04 percent of parcels/valuation representation. Given these distributions, 10.04 percent of the total current county expenditures would be assigned, in terms of cost/benefit (or cost generation) to the 4,009 commercial/industrial properties in Howard County, with an assessed valuation of $8,668,642,262. Of the County's current estimated tax-supported, non-education appropriations of $575,771,048, 10.04 percent, or $57,807,400 would be assigned to the County's 4,009 non-residential properties.

TABLE 6
HOWARD COUNTY, MARYLAND
FISCAL BASE AND TAX RATES 2018

A. RATABLE BASE

	Parcels	$ Value	$ Value/Parcel
Agricultural	1,131	424,789,070	375,587
Country Clubs	1	4,302,433	4,302,433
Residential	64,910	29,197,172,188	449,810
Condominiums	8,392	1,531,105,154	182,448
Residential Commercial	17	9,586,300	563,900
Commercial	1,799	4,544,601,155	2,526,182
Industrial	809	3,489,216,695	4,313,000
Commercial Condo	1,400	630,521,979	450,373
Apartments	152	2,324,481,198	15,292,639
Commercial Residential	149	45,323,934	304,187
Townhouses	24,326	7,458,252,853	294,490
Partial Exempt	0	299,656,353	0
Exempt	3,477	3,158,502,912	908,399
TOTAL	86,313	53,117,512,224	493,827

B. BUDGET SUMMARY-General Fund

Appropriations	Value	Percent
Education	627,146,166	57.1
Public Safety	134,812,893	12.3
Public facilities	70,864,978	6.5
Community Services	69,648,002	6.3
Legislative and Judicial	28,288,054	2.6
General Government	29,003,806	2.6
Non-Departmental Expenses	138,982,552	12.7
Total Howard Co. Services	$1,098,746,451	100.00

Revenues	Value	Percent
Property Taxes	$531,695,797	48.4
Local Income Tax	444,292,184	40.4
Recordation taxes	24,170,434	2.2
Other Local Taxes	8,682,851	0.8
States Shared taxes	1,627,606	0.2
Charges for Services	$13,030,776	1.2
Licenses and Permits	9,850,835	0.9
Interest, Use of Money	2,138,900	0.2
Fines and Forfeitures	3,987,105	0.4
Revenues Other Agencies	7,110,265	0.7
Interfund Reimbursement	42,202,158	3.8
Prior Years Funds	9,957,540	0.9
Total	1,098,746,451	100.0

The allocated costs of the County services which would be provided to the proposed CCRC can now be determined on the basis of the added employees of the proposed development relative to the average county cost per employee generated by the County's existing non-residential properties. Erickson Living estimates a total FTE employment level of 650 employees at the proposed facility. The allocated, Howard County costs which could be expected as a result of the proposed development may now be estimated through the following formula:

Non-Residential Costs	/	Existing Employees	X	Added Employees	=	Anticipated added Costs
$57,807,400	/	181,005 (Est.)[6]	X	650 (FTE)	=	$207,590

Under the added employment methodology, the allocated annual cost of County government services associated with the development and occupancy of the proposed new CCRC would equate to $319.37 per employee for a total annual cost of $207,590.

The combined allocated residential and commercial cost of Howard County services assigned to the proposed CCRC have been calculated to be between $1,481,600 ($1,274,010 + $207,590 = $1,481,600, assuming an adjusted cost of services to the new residents and $2,755,610 ($2,548,020 + $207,590) assuming a full average cost of providing services to the residents of the CCRC.

Cost Allocations - The actual experience and distribution of the County's expenditures among its various budgetary components provides a basis for the allocation of costs estimated for the proposed new development. The County's current general government budget appropriations, which furnish the statistical foundation for cost and revenue allocations, are tabulated in Section B of Table 6. Utilizing the proportional appropriations observed in Howard County, the upper limit local general fund costs of $2,755,610 which are attributable to the proposed development could be allocated to the pertinent cost categories. The allocation of costs would reflect an annual allotment of estimated appropriations predicated upon the County's existing levels of service and appropriations. The allocated costs of $2,755,610 would indicate that the County's general fund non-educational

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[6] Employee estimate based on the Census Bureau's County Business Patterns 2016 reported employment total of 176,059 employees increased by 75 percent of the 1990 to 2016 average annual employment increase of 3,298 net new employees per year.

appropriations (inclusive of Fire and Rescue Services) of $575,771,048 would be expected to increase by less than 0.48 percent in order to maintain the same level and quality of County tax supported services to the existing properties in Howard County.

County Revenues

The existing and added costs of County services are paid by the various sources of revenues. In Howard County these categories include real estate (ad valorem) and personal income taxes; transfer funds (State and Federal Payments); and other, primarily comprising permit/privilege fees, impact fees and charges for services. These categories contain revenue sources which may be considered to be "one time" contributions or fees which are generally derived from an off setting cost generation, as well as other recurring annual revenue sources. The annual, recurring revenue to be derived from the taxes associated with the completion and occupancy of the proposed CCRC are examined below. As was the case in estimating costs, the added revenues generated by the proposed CCRC may be calculated on the basis of the County's actual experience in generating County revenues. The added revenues anticipated to be generated are summarized as follows.

