

Delaware 8 Concept Plan and Operations Study

May, 2008

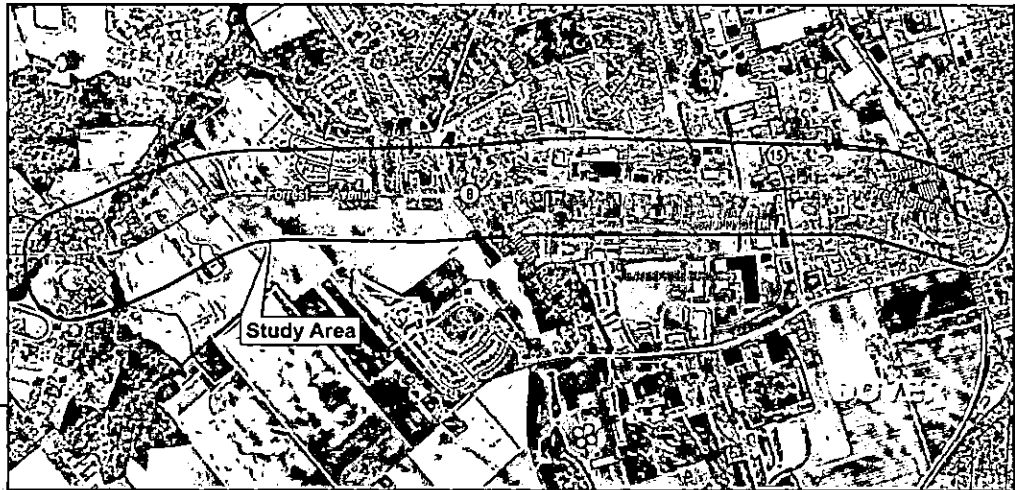


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Executive Summary

Introduction

Route 8 is an important local and regional corridor for Delaware. Within the City of Dover limits it serves as the primary western gateway into the City. In 1992, the City adopted a Corridor Overlay Zone on Del. 8 to address both aesthetic and functional aspects of the roadway. In 2000, the Strategic Development Plan for the West Side report was prepared which identified strategies to improve the corridor.

The purpose of this project is to conduct a planning level study of Route 8 that will develop a concept of the corridor as an aesthetic gateway to the west side of Dover and address the need to provide a safe and efficient traffic flow, accommodate multiple modes of travel and provide access to the adjacent land uses. In addition, the concept plan will evaluate land use issues in order to develop strategies to guide future transportation and land use decisions.

The process followed to develop the concept plan included data collection, analysis, development of alternatives and the identification of a preferred alternative. A comprehensive public involvement process was used throughout the project to help identify issues, develop alternatives and to gain consensus among the stakeholders.

Data Collection

An initial step in the project was to perform data collection. Base mapping was gathered from 2002 aerial photography. In addition, high resolution digital ortho-imagery was collected along the corridor. Existing environmental and cultural resources were identified using research of existing records and mapping and field verification. Proposed land developments were also reviewed and incorporated into the study. Crash records throughout the corridor covering a three year period were gathered and reviewed. Turning movement counts were conducted at each signalized intersection within the corridor and Automatic Traffic Recorders were placed for two full weekdays. From this information, existing 2006 peak hour, average daily traffic volumes, and truck percentages were developed. Utilizing DelDOT's traffic model, 2030 traffic volumes were developed. Finally, pedestrian, bicycle and transit facilities were inventoried and reviewed for compatibility with current standards.

Analysis

The analysis of the existing conditions focused on safety issues, capacity deficiencies, multi-modal needs, and land use trends.

Safety – There were 132 reported crashes from January 2003 to December 2005. Clash clusters were identified at Mifflin Road, Kenton Road, Independence Boulevard, and Saulsbury Road. It was noted that the majority of crashes (55%) involved injuries. This can be attributed to the fact that 57% of the incidents were either left turn or angle crashes. This type of crash is related to the protected/permissive phasing of the signals. Through field observation and the

public input, it was observed that many drivers violate existing right turn only access points. While the crash reports did not identify this as statistically significant problem, it does create an operational problem within the corridor.

Capacity/Level of Service – Capacity and level of service (LOS) analysis is used to estimate the traffic-carrying ability and quality of service provided by the roadway facility. A SYNCHRO traffic model was developed for existing and future (2030) traffic volumes. A LOS analysis was performed to identify existing capacity deficiencies and future problems under a no-build scenario.

The analysis determined that all signalized intersections have acceptable levels of service for the existing and future conditions with the exception of Saulsbury Road and Kenton Road. Saulsbury Road will have a LOS F in the future AM and PM peak hours and Kenton Road will operate at a borderline LOS E in the future PM peak hour. In addition, the unsignalized intersection of Forest Street and Route 8 has an LOS F in both the existing and future conditions.

