

Appendix A

BWI Gas Station Site Selection Study

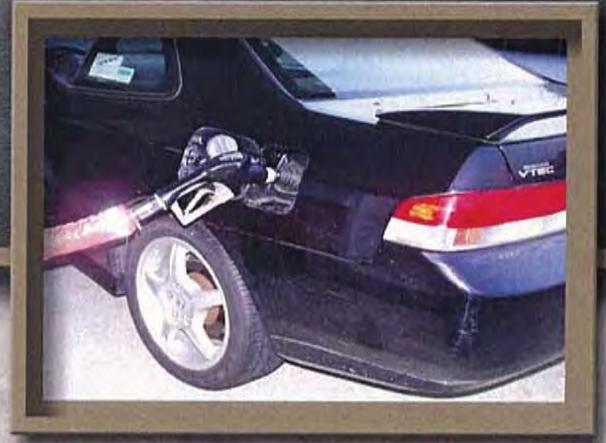
Final Report

BWI Gas Station Site Selection Study

Prepared for



Maryland Department of Transportation
Maryland Aviation Administration
Office of Planning and Environmental Services



Prepared by

**PARSONS
BRINCKERHOFF**

March 2006

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MARCH 2006

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1.0 INTRODUCTION

MAA requested a site selection study to identify a preferred location for a proposed second gas station. This study addresses the selection of potential sites, development of evaluation criteria, evaluation of alternative locations, and recommendation of a preferred site. A preliminary purpose and need statement has also been prepared for the project. These elements will assist the MAA in moving the project forward into the environmental study, request for proposal, and project implementation phases.

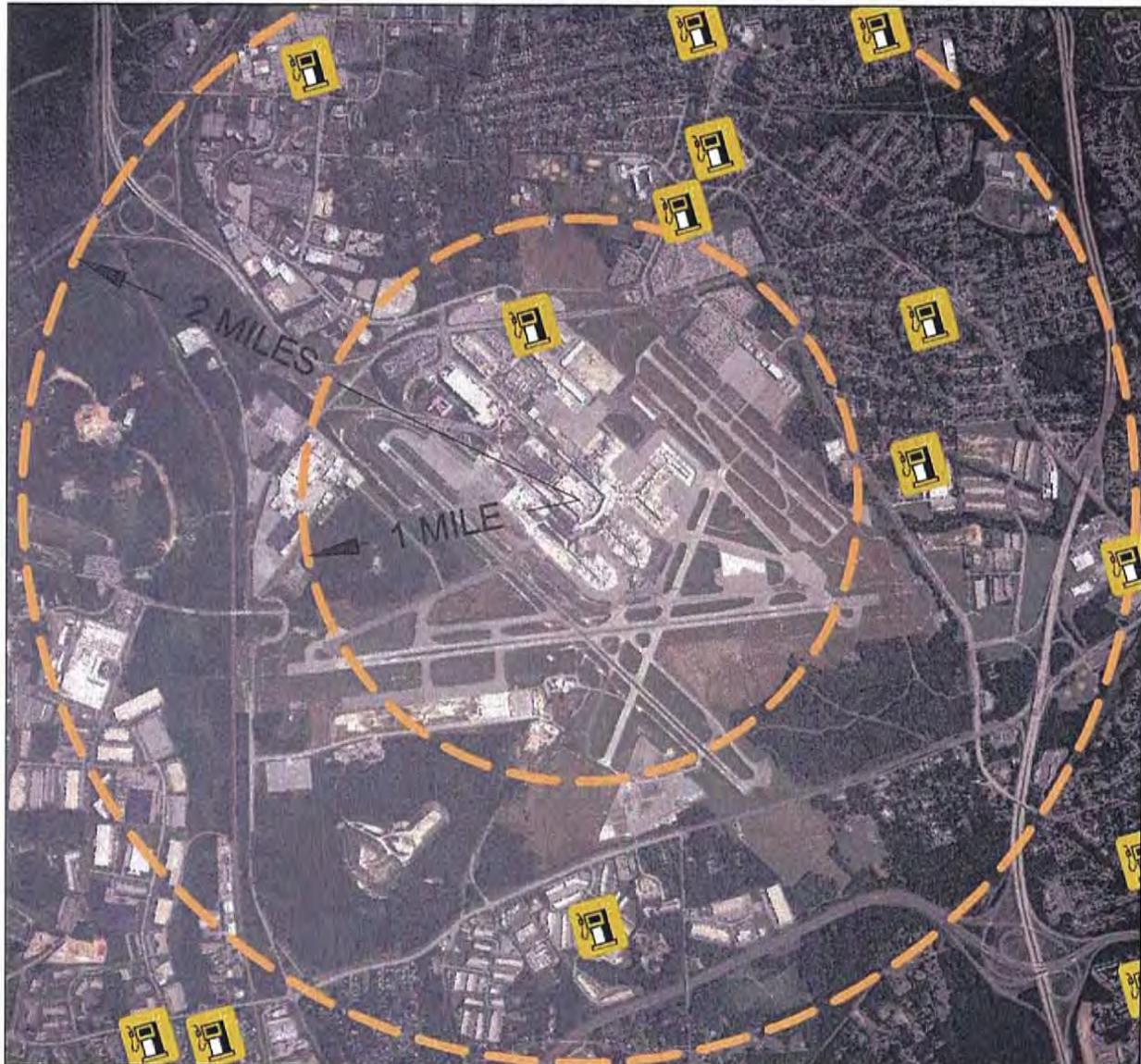
1.1 Background

According to a recent economic report prepared for MAA, a significant level of employment growth has occurred in the BWI area. The Local and Regional Economic Impacts of Baltimore/Washington International Airport report was prepared by Martin Associates in February 2000. This report indicated that approximately 37 percent of the new jobs created from June 2003 to June 2004 in Maryland were in Anne Arundel County. In addition, Anne Arundel County experienced new job growth of over 4 percent from the end of 2003 to the end of 2004. Along with this employment growth, there has been a significant expansion in the amount of office, research, and industrial/warehouse space in the area. Net office market absorption alone in the BWI submarket was 856,000 square feet in 2004 and the office vacancy rate was 6 percent. The strong market conditions in the BWI area are projected to continue for at least the next few years, driven in large part by the government contracting sector. In addition to the area growth, BWI has grown. Physical changes include the addition of the new Daily A Garage and the relocation of rental car operations to the Consolidated Rental Car Facility (CRCF). Except for the downturn after 9/11, air passenger growth has also been very strong over the last decade. One result of the local area and airport growth has been an increase in vehicular traffic at the airport and in the vicinity of the airport.

Currently, there are approximately 15 gas stations within a three mile radius of the airport's main terminal. The closest gas station is located on airport property on Aviation Boulevard. Other stations relatively close to the airport are located on Camp Meade Road, Dorsey Road, and West Nursery Road. As shown on Figure 1.1, the majority of the existing gas stations are located north, east, and south of the airport. There are no gas stations located on Aviation Boulevard between Dorsey Road and I-195, nor are there any gas stations in the Stoney Run Road area directly west of the Airport's main terminal. However, there has been considerable development in the area west of the Airport, with the construction of the Consolidated Rental car Facility (CRCF), construction of a second parking garage at the Amtrak Station, development of the Mid-Field Cargo Complex, construction of remote tenant parking, and other private development in the New Ridge Road corridor. Traffic volumes on Aviation Boulevard in this area range from 18,000 vehicles per day (VPD) near Dorsey Road to 33,000 VPD near I-195.

Given the lack of gas stations on the west side of the Airport, MAA has focused on developing a new gas station in this area, an area with high traffic volumes and considerable new development that appears to be underserved.

Figure 1.1: Nearby Gas Stations



1.2 Gas Station Project Goals

Through discussions with MAA, project goals were developed for the purposed new gas station. The primary goals included:

- Provide a high degree of customer service; and
- Optimize revenue to the MAA.

In order to achieve these two goals, this study is designed to analyze a series of potential gas station sites under an agreed upon list of evaluation criteria. These criteria will help determine each site's benefits and limitations as well as provide a qualitative ranking used for comparing one site against another. The cumulative rankings will be used to determine the preferred site for a new gas station.

1.3 Project Purpose and Need

The purpose of the proposed project is to provide a convenient location for a gas station/convenience store serving BWI air passengers, rental car patrons, BWI employees, and other BWI area motorists in a manner that maximizes revenue for BWI.

The major needs for the project are outlined below.

1. According to 2004 North America Traffic Report published by the Airports Council International, BWI was ranked as the 26th largest airport in the U.S. based on total passengers. In addition, BWI serves as the fourth largest population and travel market in the U.S. This contributes to a high percentage of origin and destination (O&D) passengers and results in a significant amount of landside vehicle traffic. Over the next 20 years, air passenger traffic is expected to grow significantly from 20 million passengers per year currently to nearly 35-40 million passengers per year by 2025. This will result in an increase in the demand for fuel and food services in the area. In order to help meet the anticipated level of growth, MAA decided to evaluate the feasibility of constructing facilities which will meet the needs of its passengers. To do this, MAA will promote development that will provide a high level of service to these passengers.
2. Development in the BWI Region has grown significantly over the last 20 years as presented in the 2003 BWI/Linthicum Small Area Plan. Key markets have included office, high-tech/research, government office, industry, and warehouse. Strong future growth is projected for these markets due to the national and regional emphasis on safety, security, and high-technology fields. This new development and the associated growth in regional employment will increase demand for gas station facilities.
3. The relocation of rental car operations to the CRCF has shifted the center of rental car activity to the west side of the airport, thereby increasing the demand for vehicle fueling and services in that area; however, no gas stations currently exist between I-195 and the CRCF. In addition, there are no gas stations between MD 100 and the CRCF. The closest gas station is located approximately 10 minutes driving time from the CRCF.
4. MAA continues to require additional revenue to support current and future operations and maintenance needs. MAA also has land available that could be used to generate additional revenue in support of BWI. A new gas station and convenience store with basic vehicular maintenance and towing capabilities could play a beneficial role in enhancing revenue generation to MAA.

2.0 PROJECT DEFINITION

It is important to define the proposed gas station/convenience store project in sufficient detail to be able to evaluate and compare potential sites upon which the project could be constructed.

2.1 Fuel Services

The development of a new gas station is assumed to include 12 self-service gas pumps. Of the 12 pumps, ten pumps would provide regular, mid-grade, and premium unleaded gasoline. The remaining two pumps could be separate truck diesel pumps. This assumed arrangement is based on the layout of the existing gas station at the airport.

2.2 Convenience Store and Food Services

The new gas station is assumed to include a convenience store and food services. It also is assumed to include a fast-food vendor/restaurant.

2.3 Automotive Services

The third proposed component of a new gas station is the provision of basic automotive services to BWI customers. It is assumed that at a minimum these services will include: vacuum canisters; windshield/window cleaning equipment; and air tanks for refilling tires. In addition, a self-service car wash; vehicular towing; and minor vehicle maintenance services could also be incorporated into the project.

2.4 Estimated Gas Station Site Size Requirements

Several planning assumptions were made in order to estimate the total square footage required for the proposed gas station. These assumptions were based in part on information collected from the existing gas station located on airport property as well as concept planning level assumptions for the new gas station. **Table 2.1** presents the estimated space requirements for each of the proposed facilities in the new gas station as well as an overall total.