Local Tax Revenues - Of the County's current annual general fund budgeted revenues of $1,098,746,451, the most significant revenue source is the property tax which accounts for $531,695,797 equal to 48.4 percent of the County general fund revenues of $1,098,746,451, with personal income taxes providing an additional $444,292,184 (40.4 percent) in revenue. These two revenue sources account for $975,987,981, equal to 88.8 percent of the total county general fund revenues of $1,098,746,451. In Howard County, property taxes are paid by the owners of record of the $53.1 billion in assessed property value. In the 2018 fiscal year, the tax rate for real property in Howard County including the site of the proposed retirement community was $1.382 per $100 of real assessed property value. The proposed CCRC would be expected to have a total real property value of $260,640,000 and would be expected to generate $3,533,253 in added tax revenues for the various tax authorities governing the subject property. The distribution of this tax revenue among the various tax authorities is set forth below.

Erickson Living
Proposed Howard County CCRC
Anticipated Tax Revenues

Tax Authority Name/No.[5]	Tax Rate	Taxes Generated
Howard County Government	1.014	$ 2,642,890
Fire District	0.176	458,726
Ad Valorem	0.080	208,512
Total Property Tax	1.270	3,310,128
Business Property[6]		
County	2.535	190,125
Fire	0.440	33,000
Total	2.975	223,125
Total Taxes		$3,533,253

In addition to the local taxes raised from the use and implementation of the local tax rate, the county also collects a significant share of its revenues from the imposition of a local income tax, currently set at 3.2 percent of income. According to the U. S. Census Bureau, American Community Survey, during 2016, within Howard County the median household income for households with the householder aged 65 years or older was $77,598, with 72.3 percent of those households estimated to have annual incomes greater than $50,000. With an estimated total of 1,344[7] households within the proposed CCRC, and utilizing the 65+household income estimate of $77,598, added Howard County income tax revenue of $3,337,335 would be calculated (1,344 households x $77,598 per household at 3.2 percent tax rate equals $3,337,335) When combined with the added revenue

---

[5] Maryland State Tax rate of 0.112 has been omitted from this revenue calculation as those revenues collected are for the funding of principal and interest payments on state bonds, and are not part of the Howard County operating budget. This tax would be expected to generate $291,917 in revenue for the State of Maryland.

[6] Based upon an estimated initial furniture, fixtures and equipment assessment of $7,500,000.

[7] It is assumed that within the proposed CCRC, 40 percent of the 240 care units have a spouse living in one of the 1,200 ILU's. Therefore the total number of households is reduced from 1,440 to 1,344 (1,200 + 60% of 240 [144] equals 1,344).

collected on the real property the total income accruing to Howard County from the proposed development would total $6,870,600 (rounded).

Other Local Revenue Sources - Howard County generates revenue from a variety of additional sources, licenses and permits, fines and forfeits, charged services; and miscellaneous or other revenues. During the construction phase of the proposed development the project would be expected to generate significant fee income for the County, but those fees are assumed to be one time assessments and not a part of the steady-state operations of the proposed CCRC. The proposed CCRC may increase these fees as a secondary impact of development, but the estimate of increased revenues from these sources has not been included as an additional revenue source within the revenue analysis of this analysis.

Fiscal Summary - Local Howard County added tax revenues are estimated at $6,870,588 had the proposed CCRC been completed and occupied during 2018. The allocated cost of providing County services associated with the proposed CCRC total $2,755,610, and the annual County revenue surplus for local government operations is estimated to total $4,114,978. This net revenue surplus is considered to be highly conservative as the cost assumptions associated with the 1,700 residents of the community, who will be provided with a very wide range of services by Erickson Living, have been based on the average per capita costs associated with the needs of the general population of Howard County. It is believed that the residents of the community will generate costs at a significantly lower rate than that of the general population.

Erickson Living
Proposed Howard County CCRC
Anticipated Fiscal Impact

Added Tax revenue	$6,870,588
Allocated Tax Supported Costs	$2,755,610
Net fiscal impact	$4,114,978

FISCAL IMPACT OVERVIEW

In the preceding sections of this fiscal analysis, the nature and magnitude of the proposed CCRC in Howard County relative to the County have been defined and quantified. The prospective impact upon the various services furnished by the County have been determined. The additional need for a variety of services, and the costs, as a result of the proposed development were substantially refined to illustrate the ultimate impact through cost/revenue analysis.

Relative to Howard County's current (2018) fiscal infrastructure, the proposed development is expected to generate annual revenues which significantly exceed the anticipated added costs of providing service. This anticipated net revenue surplus would be available to the County for either an expansion of existing services, an adjustment to the local tax rate, or a combination of these options.