Multi-modal – The Route 8 corridor serves a diverse land use that includes retail, apartments, townhomes and single family residential and institutional uses. Multiple modes of travel need to be accommodated along the roadway. Currently, transit service is provided from the downtown area to west of Kenton Road. Sidewalks exist from Mifflin Road to the east end of the study area. A bicycle path exists on the north side of Route 8 from Kenton Road to Saulsbury Road.

The study identified several areas where improvements are needed. Transit facilities should be enhanced to include bus pads at all stops and shelters at key points, such as in front of the Modern Maturity center. Sidewalk ramps need to meet ADA standards and crosswalks and pedestrian signals should be installed at all signalized intersections. Route 8 is identified in the Statewide Bicycle Plan as a bike route. However, there are limited facilities. Improvements along Route 8 should include both on road bike lanes and signage and an off road facility from Artis Drive to Saulsbury Road.

Land Use – Land use along the corridor is characterized by historic commercial development patterns, recent commercial redevelopment of former commercial or residential parcels between Mifflin Road and Saulsbury Road, institutional uses including public schools and residential subdivisions. The trend of redevelopment of older residential development and lower class commercial space is anticipated to continue for properties fronting along the corridor between Saulsbury Road and Kenton Road. Additional lands are planned for development as well as lands are available for redevelopment.

In 1992, the City of Dover adopted a Corridor Overlay Zone. The COZ is intended to create a superior urban development. The goals of the COZ are to foster linkages between the corridor properties and adjacent land; to preserve

mobility for traffic movement; and to achieve a visually balanced streetscape environment.

As expected, there are numerous ongoing development proposals within the corridor. Most significantly, the Capital School District has proposed constructing a new high school on the Carey Farm east of Artis Drive. The high school will serve approximately 1800 students. In addition, a cluster of new developments is occurring at the northwest corner of Saulsbury Road and Route 8. These developments include Doveview, an assisted living facility, Walgreens drug store and Commerce Bank.

Alternatives

Alternatives were developed based on the analysis of existing and future no-build conditions and public input. For the future condition, the analysis assumed that the new high school was open and that the West Dover Connector had been constructed. The alternatives include:

Common Improvements

Many improvements are proposed for both Alternatives 1 and 2. These are listed below:

- a) Realign Artis Drive to eliminate the skewed angle of the intersection.
- b) Add two points of access for the new high school. The western access is proposed to be unsignalized. The entrance opposite Stoney Drive would be signalized.
- c) Create a new road connection from Route 8 to Artis Drive and Hazletville Road. This would function as a local roadway that would serve as the high school's western entrance and inter-connect with the new residential development south of the high school.
- d) Create a new road connection from Route 8 to Chestnut Grove Road. This road would serve to improve the north south grid within the study area. Ultimately it would help relieve traffic from Kenton Road. Currently, the roadway would impact land preserved under the agricultural preservation program and would extend outside both the City and County growth boundary.
- e) Change the east-west left turns at Mifflin Road, Kenton Road, Independence Road and Saulsbury Road intersections to protected only movement.
- f) Add an eastbound right turn storage lane @ Mifflin Road intersection.
- g) Provide an on-road bike lane through all intersections along Route 8.
- h) Install crosswalks and handicap ramps and pedestrian signals at all signalized intersections.
- i) Improve existing shared use path on north side of Route 8 and extend path from Kenton Road to Mifflin Road.
- j) Create two-way connection between McDonalds and Kenton Road Shopping Center.
- k) Add outside shoulders on Route 8 from Mifflin Road to Saulsbury Road.
- l) Incorporate landscaping and streetscaping elements into plan.

- m) Create interconnections between properties along Route 8 including from Wawa to Independence Blvd. and Independence Blvd to Bennington Street.
- n) Update transit stops with concrete pads and benches.

Alternative 1

- a) Construct a shared use path from Artis Drive to Mifflin Road.
- b) Construct landscaped median from west of Mifflin Road to Saulsbury Road
- c) Add 2nd eastbound left turn lane at Kenton Road
- d) Construct a connector road behind the Gateway West Shopping Center connecting Saulsbury Road with Modern Maturity intersection. The purpose of this road is to shift the SB left turns from Kenton Road to Independence Road, where more capacity exists.
- e) **Alternative 1a (in addition to Alternative 1 improvements)**
 - o Install additional through lane in both directions on Saulsbury Road
 - o Reduce the length of the northbound left turn lane to 250'
 - o Change left turn phasing on Saulsbury Road to Protected/Prohibited
- f) **Alternative 1b (in addition to Alternative 1 improvements)**
 - o Maintain geometry as in Alternate 1 and Protected/Permissive phasing on Route 8
- g) Create connection with Commerce Way and Mifflin Road
- h) Install a signal at Forest Street.