Table 2.1: Estimated Gas Station Site Size

Item	Quantity	Unit	Space per Unit	Total Space
Convenience Store & Restaurant	1	SF	4,000	4,000
Automotive Maintenance Building	1	SF	2,000	2,000
Automatic Car Wash Building	1	SF	1,500	1,500
Covered Pump Station Canopy Area (12 pumps)	1	SF	6,000	6,000
<i>Buildings and Canopy Area</i>				13,500
Parking Spaces (Visitor)	16	SF	350	5,600
Parking Spaces (Employee)	10	SF	350	3,500
Parking Spaces (Handicapped)	2	SF	500	1,000
<i>Parking Area</i>				10,100
Access and Circulation	1	SF	45,000	45,000
Landscaping and Sidewalks	1	SF	20,000	20,000
<i>Circulation and Landscaping</i>				65,000
Site Subtotal				88,600
Contingency Factor (25%)				22,150
Site Total (square feet)				110,750
Site Total (acres)				2.5

Based on the assumptions provided above, it is estimated that the gas station will require approximately 2.5 acres of available land. While a number of different layouts are possible, it was assumed that the development would follow a typical layout generally similar to that used in the existing on-airport gas station (see **Figure 2.1**). However, the actual shape and arrangement of the buildings on each site is expected to complement the site shape.

Figure 2.1: Existing Gas Station Site



3.0 ALTERNATIVE SITES

Based on previous MAA studies and a review of MAA owned land, three potential sites on the west side of the airport were considered for the proposed new gas station. Each site is owned by MAA and has unique development opportunities and constraints. The figures located at the end of this section (**Figures 3.4 through 3.7**) illustrate the three potential sites under consideration. The three sites are:

- Site 1: Managers' Lot at Amtrak Way and Aviation Boulevard
- Site 2: Pink Lot on Mathison Way
- Site 3: Dorsey Road Site A

Site 1: Managers' Lot at Aviation Boulevard and Amtrak Way

The Amtrak Way and Aviation Boulevard Site (Managers' Lot) is located on the northwest corner of the intersection of Aviation Boulevard and Amtrak Way. It is across Aviation Boulevard from Northrop Grumman and is approximately 1.5 miles from the main terminal. This site's western edge is bordered by the BWI Trail. The site is currently used for overflow vehicular parking during peak travel periods. It is approximately 4.3 acres in size. The Managers' Lot site is the smallest site under consideration; however this is more than adequate to accommodate the estimated 2.5 acre site requirement. The Manager's Lot site is wedge-shaped; however given that it is larger than required and given that a gas station would be sited at the larger east end of the site, the site's shape is considered adequate for the development of a new gas station.

Site 2: Pink Lot Site

The Pink Lot Site is located on the west side of the airport property on the south side of Mathison Way. The Pink Lot is located approximately two miles from the main terminal. The rectangular paved site is

Figure 3.1: Managers' Lot Site



Figure 3.2: Pink Lot Site



approximately 11 acres. Access to the site is provided via Mathison Way from Aviation Boulevard. Mathison Way continues east to provide access to the Midfield Cargo complex. The Pink Lot currently serves as an overflow parking lot during peak travel periods. This site lies directly south of the end of Runway 10.

Site 3: Dorsey Road Site A

The Dorsey Road Site A parcel is located at the intersection of Dorsey Road and Aviation Boulevard. Site A is approximately six acres in size and has a developable area of 5.25 acres. Site A is triangular in shape with the base of the triangle located at the south end near Dorsey Road tapering to a point at the north end of the site. Currently there is a ramp from westbound Dorsey Road to northbound Aviation Boulevard on the east side of the site. The BWI Trail also runs along the east side of the site, east of the ramp. The entire site would not be needed for a gas station, and could therefore be made available for complementary retail type development. Dorsey Road Site A is over three miles from the main terminal and is currently undeveloped.

Figure 3.3: Dorsey Road Site A



According to a recent market study for the development of the Dorsey Road parcel, the property's corner location, at a busy signalized intersection invites pad retail along Dorsey Road, with one or more of the following: fast food, a gas station, convenience store, branch bank. The market study's potential shows design for the site retail on the northern portion of the site and fast food, a gas station or similar development on the southern portion of the site.

Originally, both sites at the Dorsey Road location were considered for the proposed gas station. However, the recently completed market study concluded that Site B would be most effectively and efficiently developed as flex office space due to the size and location of the parcel. Because the market study recommended flex office space on Site B, Site B will not be analyzed in this site selection study for an alternative for the location of the proposed gas station.

Figure 3.4: Aerial Photo with All Three Sites





MANAGERS' LOT AT AVIATION BOULEVARD AND AMTRAK WAY

FIGURE 3.5





DORSEY ROAD SITE A

FIGURE
3.7

4.0 EVALUATION CRITERIA

To develop a clear understanding of the specific benefits and drawbacks of each of the proposed gas station sites, a set of evaluation criterion were selected. These criteria address the critical site selection and development issues and facilitate a comparison between the three potential sites, leading to a final recommended action for the project. The evaluation criteria include:

1. **Location and Land Use Compatibility**
2. **Access**
3. **Visibility**
4. **Market Presence/Competition**
5. **Environmental Resources**

Typical evaluation criteria, such as site topography, land availability and parcel size, are not necessary in this site selection evaluation. The three parcels to be evaluated are similar and sufficient for development. The MAA owns all three potential sites. All three sites are of adequate size and shape for a proposed gas station and none of the three sites have any limiting topographic issues. Two of the three sites are currently paved; however the unpaved site is relatively flat and is not forested. The following evaluation criteria were selected for this analysis because they offer differentiating factors between each site.

4.1 Location and Land Use Compatibility

Location and land use compatibility are two key factors in comparing the sites for development of a gas station. Preferably, a new gas station would be located in or adjacent to a major activity/employment center or corridor. Aerial photos will be used to analyze examine the surrounding land uses. Major activity/employment centers will be identified. A qualitative assessment will be made regarding the compatibility of the surrounding land use with the proposed gas station. Consideration will also be given to the current and proposed zoning of the surrounding parcels.

4.2 Access

Access in and out of each site, along with access to major highways and transportation corridors is a key factor in the selection of a gas station location. Access should be efficient and convenience to the user. Site maps, traffic flow maps, and a site visit will be used to examine access.

4.3 Visibility

Each site should be highly visible from one or more high volume highways and/or major vehicle destinations. Aerial photos, topography maps, and ADT estimates will be used to consider whether the site is clearly visible from major highways and to quantify the pass-by traffic volumes.

4.4 Market Presence/Competition

Market presence and competition are key factors in the successful siting of a new BWI gas station. The location of each site relative to competing gas stations is another key

issue to be considered. Aerial photos and site maps will be used to analyze the perceived market presence of each site and examine how many gas stations are in close proximity to each potential site.

4.5 Environmental Resources

Conducting a quick overview of environmental resources for each site will assist in determining if there are any significant environmental impacts that would deter development. While two of the three sites are paved, sensitive environmental resources on airport property may be located near each property. This overview of environmental resources will facilitate an evaluation and comparison of each site's potential for impacting key environmental resources. The following environmental subcategories to be considered for each site are:

- *Water Resources* - USGS, BWI SWMP and other available documents will be used to examine potential stream, water quality, and stormwater runoff issues.
- *Rare, Threatened, or Endangered Species* - MERLIN resource mapping and other MAA documents will be used to identify the presence of any rare, threatened, or endanger species on or near each site.
- *Hazardous Materials* - Available maps/reports will be used to analyze the potential for on-site hazardous materials.
- *Floodplains* – MERLIN resource mapping will be used to identify 100-year and 500-year floodplains.
- *Wetlands* – MERLIN resource mapping will be used to identify existing on-site wetlands.
- *Historic/Archeological Sites* - Available maps/reports will be used to identify the existence of historic/archeological sites.
- *Section 4f* - Available maps/reports will be used to determine the location of public parks and recreation areas.

5.0 SITE EVALUATION

The three alternative gas station sites were evaluated using the criteria presented in Section 4.0. A complete summary for all criteria is presented at the end of Section 5.0 in conjunction with the summary evaluation matrix.

5.1 Location and Land Use Compatibility

Managers' Lot Site: The Managers' Lot site is located on airport property along an established thoroughfare, Aviation Boulevard. It is also bordered on the east by Amtrak Way, which provides access to a large parking facility and the Amtrak/MARC station. This site is across Aviation Boulevard from a significant Northrop Grumman research and development facility. The land across Amtrak Way is used by Northrop Grumman for parking. To the west are the Amtrak rail line, BWI Trail, and natural open space including forested wetland areas. In general, the immediately adjacent development is compatible with a new gas station. According to the BWI/Linthicum Small Area Plan, the Managers' Lot site is located within two designated zoning classifications. These include Recreational/Open Space and Transportation/Utility. Current zoning at this site is compatible for a new gas station. The location would also work very well with the addition of the optional fast food component to the project. The Managers' Lot site was rated good for its location.

Pink Lot Site: The Pink Lot is located on airport property, on Mathison Way, a low volume side street, but it would draw some pass-by traffic from Aviation Boulevard. Mathison Way is a minor collector road serving the Midfield Cargo Complex, which is located a half-mile to the east. The site is bordered by forested areas to the north, south, and east. A small partially forested area is located to the west along with the BWI Trail and Aviation Boulevard. Zoning at this site is designated as Transportation/Utility. Overall the site was rated poor because there is little existing urban development in the immediate vicinity of the site.

Dorsey Road Site A: Site A is located on the northeast corner of Dorsey Road and Aviation Boulevard, also on airport property. Both Aviation Boulevard and Dorsey Road are high volume arterial roadways. Adjacent land uses include low density residential to the south, industrial to the southwest, and vacant land west across Aviation Boulevard with addition industrial located further west across the Amtrak line rail. Vacant forested airport owned property is located north and east of the site. The BWI Trail is also located east of the site. Zoning at this site is classified as Transportation/Utility in the BWI/Linthicum Small Area Plan. In general, the surrounding land uses are considered compatible with a new gas station. Overall the site was rated good.

Table 5.1: Site Location Summary

Criteria	Site 1: Managers' Lot	Site 2: Pink Lot	Site 3: Dorsey Road
Location	●	○	●
Rating	Good	Poor	Good
Legend: ● = Good ■ = Fair ○ = Poor			

5.2 Access

The site access analysis addresses access from both a traffic engineering and a customer convenience standpoint. In addition to the summary presented below, traffic access studies were prepared for the three potential gas station sites. These traffic access studies can be found in **Appendix A** of this report.

Managers' Lot Site: This site has frontage on both Aviation Boulevard (MD 170) and Amtrak way, offering flexibility with regards to the specific locations of access points. Direct access into the site can be provided to and from both roadways. Aviation Boulevard access would be limited to right-turns only, while full directional access could be provided via Amtrak Way. A traffic signal is located at Aviation Boulevard and Amtrak Way intersection facilitating access via Amtrak Way. This site also allows for pedestrian and bicycle access to the BWI Trail. Overall, the site offers good and convenient site access and was rated good.

Pink Lot Site: The Pink Lot Site is located within the surface parking area formerly used as an overflow lot. This parking lot is accessed directly from Mathison Way, which in turn connects to Aviation Boulevard (MD 170) at a signalized intersection. Mathinson Way is currently used by cargo trucks for access in and out of the cargo area. With regard to site access considerations, it is assumed that the gas station site would be built within the existing surface parking lot and that a new entrance would not be constructed. Provided that the new entrance does not violate SHA spacing requirements, there does not appear to be any physical constraints precluding a new or relocated entrance in to Mathison Way; however, it is unlikely that direct access could be provided from Aviation Boulevard due to environmental, access management, and intersection spacing requirements. Overall, this site was rated fair.

Dorsey Road Site A: Dorsey Road and Aviation Boulevard are both State roads, two lanes in each direction. There are no sidewalks or curbs and gutters along the property's frontage. A traffic signal is located at the intersection of Dorsey Road and Aviation Boulevard. Access to the site is possible at-grade from either Dorsey Road or Aviation Boulevard. While the site is visible from Dorsey Road, frontage there is narrower, and the property's orientation is perpendicular to Dorsey Road. Access is better from Aviation Boulevard where there is broad at-grade access along the entire length of the site. The Dorsey Road Site A parcel was rated good for site access.