The existence of a significant revenue surplus for local, school and other operations results from the specific nature of the proposal and the substantial extent of the on-site services to be provided by Erickson Living. The government services provided within Howard County, including general government, sheriff, fire and emergency services, road maintenance and lighting, health, welfare, recreation and, perhaps most significantly, education, are structured to respond to the needs of the County's rapidly growing resident population base.

Based upon the foregoing fiscal evaluation, the proposed CCRC would be expected to result in a significant net fiscal benefit for the various entities which presently provide services within the County with surplus revenues generated for school and county operations. It is estimated that the total net revenue surplus resulting from the construction and occupancy of the proposed CCRC would have totalled $4,114,978 had the project been occupied during 2018. It is expected that by 2020 there will be 50,050 persons aged 65 or older living in the County, with further increases to 72,330 persons in 2030 and 83,570 persons in 2040. The 2020 projected total of 50,050 persons aged 65 or older is nearly three times the total number of persons in that age group living in the County in 2000, and the anticipated rate of population growth for this group from 2010 to 2030 is 2,165 persons per year, a level 2.8 times the 765 persons per year average rate recorded from 1980 to 2010. Howard County has established an Office on Aging and Independence which has produced a "Master Plan for the Aging Population", intended to anticipate and prepare for the "types of services, programs and facilities" associated with the rapidly expanding 65+ portion of the County's population. The County expects that from 2020 to 2040 the age 65+ portion of the population is expected to increase by 44 percent during the 2020's and an additional 15 percent during the 2030's. Part of the Master Plan is comprised of a list of the apartments, assisted living facilities, retirement communities, etc. that provide age and need appropriate housing opportunities for the senior portion of the population. The proposed Erickson Living CCRC is the type of facility that would address the expanding needs of a component of the County's present and future population.

Due to their inherent operational structure and the level of service provided by the entity operating a Continuing Care Retirement Community, these facilities have only a limited impact on (need for) local services. These communities are primarily self sufficient and depending on their size and location can operate as an insular property, with the day to day needs of the residents of the community addressed on site, with medical, nutrition, recreational, educational, entertainment and other social needs addressed within the campus setting. At the same time, these facilities are among the highest value properties, with a density and value of development that provides for a very favorable tax revenue stream and net fiscal impact of the proposed development.

Introduced 7/2/18
Public hearing 7/16/18
Council action 7/27/18
Executive action 8/6/18
Effective date 10/6/18

County Council of Howard County, Maryland

2018 Legislative Session Legislative day # 10

BILL NO. 59 – 2018

Introduced by:
The Chairperson at the request of Erickson Living Properties II, LLC

AN ACT amending the General Plan for Howard County ("PlanHoward 2030") by adjusting the Planned Service Area boundary for water and sewer service to include approximately 61 acres of property located west of Clarksville Pike (MD Route 108) and south of Sheppard Lane, in Clarksville, Howard County, Maryland; to adjust the Growth Tier Maps of Howard County to reflect the incorporation of said property into the Planned Service Area and the designation of said property within the Growth Tier 1 area of Howard County; and further designating said property as a Targeted Growth and Revitalization Designated Place Type; and providing that certain adjustments will be null and void unless certain conditions are met; and generally relating to PlanHoward 2030.

Introduced and read first time July 2, 2018. Ordered posted and hearing scheduled.

By order Jessica Feldmark
Jessica Feldmark, Administrator

Having been posted and notice of time & place of hearing & title of Bill having been published according to Charter, the Bill was read for a second time at a public hearing on July 16, 2018.

By order Jessica Feldmark
Jessica Feldmark, Administrator

This Bill was read the third time on July 27 2018 and Passed ___, Passed with amendments ✓, Failed ______.

By order Jessica Feldmark
Jessica Feldmark, Administrator

Sealed with the County Seal and presented to the County Executive for approval this 30th day of July, 2018 at 11 [✓ a.m.]/p.m.

By order Jessica Feldmark
Jessica Feldmark, Administrator

[✓ Approved]/Vetoed by the County Executive Aug 6, 2018

Allan H. Kittleman, County Executive

NOTE: [[text in brackets]] indicates deletions from existing law; TEXT IN SMALL CAPITALS indicates additions to existing law; ~~Strike-out~~ indicates material deleted by amendment; Underlining indicates material added by amendment.