Alternative 2

- a) Construct sidewalk from Artis Drive to Mifflin Road
- b) Construct connector Road between Kenton Road and Independence Blvd
- c) Maintain center turn lane from west of Mifflin Road to Saulsbury Road; widen to create outside shoulder
- d) Construct an additional through lane in both directions on Saulsbury and double left turn bays on both northbound and southbound Saulsbury Road in lieu of new interconnection to Modern Maturity Center.
- e) Construct a roundabout at Forest Street/Route 8 split.

Alternative 3 – No Build**Preferred Alternative**

The Preferred Alternative was developed based on the results of the technical analysis, public input and direction from the Project Advisory Committee. Improvements included in the Preferred Alternative are as follows:

Artis Drive Realignment - This option would re-align the intersection of Artis Drive and Route 8 to eliminate the skewed intersection.

High School Access at Stoney Drive - The signalization of the Stoney Drive in conjunction with the new high school construction and would serve as access to the new school.

North-South Connector Roads – A connector road from Route 8 to Chestnut Grove Road is planned and a connection from Route 8 to Artis Drive and Hazletville Road.

Left-Turn Phasing at signalized intersections - This improvement would alter the existing protected/permissive left-turn phasing to protected/prohibited phasing at the intersections of Mifflin Road, Kenton Road, Independence Boulevard and Saulsbury Road.

Eastbound Right-Turn Lane at Mifflin Road - An eastbound right-turn lane at this location, while not required from a capacity standpoint, was included to remove turning vehicles from the through travel lanes, improve intersection safety, and reduce overall delay.

Bike Lanes Through all Intersections - Route 8 is identified as a regional Kent County bike route by DelDOT; therefore on-road bicycle facilities should be provided throughout the corridor.

Shoulders along Route 8 - Shoulders will be added to Route 8 throughout the corridor.

Pedestrian Accommodations at Signals - Pedestrian accommodations at signals should include, at minimum, high-visibility crosswalks, possibly textured crosswalks at selected locations, pedestrian push buttons, and pedestrian signal heads.

Existing Shared-Use Path Improvement- The existing shared-use path that extends from Mifflin Road to just east of Saulsbury Road will be improved.

Interconnections between properties along Route 8 - The longer-term improvement option that should be explored would be a continuous service road connection between Mifflin Road all the way through to Independence Boulevard. This would allow local trips to use this service road to access businesses without the need to use Route 8. As redevelopment occurs the following connections should be made:

- A 2-way connection between McDonald's and the signal to Kenton Road.
- An interconnecting street from Independence Boulevard to Mifflin Road. The street would be a City street and designed to city street standards.
- An interconnection between Independence Blvd and Bennington Street.
- An interconnection between Dove View and Modern Maturity Center
- Interconnection between Heatherfield Way and Stoney Drive; and Heatherfield and Cranberry Run

Landscaping and Streetscaping elements - Landscaping and urban design elements should be included with roadway improvements to encourage multi-modal activity and improve the aesthetics of the corridor.

Transit Stops - Updating transit stops along the corridor include, at minimum, concrete pads and shelters at all existing bus stops within the study area.

New Entrance to Brandywine Apartments - This improvement would create a new access point for the Brandywine Apartment complex at Mifflin Road.

Pedestrian Crossing at Forest Street - An unsignalized crossing of Forest Street in the area of the Route 8 split is proposed to provide a safe crossing for pedestrians and to allow bicyclists a viable way to continue on eastbound Route 8 through the split at Forest Street.

Shared Use Path - This improvement includes constructing a 10 foot wide shared use path from Artis Drive to Mifflin Road.

Landscaped Median – This improvement includes the installation of a 16' wide landscaped median along DE Route 8 from just west of Mifflin Road to just east of Saulsbury Road.

Kenton Road – In the area of Kenton Road a combination of improvements are included in the Preferred Alternative. First, a connector road from Kenton Road to Independence Boulevard is needed to help divert southbound left turns and westbound right turns from the Kenton Road/Route 8 intersection. Because the diversion of traffic to the connector road is uncertain; it is recommended that the intersection should be widened to accommodate a future 2nd eastbound left turn lane.

Connector Road behind Gateway West Shopping Center and Additional through lane on Saulsbury Road - These improvements are related to one another as they both are intended primarily to improve operations at the intersection of Route 8 & Saulsbury Road. By allowing northbound left-turning vehicles along Saulsbury and eastbound right-turning vehicles along Route 8 to use a roadway connection behind the Gateway West Shopping Center, they could avoid this congested intersection.

Signalization of Forest Street/Weston Drive & Route 8 - A signal at the intersection of Route 8 & Weston Drive would provide better operations and shorter queues for left-turning vehicles along the Weston/Forest Street approach to the intersection.