Table 5.1: Site Access

Criteria	Site 1: Managers' Lot	Site 2: Pink Lot	Site 3: Dorsey Road
Access	●	○	●
Rating	Good	Poor	Good
Legend: ● = Good ◐ = Fair ○ = Poor			

5.3 Visibility

Managers' Lot Site: The Managers' Lot site is highly visible from all travel directions on Aviation Boulevard and Amtrak Way; however, visibility may be limited in some areas near the I-195 interchange. The Managers' Lot site is highly visible from the Northrop Grumman facility which is located directly across Aviation Boulevard. Traffic on Aviation Boulevard east of the site is approximately 33,000 vehicles per day (See Appendix A). In addition, thousands of passengers use the Amtrak station every day, with many parking at the two on-airport garages. Northrop Grumman has an employment site located across the street from the site. Many rental car patrons also drive past this site to reach the new CRCF. The development of a gas station at this site is considered highly convenient for many potential customers including: air passengers, rail passengers, rental car drivers, employees, and residents traveling through the area. The site is rated good.

Pink Lot Site: The visibility of the Pink Lot site from Aviation Boulevard is partially obstructed by forests. Aviation Boulevard carries approximately 26,000 vehicles per day in this area (See Appendix A). The volume of customers attracted would be affected by the level of marketing (leading to the desire for a tall sign structure), but would be tempered by the fact that the station would not have direct access to the main arterial. Unlike the other two sites, there are also no substantial local traffic generators in the immediate vicinity of the site. It is anticipated that signage would be necessary to identify the location of a new gas station. As a result, the Pink Lot site was rated poor.

Dorsey Road Site A: Site A has the potential to be positioned as a marquee southern gateway to the airport from MD Route 100, which provides high-speed east/west access from the interstate road network. Traffic counts from the 2004 State Highway Administration Traffic Access Study indicated Dorsey Road averages 17,600 vehicles per day. (See Appendix A) For Aviation Boulevard, an average of 18,325 vehicles per day occurs at a point just north of Dorsey Road. To the south, approximately 24,425 vehicles per day travel on Aviation Boulevard. The visibility of Site A is limited from eastbound Dorsey Road, but excellent from the other three directions. A corner location near a traffic signal along an area of high traffic volumes and an area of high roadway visibility adds value for development. This site was rated good for its visibility.

Table 5.1: Site Visibility Summary

Criteria	Site 1: Managers' Lot	Site 2: Pink Lot	Site 3: Dorsey Road
Site Visibility	●	◐	●
Rating	Good	Fair	Good
Legend: ● = Good ◐ = Fair ○ = Poor			

5.4 Market Presence/Competition

Managers' Lot Site: The development of a new gas station located on the Managers' Lot site is anticipated to have a highly favorable market presence. A new gas station located at this site is expected to capture both rental car return patrons and many other travelers passing through the area. The competition for a gas station located on the Managers' Lot includes a number of facilities north, east and southwest of the airport; however, there are no gas stations in the immediate site vicinity west of the airport. The only fueling facility in that area is the CRCF itself, where rental car patrons can purchase pre-paid fuel. This site is a high traffic location, which could compete well with the other locations; it was rated good.

Pink Lot Site: The market presence at the Pink Lot site was rated poor due to its lack of direct visibility and access. In addition, it is not anticipated to draw significant traffic from Aviation Boulevard, which will limit its ability to become well known. The Pink Lot site is located approximately 2 miles gas station located at Dorsey Road west of Aviation Boulevard. The site was rated fair.

Dorsey Road Site A: A new gas station development at Dorsey Road Site A is expected to have a significant market presence given its corner location on major roads, access into the site and also the visibility of the location. The competition for a gas station on this side includes several gas stations located on Dorsey Road. There are two gas stations located to the east of Site A and one gas station located to the west of the site on Dorsey Road. This site received a rating of good.

Table 5.3: Market Presence Summary

Criteria	Site 1: Managers' Lot	Site 2: Pink Lot	Site 3: Dorsey Road
Market Presence/Competition	●	◐	●
Rating	Good	Fair	Good
Legend: ● = Good ◐ = Fair ○ = Poor			

5.5 Environmental Resources

5.6.1 Water Resources

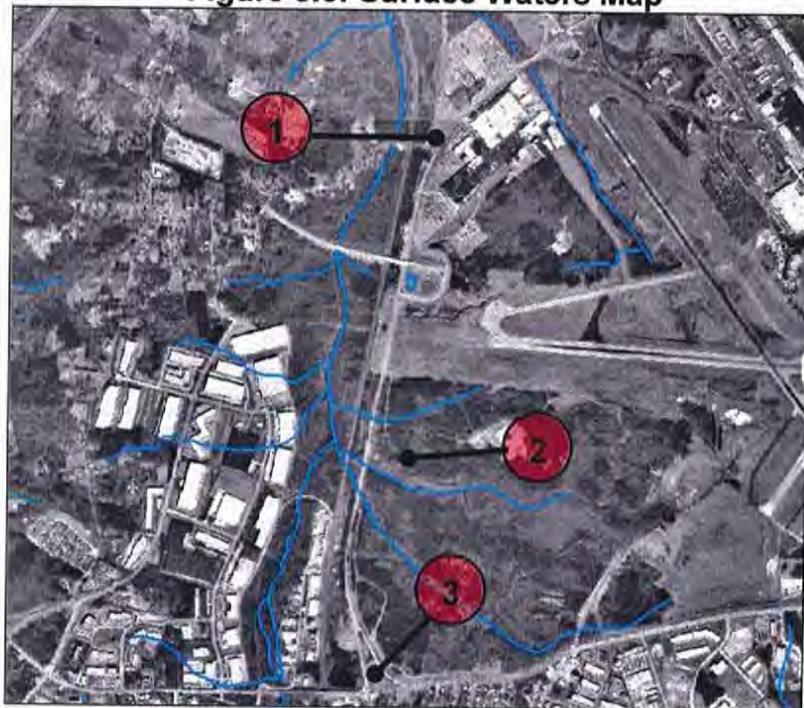
Readily available published information was examined to identify potential water resources in the vicinity of the three alternative sites. All three sites being considered are currently paved and/or developed for other land uses. However, redevelopment of these sites would still require a Stormwater Management (SWM) analysis addressing both water quantity and water quality. According to the Maryland Department of the Environment's *Maryland Stormwater Management Guidelines for State and Federal Projects* any project that exceeds 5,000 square feet on existing impervious surface is a "redevelopment" project and would be required to reduce impervious area by 20 percent or provide qualitative control for a minimum of 20 percent of the project's predevelopment impervious area.

To the extent possible, site specific SWM facilities would be designed to mitigate potential impacts identified in the analysis stage for any of the sites. In addition, all of these sites drain into the Stony Run watershed, which is known to contain sensitive habitats for rare, threatened, and endangered species, therefore special attention should be paid to designing SWM facilities to minimize impacts to this watershed.

Managers' Lot Site: This site does not contain any streams within its boundary, though Stony Run lies west of the site near the rail line. The site is paved and surface runoff at this site is collected and drained in the King Branch drainage basin. The site is impervious and would qualify as a redevelopment project. The development of a new gas station is not anticipated to result in any significant water quality or stormwater issues. The site was rated good.

Pink Lot Site: The Pink Lot site is paved and does not contain any streams within its boundary. Two small streams are located to the north and south of this site, outside of the project boundaries (Signal and Hawkins Branches respectively). The site drains to these drainage areas and from there into the Stony Run watershed. The site is impervious and would qualify as a redevelopment project. The development of a new gas station is not anticipated to result in any significant water quality or stormwater issues. The Pink Lot site was rated good.

Figure 5.6: Surface Waters Map



Dorsey Road Site A: The Dorsey Road site does not contain any streams within the parcel's boundary. The site drains into a tributary of the Clark Branch watershed. Although increasing the impervious surface on the parcel of land, due to the size and location, the development of a gas station is not anticipated to result in any significant water resource issues. This site was rated good.

5.5.1 Rare, Threatened, or Endangered Species

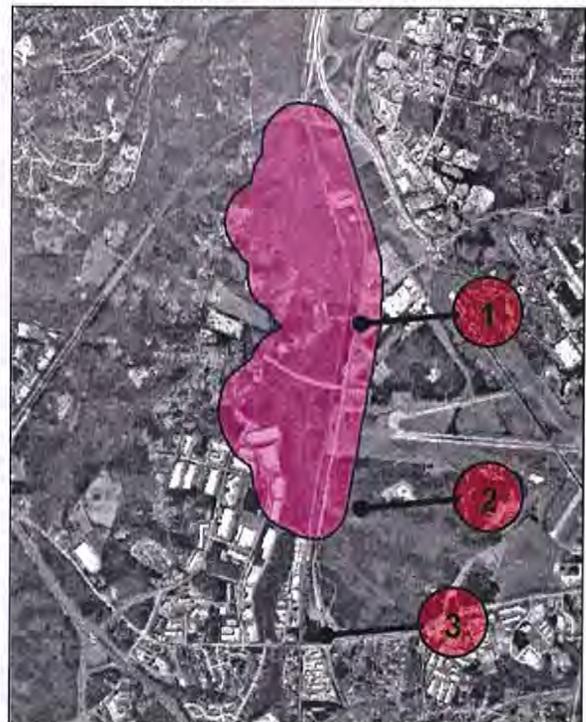
Mapping for rare threatened and endangered species (RTEs) was obtained from prior studies and from MERLIN. See **Figure 5.7** for approximate boundaries of rare, threatened, and endangered species in the vicinity of the three sites.

Managers' Lot Site: The Managers' Lot Site is located in an area designated as a Sensitive Species Review Area (SSPRA) because populations of state and federally listed RTE species or their supporting habitats are known to occur in the area. However, the site is currently paved, and no RTEs or their habitats have been identified on the Managers' Lot site in previous studies. Therefore the site was rated good.

Pink Lot Site: A small portion of the Pink Lot site lies partially within the SSPRA. However, the site is currently paved, and no RTEs or their habitats have been identified on the Pink Lot site in previous studies. Therefore the site was rated good.

Dorsey Road Site A: The Dorsey Road site is not located within the SSPRA. Although the site is undeveloped and partially wooded, there have been no RTEs identified on the site in previous studies. Therefore, the site was rated good.

Figure 5.7: RTE Map



5.5.2 Hazardous Materials

A general assessment of the potential for hazardous materials was based on current or known prior uses for each of the sites as well as any available recent MAA study documentation such as the 2000 Environmental Assessment.

Pink Lot Site: Previous or current hazardous materials usage has not been documented at the Pink Lot site. The site was rated good.

Managers' Lot Site: Previous or current hazardous materials usage has not been documented at the Managers' Lot site. The site was rated good.

Dorsey Road Site A: A Phase I report was conducted for the Dorsey Road Site A parcel. Previous or current hazardous materials usage has not been documented at the Dorsey Road site; therefore, the site was rated good.

5.5.3 Floodplains

Floodplain mapping was obtained from the MERLIN system as shown in **Figure 5.8**.

Managers' Lot Site: The Managers' Lot site is not located within a floodplain. The closest floodplain to this site is associated with Stony Run. This floodplain is approximately 500 feet west of the site and the proposed project is not expected to result in any floodplain impacts. This site was rated good.