EXHIBIT F

WHEREAS, the General Plan for Howard County ("PlanHoward 2030") establishes the Planned Service Area, which is the area within which the County provides public water and sewer service; and

WHEREAS, PlanHoward 2030 also establishes the Growth Tier Maps of Howard County which maps were adopted by Howard County in fulfillment of its obligations under the Sustainable Growth and Agricultural Preservation Act of 2012 (Senate Bill 236); and

WHEREAS, PlanHoward 2030 further establishes the Designated Place Type Maps of Howard County which maps were also adopted by Howard County in fulfillment of its obligations under the Sustainable Growth and Agricultural Preservation Act of 2012 (Senate Bill 236); and

WHEREAS, PlanHoward 2030 provides that any requests for a General Plan amendment for the expansion of the Planned Service Area for water and sewer service should be denied unless the following minimum criteria are met: the proposed expansion of the Planned Service Area is part of a zoning proposal and is consistent with the General Plan and Smart Growth policies; or the proposed expansion of the Planned Service Area is intended to provide for a public or institutional use such as a religious facility, charitable or philanthropic institution, or academic school; and

WHEREAS, the proposed expansion of the Planned Service Area boundary to include approximately 61 acres of property located west of Clarksville Pike (MD Route 108) and south of Sheppard Lane, in Clarksville, Howard County, Maryland is further identified as Tax Map 34, Parcel 185 and a part of Tax Map 28, Parcel 100 (the "Property"), as shown on attached **Exhibit A** and **Exhibit B**; and

WHEREAS, the proposed expansion of the Planned Service Area is a part of a specific zoning proposal to rezone the Property from RC-DEO to CEF-M for the stated purpose of providing a continuing care retirement community ("CCRC") to consist of independent living units; assisted living; and skilled nursing care; and

WHEREAS, the establishment of a CCRC on the Property in accordance with the Petitioner's stated purpose advances a number of stated land use policies within the General Plan and will satisfy in part a growing and well documented need for continuing care retirement communities within Howard County for people over the age of 62.

WHEREAS, the establishment of such a CCRC at the proposed location will afford the County's senior population much needed additional flexibility to age in place within the County; and

WHEREAS, Chapter 6 (Growth) of the Howard County General Plan notes the following:

> *[w]hereas the total U.S. population grew by 9.7% from 2000 to 2010, those entering the 45 to 64 year age cohort, the approximate ages of the baby boomers, increased by 31.5% during that time period. Baby boomers currently make up about 29% of the countywide population and are starting to move into the 65-plus age cohort.*
>
> *PlanHoward, Chapter 6 (Growth), pg. 66*

In addition, Chapter 6 (Growth) of the Howard County General Plan makes the following pertinent finding:

> *[w]hereas the overall County population increased by 16%, those 65 and over increased by 57%. There are now 10,577 more residents 65 and older compared to ten years ago – 29,045 total in 2010 compared to 18,468 in 2000. Almost 27% of the total increase of 39,243 residents over the decade was comprised of those aged 65 and older. The very old, 85 and over, increased by 47%. This trend will continue as the baby boomers continue to age.*
>
> *PlanHoward, Chapter 6 (Growth), pg. 66*

Furthermore, Policy 9.4 of the Howard County General Plan aims to "expand housing options to accommodate the County's senior population who prefer to age in place and people with special needs." In support of that Policy Goal, the Howard County General Plan finds that the

> *County's housing stock should support the aging population and will need to continue General Plan 2000 policies to promote diverse senior housing for those that wish or need to downsize to more easily maintained units as they age. The policies should also continue to support seniors who choose to age in place in their own homes or in their own communities...The County also recognizes that as older residents' ability to live independently diminishes, they often need to move to housing that provides support services. There are both*

> *nursing and assisted living options for seniors in the County, offering a continuum of services, from acute care to congregate and group housing to in-home services. In order to accommodate the projected 19% of residents age 65 or older by 2030, the County's support of continuing care housing and services must be maintained.*
>
> *PlanHoward, Chapter 9 (Housing), pp. 130-131*; and

WHEREAS, the Property is adjacent to the existing boundary of the Planned Service Area and that the inclusion of the Property will continue the linear boundary of the Planned Service Area without including an intervening privately owned parcel currently not located in the Planned Service Area; and

WHEREAS, the Planning Board has reviewed and recommended approval of the proposed expansion.

Now, Therefore,

Section 1. Be It Enacted by the County Council of Howard County, Maryland that the PlanHoward 2030 policy maps identified below are amended to expand the Planned Service Area, the Growth Tier I Area, and the Growth and Revitalization Designated Place Type area to include approximately 61 acres of property located west of Clarksville Pike (Md Route 108) and south of Sheppard Lane, in Clarksville, Howard County, Maryland and further identified as Tax Map 34, Parcel 185 and a part of Tax Map 28, Parcel 100 (the "Property"), as shown on attached **Exhibit A** and **Exhibit B**. Amended Policy Maps include: Map 4-1; Map 5-1; Map 6-2; Map 6-3; and Map 8-1.

Section 2. Be It Further Enacted by the County Council of Howard County, Maryland that the provisions of this Act providing for expansion of the Planned Service Area and amendments to the Growth Tier Maps and Designated Place Types for Howard County shall be null and void and the Planned Service Area, Growth Tier Map, and Designated Place Type as it relates to this Property, shall revert to the Planned Service Area, Growth Tier, and Designated Place Type in place prior to this Act without any additional action of the County Council if:

(1) The Howard County Zoning Board shall fail to issue a Decision and Order approving a Petition to Amend the Zoning Maps of Howard County to rezone the Property to CEF-M for the stated purpose of developing a CCRC community within 3 years from the effective date of this Act; or

(2) The connection between the Property and the public water and sewer infrastructure ~~are~~ for the purpose of serving a CCRC development is not made within 10 years of the effective date of this Act.