Public Involvement

The development of the concept plan has been a collaborative effort of residents, public agencies and business owners. A Project Advisory Committee was established at the outset of the project. The committee consists of representatives from the City of Dover, Dover Planning Commission, DelDOT, the D/KC MPO, Kent County, Office of State Planning, Capital School District, local residents, and business owners. The Advisory Committee provided guidance, input and feedback on the project scope, the data collection, analysis, and alternatives.

In addition, the public involvement has involved public workshops where the results of the data collection and analysis were presented. At this workshop, which was held on February 19, 2007, the public was presented with the analysis which helped define the needs for the corridor. Potential alternatives were presented for consideration. In addition, the public was encouraged to describe additional issues or concerns as well as potential alternatives for consideration.

Based on this workshop and subsequent input from the Project Advisory Committee, alternatives were developed and analyzed for their effectiveness. The alternatives were presented at a Public Workshop on August 1, 2007. The final Preferred Alternative is a combination of improvements from both alternatives. It was developed based on the input from the public workshop and the Project Advisory Committee.

1. PURPOSE AND NEED

The purpose and need for this project is to develop a long range concept plan for Delaware Route 8 from Artis Drive to the Delmarva Secondary Railroad crossing that will enhance the corridor as an aesthetic gateway to the west side of Dover and address the need to provide a safe and efficient traffic flow, accommodate multiple modes of travel and provide access to the adjacent land uses. In addition, the concept plan needs to support the City's Corridor Overlay Zone. The study area is shown in Exhibit 1-1.



Exhibit 1-1: Study Area: Delaware 8 – Artis Drive to Delmarva Secondary Railroad

Based on the analysis of existing and future conditions, improvements are needed to address safety, capacity, multi-modal and aesthetic deficiencies along the corridor.

Safety: Crash clusters were evaluated throughout the study area. Crash clusters were identified at the Mifflin Road, Kenton Road, Independence Boulevard and Saulsbury Road intersections. Left turn crashes are the predominant type of crash which occurs at signals with a protected/permissive phasing.

Capacity and Mobility: Existing intersection levels of service at the signalized intersections were found to be adequate throughout the corridor. Future (2030) levels of service at the Saulsbury Road intersection were determined to be LOS F/LOS F in the AM/PM peak hour, respectively and the intersection of Kenton Road was found to operate at a borderline LOS E in the PM peak hour. For the most part, access between properties within the corridor is limited. Interconnecting properties with both pedestrian and vehicular connections will enhance mobility.

Multi-modal: The corridor is designated as a state bicycle route. However, there are limited bicycle facilities, such as signing and bike lanes. Similarly, the pedestrian facilities require improvement with the addition of crosswalks, pedestrian signals and upgrading curb ramps. Standard bus pads need to be added to all bus stops.

Aesthetics: Alternatives to address and improve the aesthetics along the corridor need to be evaluated.

2. EXISTING CONDITIONS

2.1 Environmental Characteristics

2.1.1 Cultural Resources

As part of Section 106 compliance completed for the project, A.D. Marble & Company conducted a cultural resources planning study, including background research and an architectural resource reconnaissance survey of the study area. This preliminary survey is meant to assist in the identification of historic properties within the vicinity of the proposed roadway improvements. The preliminary National Register eligibility recommendations presented in this report are solely the opinion of A.D. Marble & Company and are meant to provide direction for future Section 106 studies that will be required for the project.

1.1.1. Project Description and Purpose and Need

The purpose and need for this project is to develop a long range concept plan for Delaware Route 8 from Artis Drive to the Delmarva Secondary Railroad crossing that will enhance the corridor as an aesthetic gateway to the west side of Dover and address the need to provide a safe and efficient traffic flow, accommodate multiple modes of travel and provide access to the adjacent land uses. In addition, the concept plan needs to support the City's Corridor Overlay Zone.

Based on the analysis of existing and future conditions, improvements are needed to address safety, capacity, multi-modal and aesthetic deficiencies along the corridor. More information on these identified improvements can be located in the Route 8 Concept Plan and Operations Study (JMT 2007). Once the Route 8 Concept Plan and Operations Study is approved, the Dover/Kent County Metropolitan Planning Organization (MPO) and DelDOT will determine how future projects will be identified, funded, and constructed.

A.D. Marble & Company was hired by the MPO to perform a windshield survey associated with the Route 8 Concept Plan and Operations Study. The undertaking includes a planning study to consider motorized and non-motorized strategies to address current and future travel demand in the Route 8 corridor from Artis Drive to the Delmarva Secondary Railroad crossing in Dover. The study will also examine land use alternatives for undeveloped parcels and the impacts of those alternatives on the transportation system. Finally, the study will result in a corridor concept describing how Route 8 should look and operate in the future.