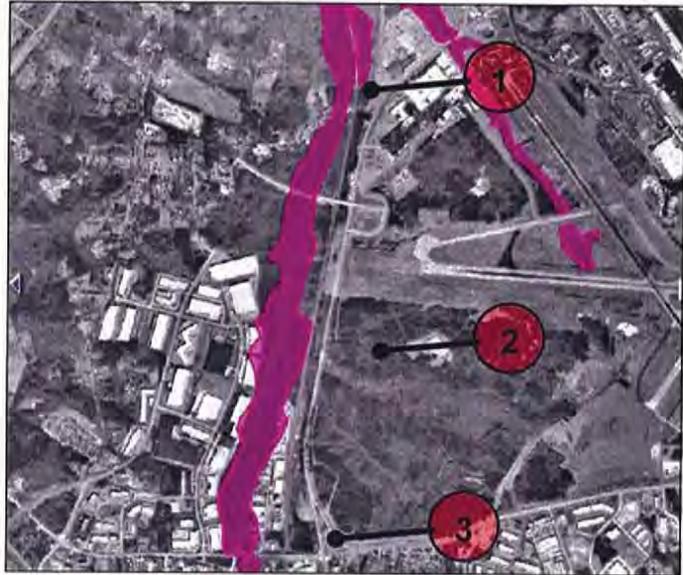
Pink Lot Site: The Pink Lot site is not located within a floodplain. The closest floodplain to this site is associated with Stony Run, which is across Aviation Boulevard and the railroad tracks from the site. The proposed project is not expected to result in any floodplain impacts. This site was rated good.

Dorsey Road Site A: The Dorsey Road site is not located within a floodplain. The closest floodplain to this site is associated with Stony Run. This floodplain is hundreds of feet east of the site and the proposed project is not expected to result in any floodplain impacts. This site was rated good.

5.5.4 Wetlands

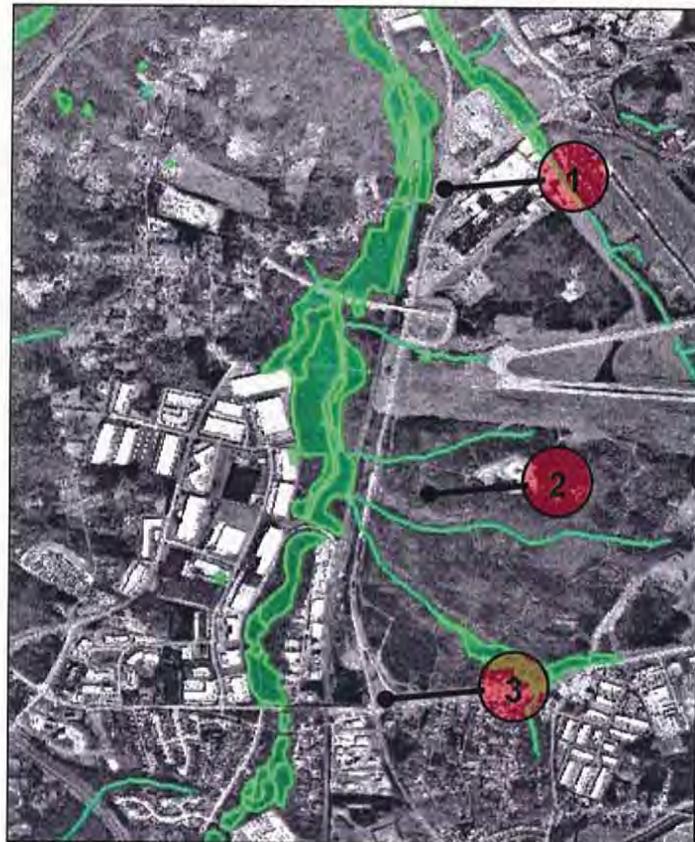
Wetland mapping was obtained from the online MERLIN system as shown in **Figure 5.9**. Additional wetland information was obtained from previous studies and mapping.

Figure 5.8: Floodplain Map



Stony Run, which is across Aviation Boulevard

Figure 5.9 Wetlands Map



Managers' Lot Site: One small wetland exists just beyond the southern boundary of the Managers' Lot site. Since the site is already paved, impacts to this wetland are deemed unlikely if the gas station is constructed within the paved area and stormwater management is designed according to the redevelopment requirements in the *Maryland Stormwater Management Guidelines for State and Federal Projects*. As a result, the Managers' Lot site was rated good for potential impacts to wetlands.

Pink Lot Site: The Pink Lot site does not contain any wetlands. A rating of good was given to the Pink Lot site.

Dorsey Road Site A: The Dorsey Road site does not contain any wetlands; therefore a rating of good was given to this site.

5.5.5 Historic/Archeological Sites

The MAA prepared a Historic Preservation Plan (MAA, 1996), which documents known historical and archaeological resources. The document also provides an assessment of the probability of historical and archaeological resources throughout MAA property. This information, combined with other known previous studies was used for the following site analysis.

Managers' Lot Site: There are no records of historic/archeological sites within the Managers' Lot boundary. As a result, no impacts to historic/archeological sites are expected at this site. The Managers' Lot site was rated good.

Pink Lot Site: The Pink Lot site lies within an area which has been previously studied and determined not to contain any historic/archeological sites. This site was rated good.

Dorsey Road Site A:

According to the 1996 Historic Preservation Plan, plan, Site A was disturbed during the construction of Aviation Boulevard and Dorsey Road. As a result, these areas are designated as "previously evaluated and require no additional archaeological study." Based on this determination, no impacts to historic/archeological sites are expected at this site; therefore, the site was rated good.

5.5.6 Forests

Forested areas were considered in evaluating the potential environmental considerations for each site. MAA has prepared a Reforestation Master Plan (MAA, 2003) and a Forest Management Plan (MAA, 2004 revised) for BWI Airport.

Managers' Lot Site: The Managers' Lot site is adjacent to one forested area located west of the site. The proximity of the forests to this site creates the potential for impacts to forests if development extends outside the paved area. Assuming the development remains on the paved area, it is unlikely that forest impacts will occur. The site was rated good.

Pink Lot Site: The Pink Lot site is currently paved and is not forested. No forest impacts are expected. This site was rated good.

Dorsey Road Site A: The Dorsey Road site is undeveloped and partially covered with vegetation. There are a few trees located on the site; however, the site is identified in the Reforestation Master Plan as a forest area and would require mitigation if the vegetation is removed. The site was rated fair.

5.5.7 Section 4(f)

Section 4(f) impacts involve disruption or use of publicly owned land from a public park, recreation area or wildlife and waterfowl refuge or national state or local significance. As shown in **Figure 5.10**, the BWI Trail represents a Section 4(f) property; however development of a gas station on any of the three sites will not disrupt or use the BWI Trail. An analysis of the view shed would be required for all sites.

Managers' Lot Site: The BWI Trail runs north and south on the west side of the site. This site was rated good because development of a gas station on this site will not impact the BWI Trail.

Pink Lot Site: The Pink Lot site is located within the vicinity of the BWI Trail, but the site does not abut the Trail. Therefore development of this site will not impact the Trail and this site was rated good.

Dorsey Road Site A: The Dorsey Road Site A parcel of land abuts the BWI Trail on the east side of the site. However, development of this site will not impact the Trail; therefore this site was rated good.

Figure 5.10 Section 4(f) Map

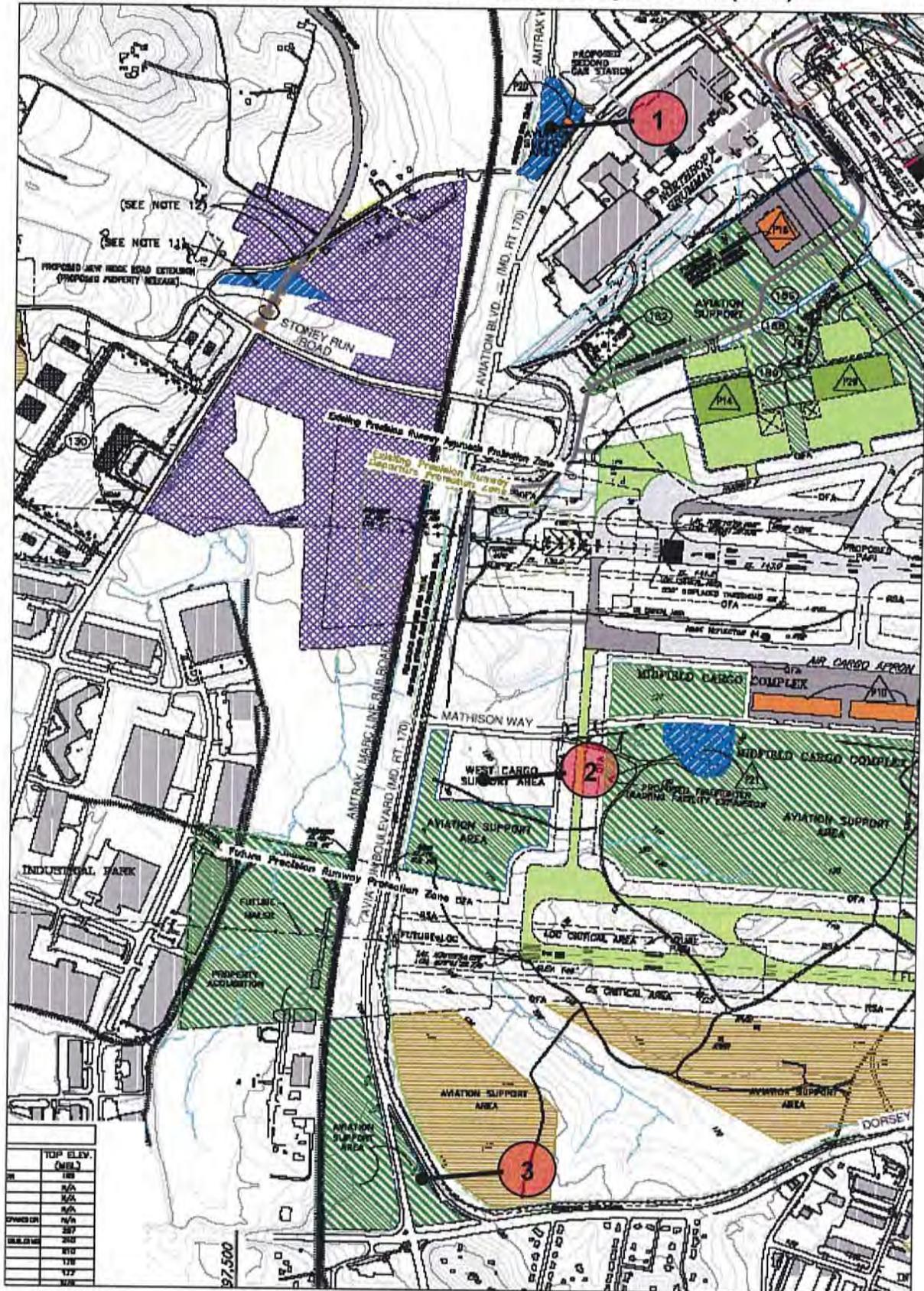


As shown on **Table 5.6**, there are no major environmental resources and few environmental issues at any of the sites.

Table 5.6: Environmental Resources Summary

Criteria	Site 1: Managers' Lot	Site 2: Pink Lot	Site 3: Dorsey Road
Water Resources	●	●	●
Rare, Threatened and Endangered Species	●	●	●
Hazardous Materials	●	●	●
Floodplains	●	●	●
Wetlands	●	●	●
Historic/Archeological Sites	●	●	●
Forest	●	●	◐
Section 4(f)	●	●	●
Rating	Good	Good	Good
Legend: ● = Good ◐ = Fair ○ = Poor			

Figure 5.11 Proposed Future Airport Layout Plan (ALP)



6.0 EVALUATION SUMMARY

Using the evaluation criteria, each of the three potential sites was rated to determine which site was best suited for development of the proposed new gas station. **Table 6.1** provides a summary of this cumulative evaluation.