Section 3. Be It Further Enacted by the County Council of Howard County, Maryland that this amendment be attached to PlanHoward 2030.

Section 4. Be It Further Enacted by the County Council of Howard County, Maryland that if any provision of this Act or the application thereof to any person or circumstance is held invalid for any reason in a court of competent jurisdiction, the invalidity shall not affect other provisions or any other application of this Act which can be given effect without the invalid provisions or application, and for this purpose the provisions of this Act are severable.

Section 5. Be It Further Enacted by the County Council of Howard County, Maryland that this Act shall become effective 61 days after its enactment.

EXHIBIT A

SURVEYED DESCRIPTION
PROPOSED PARCEL

BEING PART OF THE PROPERTY ACQUIRED BY LIMESTONE VALLEY FARM, A MARYLAND GENERAL PARTNERSHIP FROM BARBARA L. WARFIELD BY DEED DATED AUGUST 8, 1995 AS RECORDED IN LIBER 3583 FOLIO 234, AMONG THE LAND RECORDS OF HOWARD COUNTY, MARYLAND AND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING FROM THE INTERSECTION OF THE DIVISION LINE BETWEEN THE LANDS OF BREEDEN FAMILY LIMITED LIABILITY COMPANY (LIBER 5341 FOLIO 656) ON THE WEST, AND THE LANDS OF LENORE, LLC (LIBER 11056 FOLIO 243) AND SERVILLE LLC (LIBER 11119 FOLIO 401) ON THE EAST, WITH THE DIVISION LINE BETWEEN THE LANDS OF LIMESTONE VALLEY FARM (LIBER 3583 FOLIO 234) ON THE NORTH AND THE SAID LANDS OF LENORE, LLC AND SERVILLE LLC ON THE SOUTH, THENCE WITH SAID DIVISION LINE;

A. SOUTH 67° 25'003" EAST, 365.13 FEET TO THE POINT OF BEGINNING; THENCE DEPARTING SAID DIVISION LINE AND WITH A LINE THROUGH THE SAID LANDS OF LIMESTONE VALLEY FARM, THE FOLLOWING FIVE COURSES AND DISTANCES

1. NORTH 07° 01' 21" WEST, 154.40 FEET, THENCE;

2. CONTINUING, NORTH 17° 32' 18" WEST, 123.97 FEET, THENCE;

3. CONTINUING, NORTH 64° 44' 46" EAST, 193.40 FEET, THENCE;

4. CONTINUING, SOUTH 86° 08' 09" EAST, 802.70 FEET, THENCE;

5. CONTINUING, SOUTH 74° 18' 35" EAST, 781.09 FEET TO THE CENTERLINE OF SHEPARD LANE (VARIABLE WIDTH AND PRESCRIPTIVE RIGHT-OF-WAY), THENCE WITH SAID CENTERLINE;

6. SOUTH 14° 10' 35" EAST, 458.61 FEET TO THE INTERSECTION OF SAID CENTERLINE WITH THE SOUTHERLY SIDE OF CLARKSVILLE PIKE - MD RTE. 108 (PRESCRIPTIVE RIGHT-OF-WAY), THENCE WITH SAID SOUTHERLY SIDE;

7. SOUTH 39° 34' 56" WEST, 372.59 FEET; THENCE DEPARTING SAID SOUTHERLY SIDE OF CLARKSVILLE ROAD AND WITH A LINE THROUGH SAID CLARKSVILLE PIKE AND WITH THE EXTENSION OF THE DIVISION LINE OF THE SAID LANDS OF LIMESTONE VALLEY FARM ON THE NORTH, AND THE LANDS OF LENORE, LLC (LIBER 11056 FOLIO 243) AND SERVILLE LLC (LIBER 11119 FOLIO 401) ON THE SOUTH;

8. NORTH 67° 25' 03" WEST, 1674.87 FEET TO THE PLACE OF BEGINNING.

CONTAINING 1,054,111 SQUARE FEET OR 24.199 ACRES

I HEREBY CERTIFY THAT THE METES AND BOUNDS DESCRIPTION HEREIN WAS PREPARED BY ME PERSONALLY OR UNDER MY DIRECTION AND THAT THIS DESCRIPTION AND ANY SURVEY WORK REFLECTED HEREIN WAS PREPARED IN COMPLIANCE WITH COMAR 09.13.06.12.