The proposed project study area encompasses the area immediately adjacent to Route 8 (Forrest Ave./Forrest St./W. Division St.). All properties adjacent to the roadway are also included in the study area. The architectural study area includes all properties fronting portions of Route 8 (Forrest Ave./Forrest St./W. Division St.) between Artis Drive in Kent County to the Norfolk Southern Railroad tracks in the City of Dover.

No formal archaeological survey will be undertaken as part of this phase of the project nor was any research conducted with regards to the potential for archaeological resources. Future studies undertaken as part of the Route 8 project will include an archaeology component as required by Section 106 of the National Historic Preservation Act.

Background Research

Background research was performed to gain an understanding of the cultural and architectural development of the study area and to identify and assess previously prepared documentation. Specific repositories consulted by A.D. Marble & Company during this phase include the DE SHPO and DelDOT. A.D. Marble & Company examined relevant historic maps and atlases, aerial photographs, and previous cultural resources surveys and National Register nominations for properties, structures, and sites located within and near the study area.

For the purposes of this project, the cut-off date of construction for structures to be evaluated (1958) was developed using the National Register's 50-year age consideration and the planned execution date of the project. Resources dating to 1958 were identified through a windshield survey of the project area and a review of 1956 United States Geological Survey (USGS) mapping. Further research is needed to determine more accurate construction dates for these resources. It is likely the 1958 cut-off date will be expanded under future Section 106 studies as future projects may not occur for a period of five to ten years.

Previous Cultural Resources Survey Work

A review of files held by the DE SHPO revealed two previous cultural resource reports whose study area is located within the vicinity of the proposed project area (Lincoln Park Center and Clarence Street Extension Project and the Lockerman and Forest Street Intersection Improvement Project). These two documents will be reviewed as part of the next phase of the project. Table 1 identifies architectural resources located within and around the study area that have been previously surveyed. Preliminary National Register eligibility recommendations are based on a review of the forms prepared for each resource, as well as the recently completed windshield survey, during which the integrity of each previously surveyed resource was examined and photographed. See Figure 1 and the attached photographs for more information.

Table 1. Previously Surveyed Architectural Resources within the Study Area.

Name/Address	CRS #	Tax Parcel #	Date	National Register Eligibility Status/Preliminary Recommendations
Victorian Dover Historic District	K00396	Multiple-Historic District	Multiple	National Register Listed (7-16-1979).
1205 Artis Drive	K01067	ED0007502013100	ca.1890	Potentially Ineligible – Architectural Significance and Integrity.
Massey-Draper House; Forrest Avenue	K00145	ED0507500010100	ca. 1820	Potentially Ineligible – Architectural Significance and Integrity. Original dwelling demolished.
1486 Forrest Avenue	K01071	ED0507610021000	ca. 1930	Dwelling demolished. Modern bank constructed on parcel.
1238 Forrest Avenue	K07176	ED0007610012500	ca. 1940	Potentially Ineligible – Architectural Significance and Integrity.
William Henry Middle School; 65 Carver Road	K06940	ED0507607015500	1951	Potentially Eligible – More Research Needed.
Booker T. Washington Elementary School; 901 Forrest Street	K06796	ED0507607015500	1923	Potentially Eligible – More Research Needed.
801 W. Division Street	K06813	ED0507608013200	ca. 1900	Potentially Ineligible – Architectural Significance and Integrity.

Of the eight previously surveyed resources located within and around the proposed project area, the Victorian Dover Historic District (K00396) is located outside the proposed study area and will not require additional survey work as long as the proposed improvements are located outside the National Register boundary for this resource. Both the Massey-Draper House (K00145) and the 1486 Forrest Avenue Property (K01071) have been heavily altered through the removal of the original dwellings. The Massey-Draper House still retains its original outbuildings, but a modern modular home has been added to the property. Both resources are potentially ineligible for listing in the National Register. The William Henry Middle School (K06940) and the Booker T. Washington Elementary School (K06796) are potentially eligible for listing in the National Register. Both schools are featured prominently in the African-American history of the Dover area. The remaining dwellings are heavily altered and are representative examples of their types and do not appear to retain sufficient integrity to convey historic or architectural significance (K01067, K07176, and K06813).

Cultural Resources Identified as Part of the Windshield Survey

Architectural Resources

A field survey revealed a total of 56 newly identified architectural resources constructed in or before 1958 within the proposed Route 8 Concept Plan and Operations Study Area. Table 2 presents newly identified architectural resources located within the project study area that were constructed before or around 1958. See Figure 1 for more information. Preliminary National Register eligibility recommendations with regards to architectural significance were compiled during the November 2006 windshield survey of the study area. These recommendations are preliminary in nature, based on an examination of the integrity of the resources during the field view, knowledge of local architecture, limited background research, and consideration of National Register criteria.

Table 2. Newly Identified Architectural Resources within the Study Area.