6.1 Evaluation Summary

As shown below in **Table 6.1**, the Dorsey Road Site A and Managers' Lot Site each received a rating of "Good" in all the evaluation categories including ease of access, visibility, market presence and competition and environmental resources. Since both sites received a ranking of "best" under the evaluation criteria, both suitable for the development of a new gas station. The Managers' Lot Site and Dorsey Road Site A each have the flexibility to accommodate a variety of gas station layouts and have adequate traffic levels to support the operation of a gas station. In terms of development, the Managers' Lot Site is already paved and is anticipated to require less site preparation than the Dorsey Road Site A location. In addition, the Dorsey Road Site would require removing the exist ramp connecting MD176 and Aviation Boulevard.

The Pink Lot was rated fair overall. It has reasonable development potential and would not significantly impact any existing uses assuming the 2.5 acres of parking is not replaced elsewhere. However, it does not have a strong market location and has indirect access to Aviation Boulevard.

Table 6.1: Summary Evaluation

Criteria	Site 1: Managers' Lot	Site 2: Pink Lot	Site 3: Dorsey Road
Location/Adjacent Land Use	Good (3)	Poor (1)	Good(3)
Access	Good (3)	Fair ()	Good (3)
Visibility	Good (3)	Fair (1)	Good (3)
Market Presence/Competition	Good (3)	Fair (1)	Good (3)
Environmental Resources	Good (3)	Good (3)	Good (3)
Total	15	6	15
Overall Rating	BEST	Fair	BEST

APPENDIX A

Traffic Access Studies

Appendix A includes two traffic analyses. The first analysis contains the traffic recommendations for the Gas Station Site Selection Study. This analysis evaluates traffic for the initial three sites considered for the development of a new gas station; these include the Mangers' Lot, CRCF and the Pink Lot. After the first draft review, the MAA requested that the CRCF site be removed and replaced with a new site known as the Dorsey Road site. Because traffic associated with the Dorsey Road site was not included in the traffic recommendations for the Gas Station Study, a second traffic recommendations analysis was included. This analysis is the Dorsey Road Parcel Study-Traffic Recommendations. Graphical depictions of turning movement and level of service classifications are included immediately after the Dorsey Road Parcel Traffic Recommendations Study.

Dorsey Road Parcel Study – Traffic Recommendations

1. Existing Transportation Facilities

Sites A and B are located at the intersection of MD 170 (Aviation Boulevard) and MD 176 (Dorsey Road). Specifically, the sites occupy the northwest and northeast quadrants of this intersection, bounded to the south by MD 176, to the west by railroad tracks (owned by Amtrak), and to the east by a ramp serving right turns from westbound MD 176 to northbound MD 170.

MD 170 is a four-lane undivided highway and is listed as an Urban Other Principal Arterial (OPA) on the State's secondary road system. It is oriented in the north-south direction and separates the eastern parcel of Site A from the western parcel of Site B. It has a posted speed limit of 50 mph, although observed speeds are typically 10-15 mph higher. There is currently no development along MD 170 in the vicinity of Sites A & B.

MD 176 is a four-lane undivided highway and is listed as an Urban Collector on the State's secondary road system. It is oriented in the east-west direction in the vicinity of the project. It has a posted speed limit of 45 mph, although observed speeds are typically 10-15 mph higher. In addition to four lanes of through traffic (two lanes in each direction), additional width is provided in the median along MD 176 east of MD 170 that is marked as a westbound left turn lane at the approach to MD 170. This median lane continues to the east as a two-way left turn lane (TWLTL). Near the southwest corner of Site B, MD 176 crosses over Stoney Run and the railroad tracks. At this point, the grade of MD 176 is approximately 20' higher than the ground elevation of Site B.

2. Site Access

a. Geometric Considerations

Generally, there is good accessibility to the sites from the existing road network. As the existing roadway alignments are generally straight and level, it is expected that adequate sight distance can be achieved for the new intersections. Two key constraints influence the location of appropriate access points to Sites A and B, as follows:

- **Available frontage favors access from MD 170.** MD 170 offers much longer roadway frontage than MD 176; 1180' vs. 550' for Site A and 2100' vs. 530' for Site B. The additional frontage along MD 170 provides an opportunity for better separation of the site entrances from the existing intersection which will be favorable from the standpoint of providing adequate turn lane storage between intersections.

- **Existing topography limits the feasibility of direct access to Site B from MD 176.** In addition to limited frontage, the roadway grade at the southern end of Site B is approximately 20' higher than the adjoining property, in part due to the grade separation required for the bridge crossing over the railroad tracks bounding the western edge of Site B. This is prohibitive from the standpoint of providing direct access to Site B from MD 176.

b. Operational Considerations

Operational characteristics of both roadways reflect daily traffic patterns typical of the suburban industrial nature of the area, exhibiting higher volumes during AM and PM peak periods from commuter traffic.

With regards to driver expectation, both roadways (and MD 170 in particular) provide a parkway-type environment that is generally characterized by infrequent access points to the roadway, and dedicated turn lanes at intersections to side streets and/or access to major developments. Because of this, it is recommended that site access points provide similar treatments to enhance safety and to minimize the impact of turning vehicles on "through" traffic movements along the existing roadways.

One unique feature of the area is the existing westbound right turn (from westbound MD 176 to northbound MD 170) which is configured as a high-speed ramp consistent with a grade-separated interchange. Given observed traffic volumes for this movement, this ramp is unnecessary and it is recommended that this ramp be removed as part of access improvements to Sites A and B, and replaced with a standardized channelized right turn consistent with the rest of the existing intersection.

With regards to marketability, both MD 170 and MD 176 are well-traveled roadways and provide good opportunities for retail storefront exposure.

c. Recommended Site Access Points

With consideration for the above, we recommend that access to the site be provided as shown in the preliminary site layout and described as follows:

- New full-movement "T" intersection serving as access to Site A from MD 176 approximately 400' east of MD 170, hereafter referred to as "New Intersection #1".
- New full-movement four-way intersection serving as access to Sites A&B from MD 170 approximately 800' north of MD 176, hereafter referred to as "New Intersection #2".

- New full-movement “T” intersection serving as access to Site B from MD 170 approximately 1400’ north of MD 176, hereafter referred to as “New Intersection #3”.

Additionally, the following improvements to existing roadways are recommended to facilitate site access and maintain traffic flow:

- Replacement of the existing westbound right turn ramp with a channelized right turn lane nearer to the existing intersection.
- Conversion of a portion of the TWLTL along MD 176 east of MD 170 to serve as a left turn lane from eastbound MD 176 at New Intersection #1.
- Conversion of the existing westbound auxiliary lane (currently serving the westbound right turn from westbound MD 176 to northbound MD 170) to serve as a right turn lane from westbound MD 176 at New Intersection #1.
- Widening along MD 170 to provide adequate width for right and left turn lanes serving northbound and southbound access along MD 170 at New Intersection #2.
- Additional widening along MD 170 to provide additional width for a northbound left turn lane and a southbound right turn lane at New Intersection #3.

Storage length for all left turn lanes should be 200’ minimum. Right turn lanes should be designed to provide adequate length for deceleration from observed running speeds.

3. Operational Evaluation

a. Scope of Analysis

The scope for operational analysis of the site includes the existing intersection of MD 170 and MD 176, as well as proposed access points to developed portions of Sites A and B (New Intersections #1, 2, and 3).

Five scenarios were evaluated, as follows:

- “Current” (2005)
- “Interim Year” (2010) No-Build
- “Interim Year” (2010) Build

- "Horizon Year" (2030) No-Build
- "Horizon Year" (2030) Build

b. Traffic Counts and Forecasts

Intersection turning movement counts (TMC's) were obtained from the Maryland State Highway System Highway Information Services Division for the intersection of MD 170 and MD 176. The most recent available counts at this intersection were from February 28, 2001. To establish "base year" traffic conditions, these original counts were factored upwards using growth factors developed using historical count data from SHA's Automatic Traffic Recorder station #B0660 (located 0.10 miles south of I-195 on MD 170). From the historical data, growth rates were calculated as approximately 3% per annum. This rate was extended to forecast traffic growth between 2001 and 2005 and from 2005 and 2010. A slightly lower annual rate of 2% was used to forecast traffic growth between 2010 and 2030. These resultant traffic volumes for 2005, 2010 and 2030 "No Build" conditions are included in the CLA worksheets in the Appendix, and discussed in the Analysis & Results section.

c. Site Generated Trips

The volume of site-generated trips was developed in accordance with the Institute of Transportation Engineers (ITE) Trip Generation Manual, 7th edition. Land use types used for this analysis are based on the recommendations of the Market Study and on square-footage estimates of facility sizes based on the preliminary site layout. Specifically, Site A includes 30,000 s.f. of "Shopping Center" (ITE Land Use Code 820) and 4,500 s.f. of "Fast Food Restaurant with Drive-Through Window" (ITE Land Use Code 934). Site B includes a total of 210,000 s.f. building space used as "Industrial Park" (ITE Land Use Code 130). Volumes of site-generated trips based on these estimates are documented in Table 1. These volumes are assumed to be constant; i.e. not subject to annual growth rates applied to background traffic.

Table 1 – Site Generated Trips

	AM Peak Hour	PM Peak Hour
Site A - Entering	168	217
Site A - Exiting	147	222
Site B - Entering	174	38
Site B - Exiting	52	194

The distribution of site-generated trips was estimated to determine the routing of these trips to and from the subject parcels, based on the majority of "source" (i.e. residential) development being located south of the airport. These assumptions are documented in Tables 2a, 2b, and 2c.

Table 2a – Distribution of Site Trips by Access Point

	Site A	Site B
New Intersection #1	40%	N/A
New Intersection #2	60%	70%
New Intersection #3	N/A	30%

Table 2b – Distribution of Entering Site Trips by Origin

	Site A via Intx #1	Site A via Intx #2	Site B via Intx #2	Site B via Intx #3
MD 170 North	10%	30%	20%	30%
MD 170 South	10%	40%	30%	30%
MD 176 East	50%	10%	20%	20%
MD 176 West	30%	10%	20%	20%
Other site via Intx #2*	N/A	10%	10%	N/A

* Assumes trips to Site A from Site B, and vice-versa.

Table 2c – Distribution of Exiting Site Trips by Destination

	Site A via Intx #1	Site A via Intx #2	Site B via Intx #2	Site B via Intx #3
MD 170 North	10%	30%	20%	30%
MD 170 South	30%	40%	30%	30%
MD 176 East	30%	10%	20%	20%
MD 176 West	30%	10%	20%	20%
Other site via Intx #2*	N/A	10%	10%	N/A

* Assumes trips to Site A from Site B, and vice-versa.

Site generated trips were added to no-build traffic volumes to establish "Build" condition traffic volumes for years 2010 and 2030. "Through" volumes for the three new intersections were calculated from the MD 170 / MD 176 intersection. Resultant AM and PM Peak Hour intersection volumes for build conditions are included in the CLA worksheets attached at the end of this report, and discussed in the Analysis & Results section.

d. Analysis and Results

Subject intersections were analyzed for the various development scenarios using the Critical Lane Analysis (CLA) method favored by SHA for planning evaluations. Five scenarios were evaluated, including "Current" (2005) conditions and both No-Build and Build scenarios for "Interim Year" (2010) and "Horizon Year" (2030) conditions. Level of Service (LOS) and Volume-to-Capacity (v/c) ratio are given for both the AM and PM Peak Hour in Table 3.