ROBERT C. HARR, JR.
21587

7/2/18
DATE

ROBERT C. HARR, JR.
STATE OF MARYLAND
PROFESSIONAL LAND SURVEYOR NO. 21587
EXPIRATION DATE JANUARY 16, 2019

S:\Surveys\2017\SD172015\Admin\Metes and Bounds\SURVEYED DESCRIPTION-SHEPARD LANE NEW with COMAR.docx

SURVEYED DESCRIPTION

BEING PART OF THE PROPERTY ACQUIRED BY LENORE, LLC AS TO AN UNDIVIDED 50% INTEREST FROM LENORE R. SHAVELL BY DEED DATED NOVEMBER 29, 2007 AS RECORDED IN LIBER 11056 FOLIO 243 AND BY SERVILLE LLC AS TO AN UNDIVIDED 50% INTEREST FROM IRENE C. GLASER BY DEED DATED JANUARY 30, 2008 AS RECORDED IN LIBER 11119 FOLIO 401, AMONG THE LAND RECORDS OF HOWARD COUNTY, MARYLAND AND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE INTERSECTION OF THE DIVISION LINE BETWEEN THE LANDS OF BREEDEN FAMILY LIMITED LIABILITY COMPANY (LIBER 5341 FOLIO 656) ON THE WEST, AND THE LANDS OF LENORE, LLC (LIBER 11056 FOLIO 243) AND SERVILLE LLC (LIBER 11119 FOLIO 401) ON THE EAST, WITH THE DIVISION LINE BETWEEN THE LANDS OF LIMESTONE VALLEY FARM (LIBER 3583 FOLIO 234) ON THE NORTH AND THE SAID LANDS OF LENORE, LLC AND SERVILLE LLC ON THE SOUTH, THENCE WITH SAID DIVISION LINE;

1. SOUTH 67° 25’ 03” EAST, 2026.07 FEET TO THE INTERSECTION OF SAID DIVISION LINE, WITH THE DIVISION LINE BETWEEN THE SAID LANDS OF LENORE, LLC AND SERVILLE LLC ON THE WEST, AND THE LANDS OF STEPHEN KLEIN & ASSOCIATES, LLC (LIBER 5082 FOLIO 679) ON THE EAST, ALSO BEING THE CENTERLINE OF CLARKSVILLE PIKE – MD RTE. 108 (PRESCRIPTIVE RIGHT-OF-WAY), THENCE WITH SAID DIVISION LINE;

2. SOUTH 40° 23’ 40” WEST, 548.04 FEET, THENCE CONTINUING WITH A LINE THROUGH SAID CLARKSVILLE PIKE;

3. SOUTH 17° 13’ 42” EAST, 33.00 FEET, THENCE CONTINUING WITH SAID THROUGH LINE AND FURTHER CONTINUING WITH THE DIVISION LINE BETWEEN THE SAID LANDS OF LENORE, LLC AND SERVILLE LLC ON THE NORTH, AND THE LANDS OF CLARKSVILLE FREESTATE, LLC (LIBER 16629 FOLIO 30), CLARKSVILLE AUTO PROPERTIES, LLC (LIBER 3903 FOLIO 315), LOT 2, FOSTER PROPERTY (PLAT NO. 14068) AND THE LANDS OF CLARKSVILLE SQUARE, LLC (LIBER 4516 FOLIO 389) ON THE SOUTH;

4. SOUTH 86° 46’ 18” WEST, 1582.00 FEET TO THE INTERSECTION OF SAID DIVISION LINE, WITH THE SAID DIVISION LINE BETWEEN THE LANDS OF BREEDEN FAMILY LIMITED LIABILITY COMPANY ON THE WEST, AND THE LANDS OF LENORE, LLC AND SERVILLE LLC ON THE EAST, THENCE WITH SAID DIVISION LINE;

5. NORTH 02° 21’ 22” EAST, 1317.16 FEET TO THE PLACE OF BEGINNING.

CONTAINING 1,583,544 SQUARE FEET OR 36.353 ACRES

I HEREBY CERTIFY THAT THE METES AND BOUNDS DESCRIPTION HEREIN WAS PREPARED BY ME PERSONALLY OR UNDER MY DIRECTION AND THAT THIS DESCRIPTION AND ANY SURVEY WORK REFLECTED HEREIN WAS PREPARED IN COMPLIANCE WITH COMAR 09.13.06.12.