Name/Address	A.D. Marble Survey #	Tax Parcel #	Construction Date	National Register Preliminary Eligibility Recommendations*
2344 Forrest Ave	A00100	ED0007502011700	1880-1940	Potentially Ineligible – Architectural Significance
2318 Forrest Ave	A00101	ED0007502011800	1880-1940	Potentially Ineligible – Architectural Significance
2296 Forrest Ave	A00102	ED0007502011900	1880-1940	Potentially Ineligible – Architectural Significance
2272 Forrest Ave	A00103	ED0007502012000	1940-1960	Potentially Ineligible – Architectural Significance
2248 Forrest Ave	A00104	ED0007502013000	1940-1960	Potentially Ineligible – Architectural Significance
2100 Forrest Ave	A00105	ED0007500012600	1940-1960	Potentially Ineligible – Architectural Significance
2090 Forrest Ave	A00106	ED0007500012700	1940-1960	Potentially Ineligible – Architectural Significance
1738 Forrest Ave	A00107	ED0007500012900	1880-1940	Potentially Ineligible – Architectural Significance and Integrity
1570 Forrest Ave	A00108	ED0007600010800	1830-1880	Potentially Ineligible – Architectural Significance and Integrity
1558 Forrest Ave	A00109	ED0007600010700	1940-1960	Potentially Ineligible – Architectural Significance
1559 Forrest Ave	A00110	ED0507605010200	1940-1960	Potentially Ineligible – Architectural Significance
1555 Forrest Ave	A00111	ED0507605040400	1940-1960	Potentially Ineligible – Architectural Significance
1554 Forrest Ave	A00112	ED0007609010100	1940-1960	Potentially Ineligible – Architectural Significance
1550 Forrest Ave	A00113	ED0007609010200	1940-1960	Potentially Ineligible – Architectural Significance
1551 Forrest Ave	A00114	ED0507605010500	1940-1960	Potentially Ineligible – Architectural Significance
1547 Forrest Ave	A00115	ED0507605010600	1940-1960	Potentially Ineligible – Architectural Significance
1546 Forrest Ave	A00116	ED0007609010300	1940-1960	Potentially Ineligible – Architectural Significance

Name/Address	A.D. Marble Survey #	Tax Parcel #	Construction Date	National Register Preliminary Eligibility Recommendations*
1542 Forrest Ave	A00117	ED0007609010400	1940-1960	Potentially Ineligible – Architectural Significance
1543 Forrest Ave	A00118	ED0507605010700	1940-1960	Potentially Ineligible – Architectural Significance
1539 Forrest Ave	A00119	ED0507605010900	1940-1960	Potentially Ineligible – Architectural Significance
1538 Forrest Ave	A00120	ED0007609010500	1940-1960	Potentially Ineligible – Architectural Significance
4 Mifflin Rd	A00121	ED0507609011100	1940-1960	Potentially Ineligible – Architectural Significance
1344 Forrest Ave	A00122	ED0507610015100	1940-1960	Potentially Ineligible – Architectural Significance
1330 Forrest Ave	A00123	ED0507610015200	1880-1940	Potentially Ineligible – Architectural Significance
1324 Forrest Ave	A00124	ED0507610010100	1880-1940	Potentially Ineligible – Architectural Significance
1310 Forrest Ave	A00125	ED0507610010300	1880-1940	Potentially Ineligible – Architectural Significance
1252 Forrest Ave	A00126	ED0007610012300	1940-1960	Potentially Ineligible – Architectural Significance
1188 Forrest Ave	A00127	ED0507611026200	1880-1940	Potentially Ineligible – Architectural Significance
1128 Forrest Ave	A00128	ED0507611025900	1880-1940	Potentially Ineligible – Architectural Significance and Integrity
1124 Forrest Ave	A00129	ED0507611022001	1880-1940	Potentially Ineligible – Architectural Significance
1082 Forrest St	A00130	ED0007611020500	1880-1940	Potentially Ineligible – Architectural Significance
1076 Forrest St	A00131	ED0007611021900	1880-1940	Potentially Ineligible – Architectural Significance
1070 Forrest St	A00132	ED0007611020600	1880-1940	Potentially Ineligible – Architectural Significance
1064 Forrest St	A00133	ED0007611021300	1880-1940	Potentially Ineligible – Architectural Significance
983 Forrest St	A00134	ED0507607013600	1880-1940	Potentially Ineligible – Architectural Significance
977 Forrest St	A00135	ED0507607013700	1880-1940	Potentially Ineligible – Architectural Significance
971 Forrest St	A00136	ED0507607016200	1880-1940	Potentially Ineligible – Architectural Significance
955 Forrest St	A00137	ED0507607016300	1880-1940	Potentially Ineligible – Architectural Significance
951 Forrest Ave	A00138	ED0507607016400	1880-1940	Potentially Ineligible – Architectural Significance
960 Forrest St	A00139	ED0507611010600	1880-1940	Potentially Ineligible – Architectural Significance
948 Forrest St	A00140	ED0507611010700	1880-1940	Potentially Ineligible – Architectural Significance
916 Forrest St	A00141	ED0507612010200	1880-1940	Potentially Ineligible – Architectural Significance
908 Forrest St	A00142	ED0507612010300	1880-1940	Potentially Ineligible – Architectural