Table 3 – Level Of Service Analysis Results
AM LOS (AM v/c ratio) / PM LOS (PM v/c ratio)

	MD 170 / MD 176 Intersection	New Intersection #1	New Intersection #2	New Intersection #3
Current (2005)	B (0.69) / D (0.85)	N/A	N/A	N/A
Interim (2010) No-Build	C (0.80) / E (0.98)	N/A	N/A	N/A
Interim (2010) Build	D (0.88) / F (1.03)	A (0.44) / A (0.52)	B (0.71) / B (0.65)	B (0.64) / B (0.59)
Horizon (2030) No-Build	F (1.18) / F (1.46)	N/A	N/A	N/A
Horizon (2030) Build	F (1.26) / F (1.50)	A (0.62) / C (0.74)	F (1.01) / E (0.91)	E (0.95) / D (0.86)

A Level of Service “D” is generally considered acceptable for an urban intersection. These results show that the existing intersection operates within an acceptable LOS during the AM peak hour, but fails during the PM peak hour in 2010, even without additional development. Comparing the 2010 No-Build and 2010 Build conditions, it is apparent that while site traffic is sufficient to push LOS results to lower (worse) thresholds, this effect is incremental and does not, by itself, warrant capacity improvements to existing roadways beyond the recommended turn lanes. Furthermore, this analysis is conservative in that it is assumed that none of the trips are accounted for as pass-by trips; an assumption which maximizes the impact of site traffic. LOS for the new intersections are acceptable in 2010, yet degrade to unacceptable levels in 2030 due to forecast increases in background traffic on MD 170.

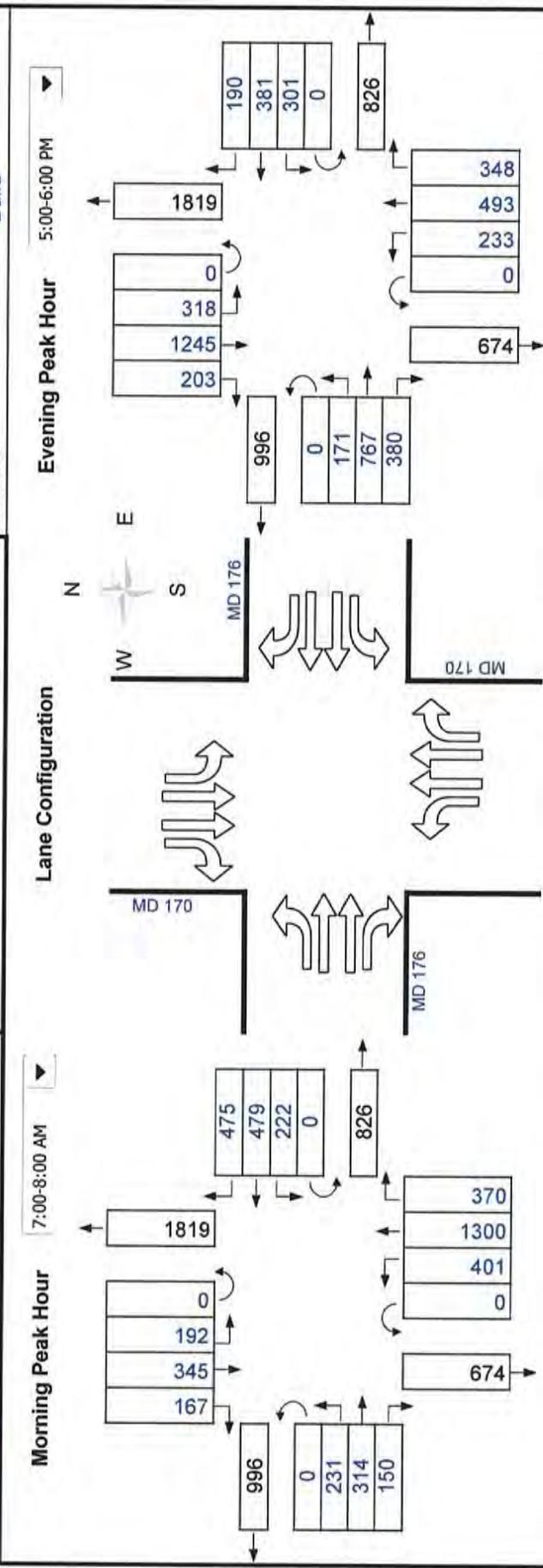
4. Conclusions and Recommendations

A preliminary site layout was developed based on interpretation of the market study recommendations for appropriate land uses at Sites A and B. Access to these sites is feasible with modifications to the existing roadways to accommodate new intersections. Widening should be provided at site access points to provide turn lanes in accordance with the recommendations presented in the “Site Access” section. Future capacity improvements to the MD 170 corridor will be required to mitigate projected increases in non-site related traffic.

Detailed design recommendations for site access intersections and widening along existing roadways, as well as designs for signalization or other appropriate intersection traffic control should be supported by a detailed analysis once the proposed site layout is finalized.

Turning Movement & Level of Service Summary

Location: **MD 170 @ MD 176**
 Count Date: **2010**
 Scenario: **Build**



φ	Morning Peak Hour				Evening Peak Hour				
	Movement	Volume	Lane Use Factor	Lane Volume	Movement	Volume	Lane Use Factor	Lane Volume	
1	NB	1300	0.55	715	NB	493	0.55	271	
	SB	345	0.55	190	SB	1245	0.55	685	
	EB	314	0.55	173	EB	767	0.55	422	
	WB	479	0.55	263	WB	381	0.55	210	
				0				0	
				0				0	
Remarks:		Total = 1401		Total = 1641		v/c = 0.88		v/c = 1.03	
		LOS = D		LOS = D		LOS = F		LOS = F	

φ	Morning Peak Hour		Evening Peak Hour		
	Opposing Lefts	Critical Lane Vol.	Opposing Lefts	Critical Lane Vol.	
1	192	907	318	589	
	401	591	233	918	
	222	395	301	723	
	231	494	171	381	
		0		0	
		0		0	
Remarks:		Total = 1401		Total = 1641	
		v/c = 0.88		v/c = 1.03	
		LOS = D		LOS = F	

φ	Morning Peak Hour		Evening Peak Hour	
	Opposing T+R Vol.	PCE	Opposing T+R Vol.	PCE
1	< 199	1.1	< 199	1.1
	< 599	2.0	< 599	2.0
	< 799	3.0	< 799	3.0
	> 999	4.0	> 999	4.0
	> 1000	5.0	> 1000	5.0

A	MD SHA Levels of Service					
	0 to 1,000	1,001 to 1,150	1,151 to 1,300	1,301 to 1,450	1,451 to 1,600	> 1,600
0						
1						
2						
3						
4						
5						
6						

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Turning Movement & Level of Service Summary

Location: **New Intersection #1**

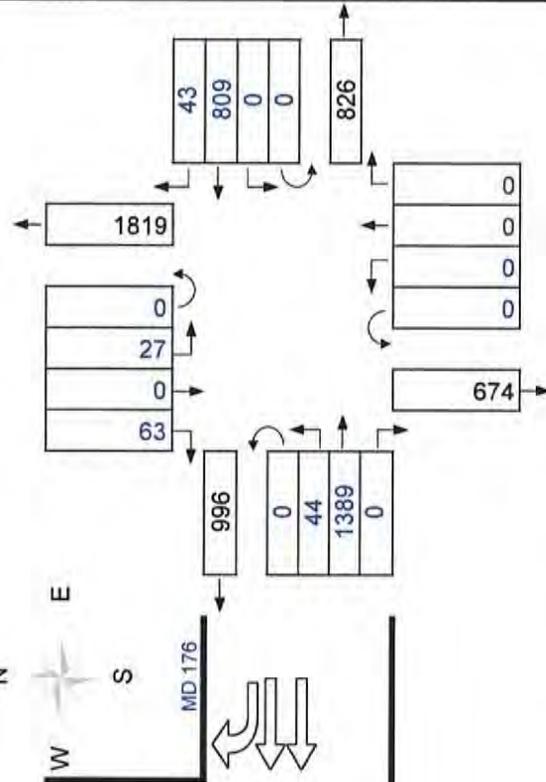
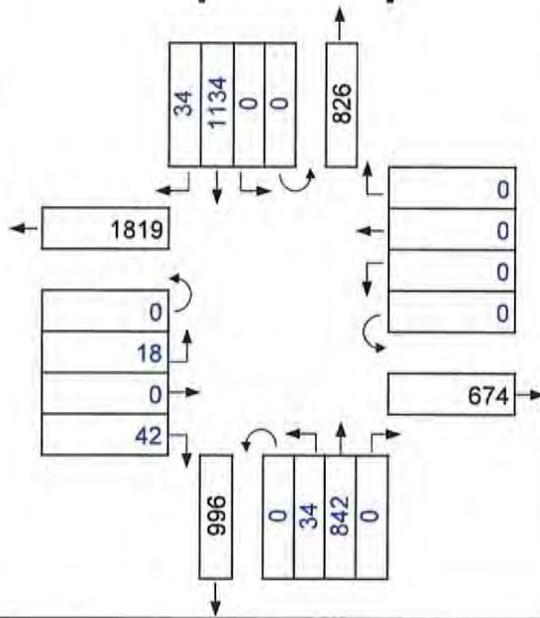
Count Date: **2010**

Scenario: **Build**

Morning Peak Hour 7:00-8:00 AM

Lane Configuration

Evening Peak Hour 5:00-6:00 PM



Phasing (φ)	Morning Peak Hour		Evening Peak Hour		RTOR	No. Lanes	Lane Use Factor	Opposing T+R Vol.	PCE	MD SHA Levels of Service							
	Volume	Lane Use Factor	Lane Volume	Lane Use Factor						A	B	C	D	E	F		
1	2	3	4			1	1.00	< 199	1.1	0 to 1,000							
5	6	7	8			2	0.55	< 599	2.0	1,001 to 1,150							
						3	0.40	< 799	3.0	1,151 to 1,300							
						4	0.30	< 999	4.0	1,301 to 1,450							
						Dble. L.T.	0.60	> 1000	5.0	1,451 to 1,600							

Morning Peak Hour

Evening Peak Hour

φ	Movement	Morning Peak Hour		Evening Peak Hour		φ	Movement	Volume	Lane Use Factor	Lane Volume	Opposing Lefts	Critical Lane Vol.
		Volume	Lane Use Factor	Lane Volume	Lane Use Factor							
	NB	0		0			NB			0		0
	SB	42	1.00	42	1.00		SB	63	1.00	63	0	63
	EB	842	0.55	463	0.55		EB	1389	0.55	764	0	764
	WB	1134	0.55	624	0.55		WB	809	0.55	445	44	489
		0		0						0		0
		0		0						0		0

Remarks:

Total =	700	Total =	827
v/c =	0.44	v/c =	0.52
LOS =	A	LOS =	A

Turning Movement & Level of Service Summary

Location: **New Intersection #2**

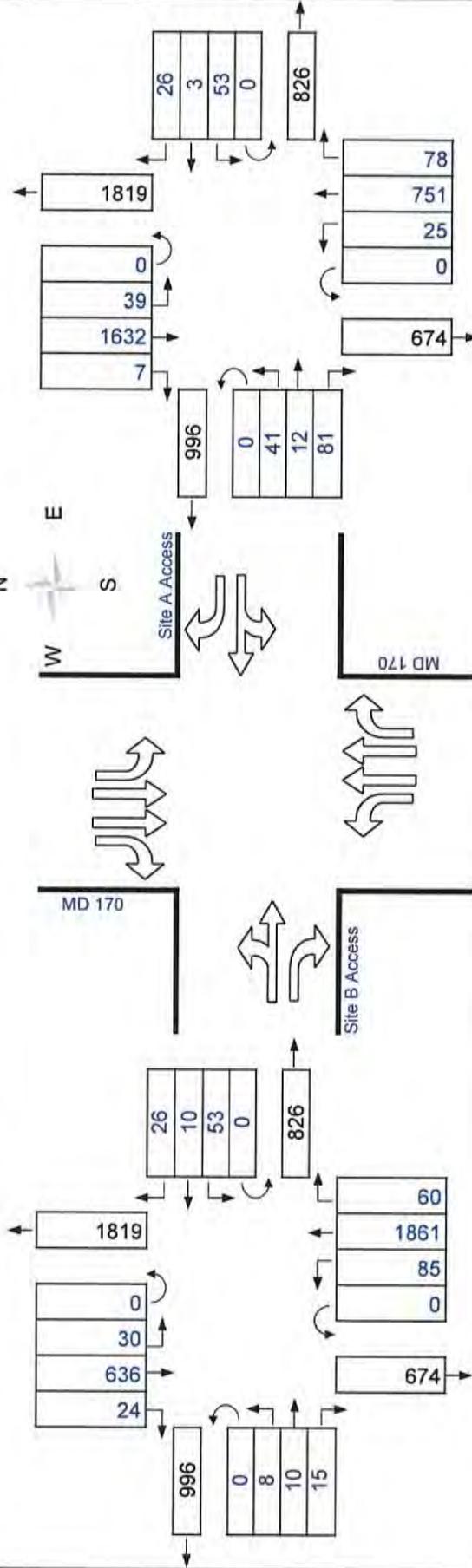
Count Date: **2010**

Scenario: **Build**

Morning Peak Hour: **7:00-8:00 AM**

Evening Peak Hour: **5:00-6:00 PM**

Lane Configuration



PCE	Opposing T+R Vol.	Lane Use Factor	No. Lanes	RTOR	Intersection Control	MD SHA Levels of Service
<	199	1.00	1	NB	Signal	0 to 1,000
<	599	0.55	2	SB	Stop	1,001 to 1,150
<	799	0.40	3	EB	Ways	1,151 to 1,300
<	999	0.30	4	WB		1,301 to 1,450
>	1000	0.60	Dble. L.T.			1,451 to 1,600
>	1000					> 1,600

Morning Peak Hour						Evening Peak Hour								
φ	Movement	Volume	Lane Use Factor	Lane Volume	Opposing Lefts	Critical Lane Vol.	*	φ	Movement	Volume	Lane Use Factor	Lane Volume	Opposing Lefts	Critical Lane Vol.
1	NB	1861	0.55	1024	30	1054	*		NB	751	0.55	413	39	452
	SB	636	0.55	350	85	435			SB	1632	0.55	898	25	923
	EB	19	1.00	19	53	72			EB	57	1.00	57	53	110
	WB	68	1.00	68	8	76	*		WB	61	1.00	61	41	102
				0		0						0		0
				0		0						0		0

Remarks:		Total = 1130	Total = 1033
		v/c = 0.71	v/c = 0.65
		LOS = B	LOS = B



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Turning Movement & Level of Service Summary

Location: **New Intersection #3**

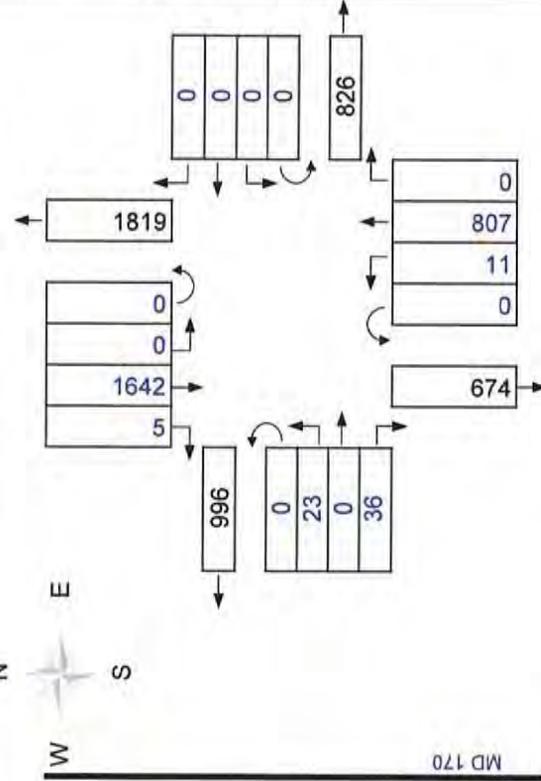
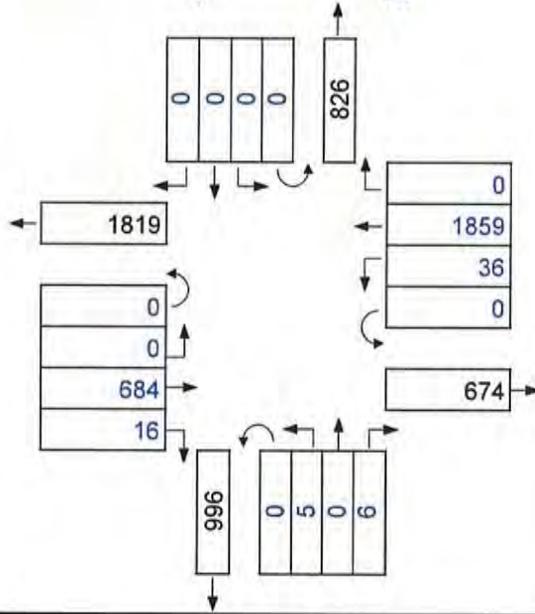
Count Date: **2010**

Scenario: **Build**

Morning Peak Hour 7:00-8:00 AM

Lane Configuration

Evening Peak Hour 5:00-6:00 PM



Phasing (φ)	Morning Peak Hour		Evening Peak Hour		RTOR	No. Lanes	Lane Use Factor	Opposing T+R Vol.	PCE	MD SHA Levels of Service								
	Volume	Lane Use Factor	Lane Volume	Lane Use Factor						A	B	C	D	E	F			
1	2	3	4			1	1.00	<	1.1	0 to 1,000								
5	6	7	8			2	0.55	<	2.0	1,001 to 1,150								
						3	0.40	<	3.0	1,151 to 1,300								
						4	0.30	<	4.0	1,301 to 1,450								
						Dble. L.T.	0.60	>	5.0	1,451 to 1,600								

φ	Morning Peak Hour		Evening Peak Hour		Movement	Volume	Lane Use Factor	Lane Volume	Opposing Lefts	Critical Lane Vol.	φ	Opposing Lefts	Critical Lane Vol.
	Volume	Lane Use Factor	Lane Volume	Lane Use Factor									
NB	1859	0.55	1022	0.55	NB	807	444	0	0	1022		0	444
SB	684	0.55	376	0.55	SB	1642	903	36	11	412		11	914
EB	6	1.00	6	1.00	EB	36	36	0	0	6		0	36
WB	0		0				0	0	0	0		0	0
							0	0	0	0		0	0
Remarks:												Total =	950
Remarks:												v/c =	0.59
Remarks:												LOS =	A

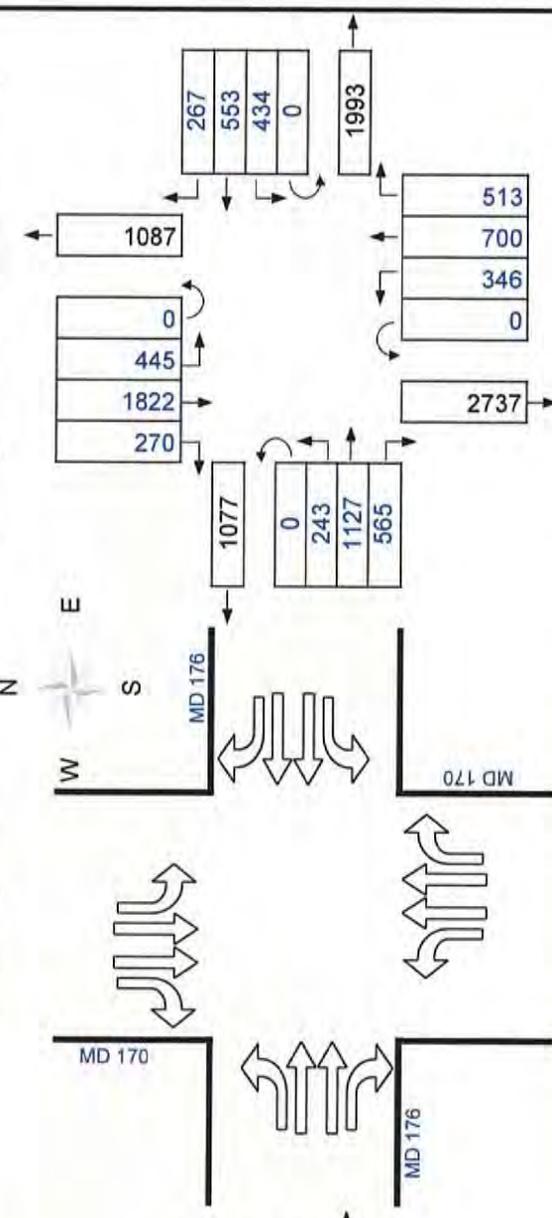
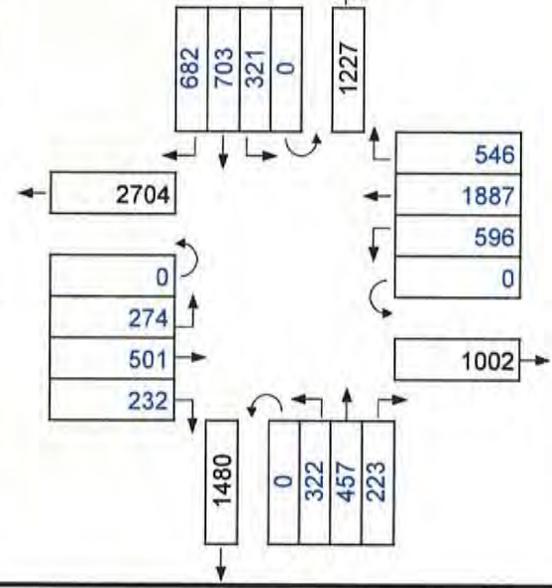
Turning Movement & Level of Service Summary

Location: **MD 170 @ MD 176**
 Count Date: **2030**
 Scenario: **Build**

Morning Peak Hour 7:00-8:00 AM

Evening Peak Hour 5:00-6:00 PM

Lane Configuration



Phasing (φ)	Morning Peak Hour		Evening Peak Hour		PCE	MD SHA Levels of Service
	Volume	Lane Use Factor	Volume	Lane Use Factor		
1	2	3	4			A
5	6	7	8			B
						C
						D
						E
						F

φ	Morning Peak Hour		Evening Peak Hour		Opposing T+R Vol.	Lane Use Factor	No. Lanes	RTOR	Intersection Control	Lane Use Factor	Volume	Movement	φ	Critical Lane Vol.	Opposing Lefts	Lane Volume	Opposing Lefts	Critical Lane Vol.
	Volume	Lane Use Factor	Volume	Lane Use Factor														
NB	1887	0.55	1038	0.55	<	0.55	1		Signal	1.00	700	NB	*	1312	274	385	445	830
SB	501	0.55	276	0.55	<	0.55	2		Stop	0.55	1822	SB	*	872	596	1002	346	1348
EB	457	0.55	251	0.55	<	0.55	3		Ways	0.40	1127	EB	*	572	321	620	434	1054
WB	703	0.55	387	0.55	<	0.55	4			0.30	553	WB	*	709	322	304	243	547
			0		>		4			0.60				0		0		0
			0				Dble. L.T.							0		0		0

Remarks: Total = 2021, v/c = 1.26, LOS = F

Remarks: Total = 2402, v/c = 1.50, LOS = F

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 100 South Charles Street, Tower 1, 10th Floor
 Baltimore, MD 21201-2727
 Phone: 410.752.9631 Fax: 410.727.4608