ROBERT C. HARR, JR.
21587

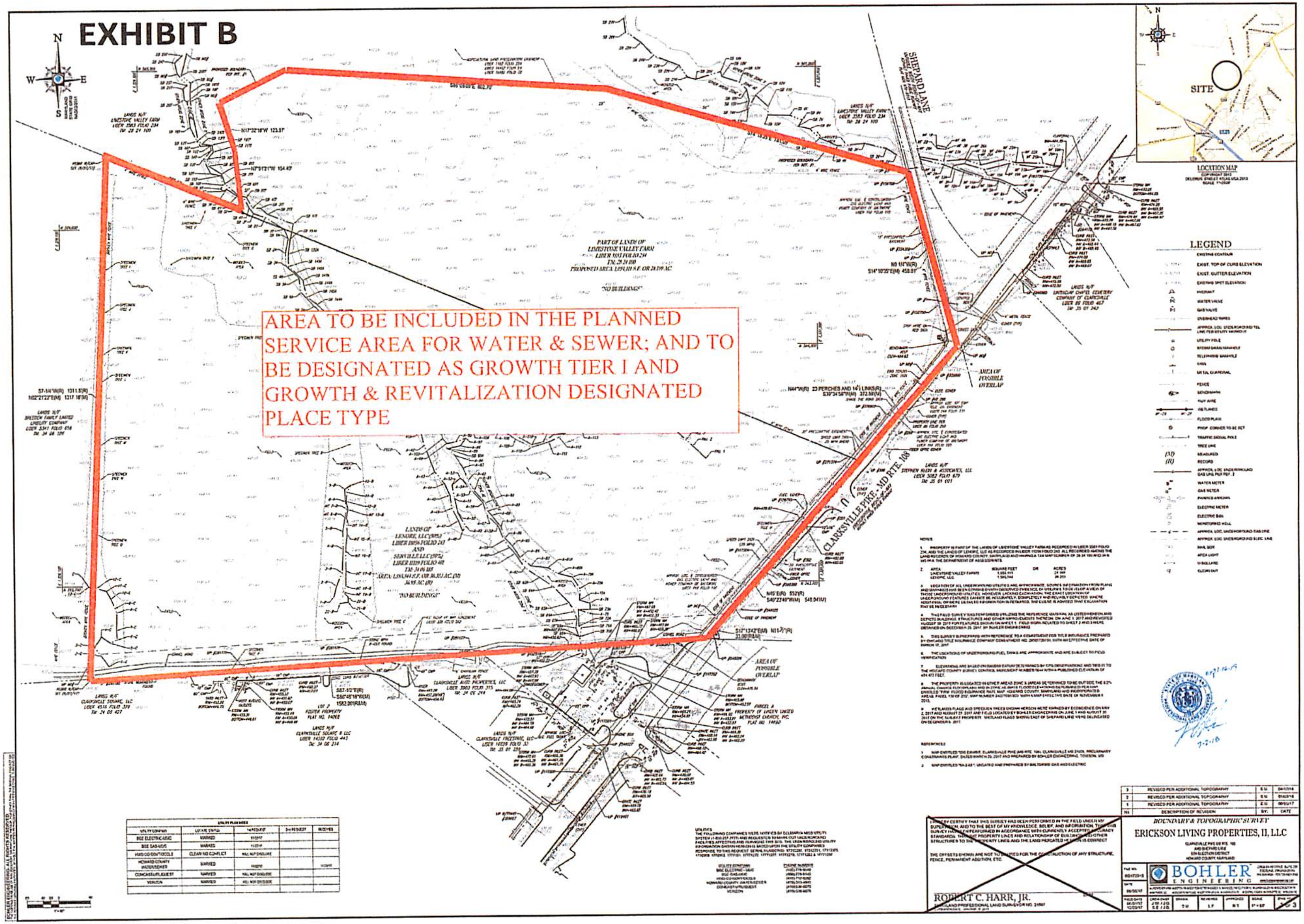
7/2/18

ROBERT C. HARR, JR.
STATE OF MARYLAND
PROFESSIONAL LAND SURVEYOR NO. 21587
EXPIRATION DATE JANUARY 16, 2019.

DATE

RT/rl
S:\Surveys\2017\SD172015\Admin\Metes and Bounds\SURVEYED DESCRIPTION-ROUTE 108.docx

EXHIBIT B


AREA TO BE INCLUDED IN THE PLANNED SERVICE AREA FOR WATER & SEWER; AND TO BE DESIGNATED AS GROWTH TIER I AND GROWTH & REVITALIZATION DESIGNATED PLACE TYPE
SHEPARD LANE
CLARKSVILLE PIKE - MD RTE 108
PART OF LANDS OF LIMESTONE VALLEY FARM
"NO BUILDINGS"
AREA OF POSSIBLE OVERLAP
SITE
LOCATION MAP
LEGEND
N
S
E
W
REVISED PER ADDITIONAL TOPOGRAPHY
DESCRIPTION OF REVISION
BY:
DATE
BOUNDARY & TOPOGRAPHIC SURVEY
ERICKSON LIVING PROPERTIES, II, LLC
BOHLER ENGINEERING
ROBERT C. HARR, JR.
7-2-18

BY THE COUNCIL

This Bill, having been approved by the Executive and returned to the Council, stands enacted on August 6, 2018.

Jessica Feldmark

Jessica Feldmark, Administrator to the County Council

BY THE COUNCIL

This Bill, having been passed by the yeas and nays of two-thirds of the members of the Council notwithstanding the objections of the Executive, stands enacted on ____________________, 2018.