Name/Address	A.D. Marble Survey #	Tax Parcel #	Construction Date	National Register Preliminary Eligibility Recommendations*
				Significance
904 Forrest St	A00143	ED0507612010400	1880-1940	Potentially Ineligible – Architectural Significance
880 Forrest St	A00144	ED0507612010700	1880-1940	Potentially Ineligible – Architectural Significance
870 Forrest St	A00145	ED0507612010800	1880-1940	Potentially Ineligible – Architectural Significance
862 Forrest St	A00146	ED0507612010900	1880-1940	Potentially Ineligible – Architectural Significance
731 W Division St	A00147	ED0507608013400	1940-1960	Potentially Ineligible – Architectural Significance
726 W Division St	A00148	ED0507608013800	1940-1960	Potentially Ineligible – Architectural Significance
721 W Division St	A00149	ED0507608013600	1880-1940	Potentially Ineligible – Architectural Significance
629 W Division St	A00150	ED0507608012500	1940-1960	Potentially Ineligible – Architectural Significance
627 W Division St	A00151	ED0507608012300	1940-1960	Potentially Ineligible – Architectural Significance
621 W Division St	A00152	ED0507608012000	1880-1940	Potentially Ineligible – Architectural Significance
622 W Division St	A00153	ED0507608014102	1880-1940	Potentially Ineligible – Architectural Significance
600 W Division St	A00154	ED0507608014200	1880-1940	Potentially Ineligible – Architectural Significance
601 W Division St	A00155	ED0507608011900	1880-1940	Potentially Ineligible – Architectural Significance

* Recommendations are initial A.D. Marble & Company opinions on National Register eligibility and are based on results of field survey, knowledge of local architecture, and limited background research. Further research is needed to determine historical significance.

Conclusion and Recommendations

In conclusion, A.D. Marble & Company identified 64 architectural resources within or around the proposed project area that were constructed before or around 1958. Recommended survey procedures for future work efforts are described below.

One previously surveyed resource is located outside the proposed project area. The Victorian Dover Historic District (K00396) has been listed in the National Register since July 16, 1979. DE SHPO staff has indicated that a potential boundary increase may be necessary for this resource. Although it is likely that this boundary increase will be located outside the study area, further research will be necessary to determine if this resource will be affected. As long as the proposed improvements are located outside of the National Register boundary for this resource, it is likely that no further research will be required. It should be noted that the study area shown on the attached mapping will likely cut-off at West Division Street and will not extend into the Victorian Dover Historic District. Any proposed project located in the vicinity of the district will take the boundary of the district into account.

Two previously surveyed resources have been heavily altered through the removal of associated buildings and are potentially not eligible. The Massey-Draper House; Forrest Avenue (K00145) is a small farm that retains a majority of its original outbuildings. The original farmhouse has been demolished and a small modular home with multiple additions currently occupies the property. The 50-plus-year-old building associated with 1486 Forrest Avenue (K01071) has been demolished. The parcel now contains a modern bank and associated parking lot. Documentation of loss of integrity will be necessary for these two resources.

Two of the previously surveyed resources may be potentially eligible for listing in the National Register. Both the William Henry Middle School (K06940) and the Booker T. Washington Elementary School (K06796) require additional research to determine their eligibility. These two resources are historically linked to African-American settlement of the Dover area.

The final three previously surveyed resources are typical examples of their type and are potentially ineligible for listing in the National Register. The resource at 1205 Artis Drive (K01067) is a heavily modified example of a late-nineteenth-century single-family dwelling. The resource at 1238 Forrest Avenue is a typical example of an early- to mid-twentieth-century single-family dwelling that currently houses a small business. The resource at 801 W. Division Street (K06813) is an early-twentieth-century dwelling that has been converted into a small apartment complex. All three resources will require further evaluation.

Of the 56 newly identified resources, based on the field examination of integrity and knowledge of local architecture of the nineteenth and twentieth centuries it is not likely that any of the resources are individually eligible for listing in the National Register for their architectural significance. Further research is recommended to determine construction dates and historical significance for the newly identified resources. These dwellings are common examples of their type, many of which feature modern additions, doors, windows, and cladding. A number of the resources have been re-used as small businesses, some of which are currently mixed-use properties. Many of these resources are located in a section of Kent County and the City of Delaware where modern development has heavily infiltrated the area. Integrity of setting and feeling of the area have been altered through this modern development.