Turning Movement & Level of Service Summary

Location: **New Intersection #1**

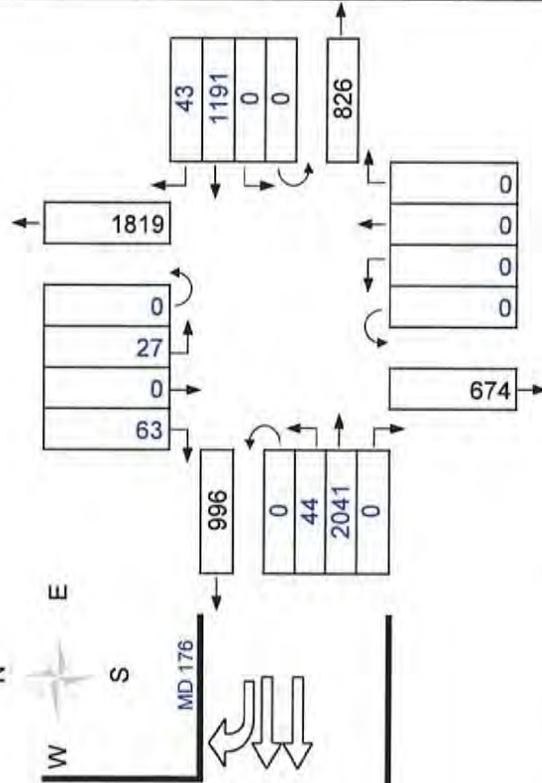
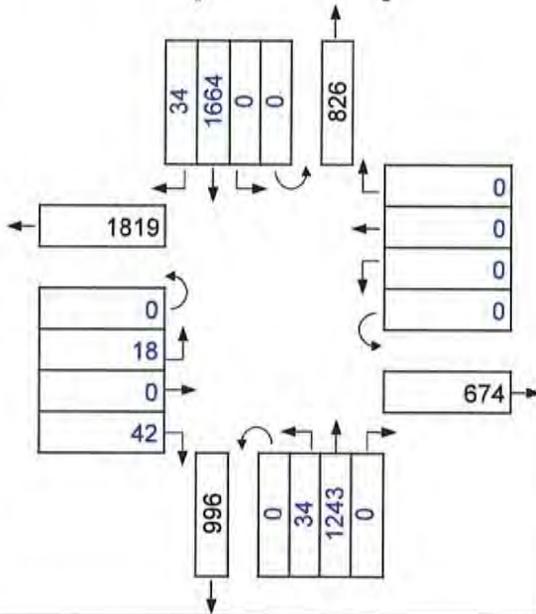
Count Date: **2030**

Scenario: **Build**

Morning Peak Hour 7:00-8:00 AM

Lane Configuration

Evening Peak Hour 5:00-6:00 PM



Phasing (φ)	Morning Peak Hour			Evening Peak Hour			MD SHA Levels of Service
	Volume	Lane Use Factor	Lane Volume	Volume	Lane Use Factor	Lane Volume	
1	2	3	4				A
5	6	7	8				B
							C
							D
							E
							F
							> 1,600

φ	Movement	Volume	Lane Use Factor	Lane Volume	Opposing Lefts	Critical Lane Vol.	φ	Movement	Volume	Lane Use Factor	Lane Volume	Opposing Lefts	Critical Lane Vol.	Remarks:		
														Total =	v/c =	LOS =
	NB	0		0	0	0		NB	0		0	0	0	Total = 1186 v/c = 0.74 LOS = C		
	SB	42	1.00	42	0	42		SB	63	1.00	63	0	63			
	EB	1243	0.55	684	0	684		EB	2041	0.55	1123	0	1123			
	WB	1664	0.55	915	34	949		WB	1191	0.55	655	44	699			
		0		0	0	0			0		0	0	0			
		0		0	0	0			0		0	0	0			

Remarks:													
												Total =	1186
												v/c =	0.74
												LOS =	C

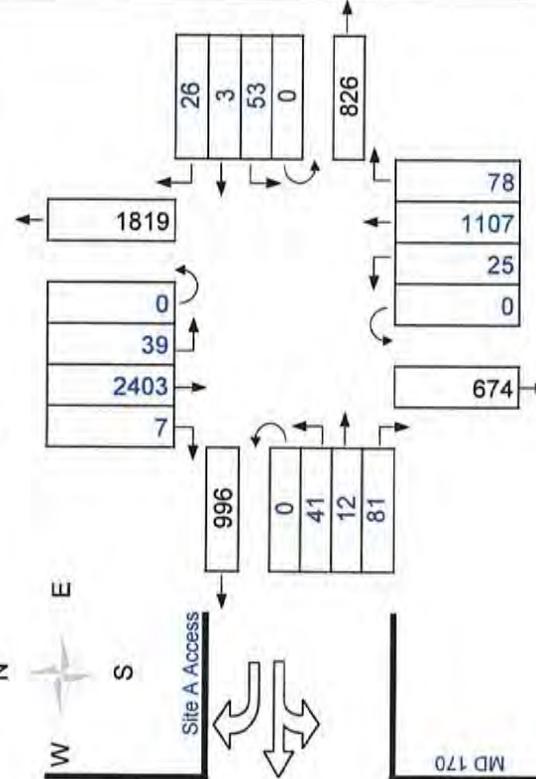
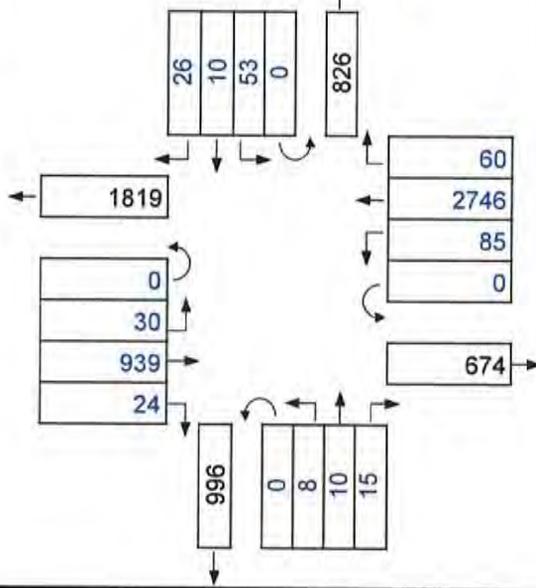
Turning Movement & Level of Service Summary

Location: New Intersection #2
 Count Date: 2030
 Scenario: Build

Morning Peak Hour 7:00-8:00 AM

Lane Configuration

Evening Peak Hour 5:00-6:00 PM



Phasing (φ)	Intersection Control			RTOR	No. Lanes	Lane Use Factor	Opposing T+R Vol.	PCE	MD SHA Levels of Service						
	Signal	Stop	Ways						A	B	C	D	E	F	
1	2	3	4	NB	1	1.00	< 199	1.1	0 to 1,000						
5	6	7	8	SB	2	0.55	< 599	2.0	1,001 to 1,150						
				EB	3	0.40	< 799	3.0	1,151 to 1,300						
				WB	4	0.30	< 999	4.0	1,301 to 1,450						
					Dble. L.T.	0.60	> 1000	5.0	1,451 to 1,600						

Morning Peak Hour

Evening Peak Hour

φ	Movement	Volume	Lane Use Factor	Lane Volume	Opposing Lefts	Critical Lane Vol.	φ	Movement	Volume	Lane Use Factor	Lane Volume	Opposing Lefts	Critical Lane Vol.	*
	NB	2746	0.55	1510	30	1540		NB	1107	0.55	609	39	648	*
	SB	939	0.55	516	85	601		SB	2403	0.55	1322	25	1347	*
	EB	19	1.00	19	53	72		EB	57	1.00	57	53	110	*
	WB	68	1.00	68	8	76		WB	61	1.00	61	41	102	*
				0		0			0		0		0	
				0		0			0		0		0	
Total = 1616													Total = 1457	
v/c = 1.01													v/c = 0.91	
LOS = F													LOS = E	

Remarks:



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Turning Movement & Level of Service Summary

Location: New Intersection #3

Count Date: 2030

Scenario: Build

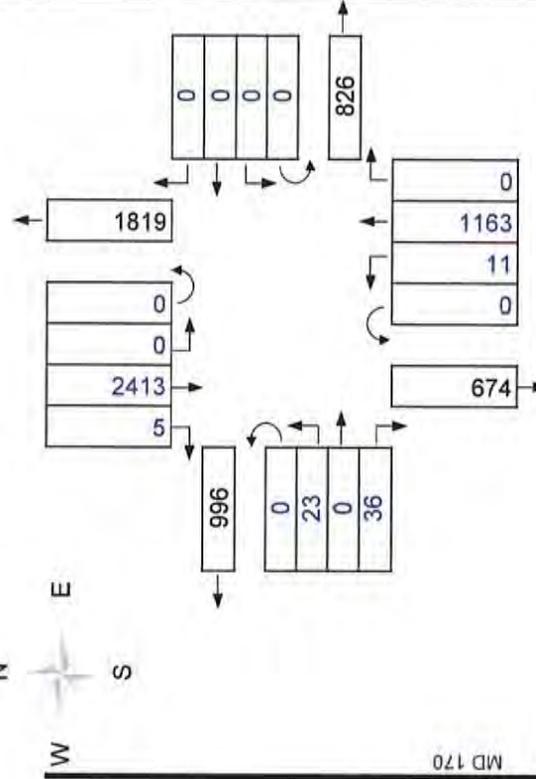
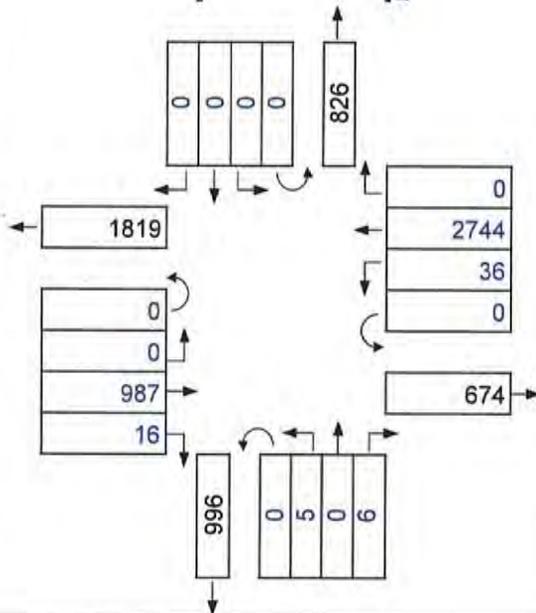
Morning Peak Hour

7:00-8:00 AM

Lane Configuration

Evening Peak Hour

5:00-6:00 PM



Phasing (φ)	Intersection Control		RTOR	No. Lanes	Lane Use Factor	Opposing T+R Vol.	PCE	MD SHA Levels of Service									
	Signal	Stop Ways						NB	SB	EB	WB	A	B	C	D	E	F
1	2	3		1	1.00	<	1.1	0 to 1,000									
5	6	7		2	0.55	<	2.0	1,001 to 1,150									
				3	0.40	<	3.0	1,151 to 1,300									
				4	0.30	<	4.0	1,301 to 1,450									
				Dble. L.T.	0.60	>	5.0	1,451 to 1,600									

φ	Morning Peak Hour				Evening Peak Hour				Critical Lane Vol.	Opposing Lefts	Opposing Lane Vol.	Critical Lane Vol.
	Movement	Volume	Lane Use Factor	Lane Volume	Volume	Lane Use Factor	Lane Volume	Volume				
NB	2744	0.55	1509	1509	1163	0.55	640	640	0	640	*	
SB	987	0.55	543	543	2413	0.55	1327	1338	11	1338	*	
EB	6	1.00	6	6	36	1.00	36	36	0	36	*	
WB			0	0			0	0		0		
			0	0			0	0		0		
			0	0			0	0		0		
Remarks:									Total =	1515	1374	
									v/c =	0.95	0.86	
									LOS =	E	D	