____

Jessica Feldmark, Administrator to the County Council

BY THE COUNCIL

This Bill, having received neither the approval nor the disapproval of the Executive within ten days of its presentation, stands enacted on ____________________, 2018.

____

Jessica Feldmark, Administrator to the County Council

BY THE COUNCIL

This Bill, not having been considered on final reading within the time required by Charter, stands failed for want of consideration on ____________________, 2018.

____

Jessica Feldmark, Administrator to the County Council

BY THE COUNCIL

This Bill, having been disapproved by the Executive and having failed on passage upon consideration by the Council stands failed on ____________________, 2018.

____

Jessica Feldmark, Administrator to the County Council

BY THE COUNCIL

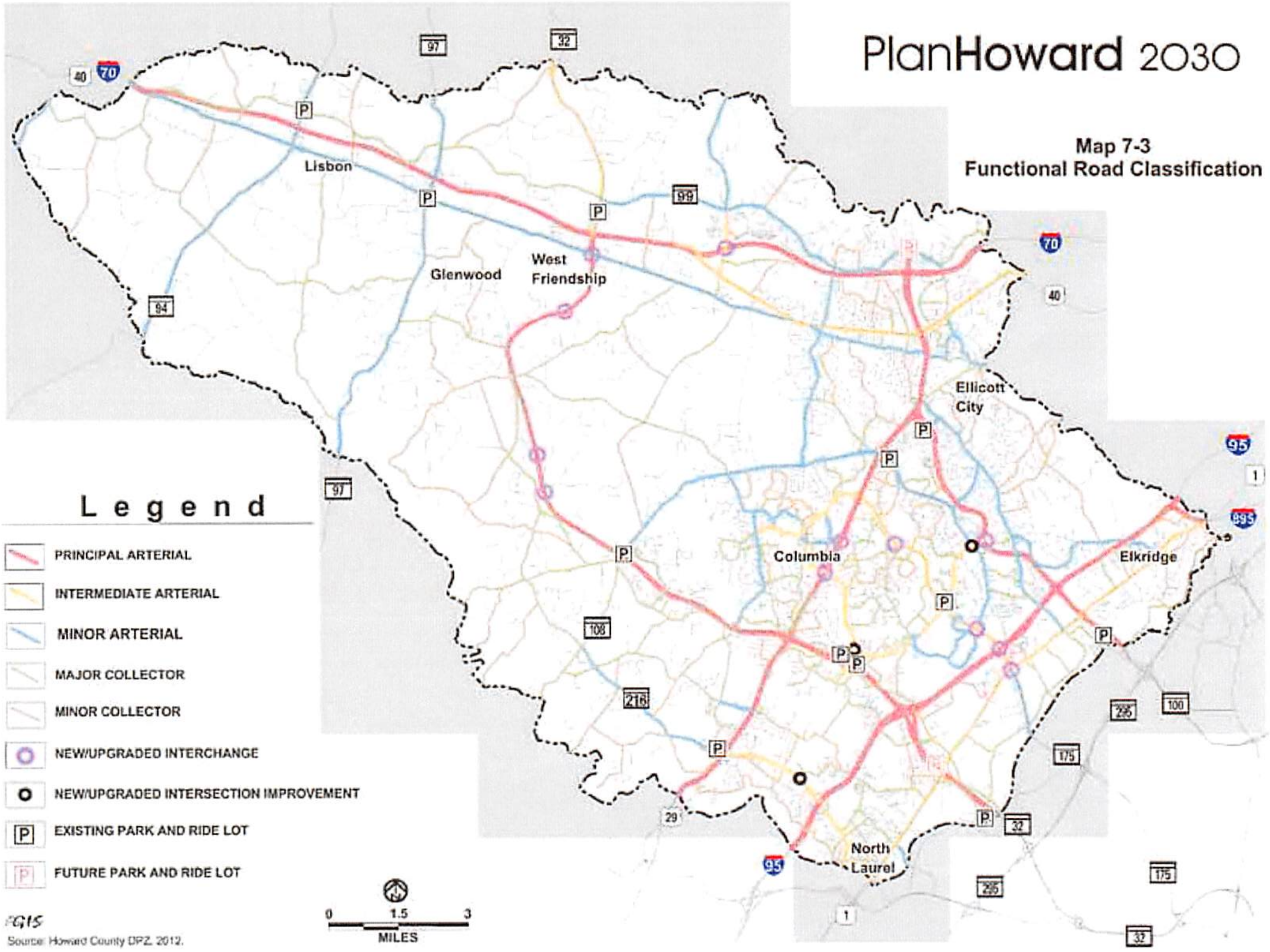
This Bill, the withdrawal of which received a vote of two-thirds (2/3) of the members of the Council, is withdrawn from further consideration on ____________________, 2018.

____

Jessica Feldmark, Administrator to the County Council

PlanHoward 2030

Map 7-3
Functional Road Classification



GIS
Source: Howard County DPZ, 2012.

EXHIBIT
G