Some of these dwellings could possibly be grouped together during future survey efforts as they are similar in style, location, and construction date and may be interrelated in their historical development. Further research is needed to determine if there is a historic relationship among these dwellings. Should these dwellings be found to be historically unrelated, they will require individual documentation on the appropriate CRS forms.

As this project progresses, further background research will also be needed to develop historic contexts allowing better understanding of the historical development and significance of resources within the project area. Repositories that may be visited as more research is needed include: the University of Delaware Library in Newark; the Historical Society of Delaware and the Hagley Library and Museum, both located in Wilmington; and the Delaware State

Archives, the Kent County Department of Planning Services, and the Kent County Recorder of Deeds Office, all of which are located in Dover. The collection of historic mapping used for dating of historic buildings and the development of historic contexts may include additional USGS mapping, the 1859 Kent County Atlas and Byles Map, the 1868 Pomeroy and Beers atlas, and aerial images from multiple years. The construction dates of resources identified as present by 1958 also may be obtained by visiting the Kent County website for tax assessment data. Once additional research efforts are complete, a more accurate list of resources meeting the 1958 age criteria may be generated.

With regards to the Route 8 Concept Plan and Operations Study, A.D. Marble & Company recommends that the next phase of work begin with detailed research on resources in the study area to determine construction dates, development patterns, and historic use. Specific resources to be consulted may include Sanborn mapping, wills, deeds of ownership, census records, and city directories. This research effort will provide sufficient information to determine if the resources in the study area are historically related and will thereby enable the development of a more concise survey methodology.

A.D. Marble & Company recommends that the intensive-level survey include the following tasks:

- An inter-agency field-view to determine resource boundaries, survey methodology, level of documentation needed, and the Area of Potential Effect (APE) for the project. Agencies would include the lead federal agency (i.e. FHWA), MPO, DelDOT, and the DE SHPO;
- Submission of an APE letter for agency concurrence;
- Upon approval of the APE and survey methodology, more research to determine the age of those resources identified as present by 1958;
- An intensive-level survey of all resources within the APE that are found to meet the age criteria established for this project;
- Preparation of a Historic Resources Survey Eligibility Report. Identified resources will be documented on the appropriate Delaware CRS forms. If any resources are determined to be potentially eligible for listing in the National Register, Determination of Eligibility documentation (e.g., National Register nomination forms) will be prepared and included in the report;
- Preparation of a Determination of Effect Report if National Register-eligible or listed resources are determined to be within the proposed project area and may be affected by the project; and
- Conduct a Phase I archaeology survey within areas of proposed direct impacts.

2.1.2 Wetland, Waterways and Rare, Threatened and Endangered Species



Potential wetland areas were identified using NWI mapping. The potential wetlands are shown on Exhibit 2-1. One named waterway, Cahoon Branch, falls within the study area. It crosses Route 8 west of Artis Drive and runs north of Route 8 between Chestnut Grove Road and Route 8. Requests for information regarding the presence of rare, threatened and endangered species were sent to the US Fish and Wildlife and the Delaware Natural Heritage Program. After review of the known environmental resources, it is not anticipated that environmental issues will have a significant influence on the alternatives being considered.

Exhibit 2-1



BEGIN STUDY LIMIT

LEGEND

- Previously Surveyed Resources – Potentially Ineligible
 - Newly Identified Resources – Potentially Ineligible
 - Previously Surveyed Resources – Potentially Eligible
-  Wetlands
-  Rare, Threatened and Endangered Species – Pending



Not to Scale

2.1.3 Hazardous Waste Site

There are no known hazardous waste sites within the project corridor.

2.1.4 Environmental Justice

Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations issued on February 11, 1994, requires federal agencies to identify and address as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations, and to provide opportunity for participation in the public involvement process.

a. Methodology

Baseline demographic information at the census tract level was obtained from the 2000 U.S. Census to identify potential locations of minority and low-income populations. During the time of this study, census block group data was not available. The census tract data was compared to overall project area totals to identify concentrations of minority and low-income populations. In addition, local planning officials were consulted to identify the location of other potential minority and low-income populations within the study area.

Executive Order 12898 defines minority persons as:

- Black (a person having origins in any of the black racial groups of Africa);
- Hispanic (a person of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture origin, regardless of race);
- Asian American (a person having origins in any of the original peoples of the Far East, South East Asia, the Indian subcontinent, or the Pacific Islands);
- American Indian and Alaskan Native (a person having origins in any of the original people of North America and who maintains cultural identification through tribal affiliation or community recognition).

Low-income is defined as a person whose median household income is at or below the Department of Health and Human Services (DHHS) poverty guidelines. The poverty guidelines issued by the DHHS are derived from the poverty thresholds updated each year by the United States Census Bureau. DHHS poverty guidelines for 2006 are \$9,800 for the first person and \$3,400 for each additional person (\$20,000 for a family of four).

b. Findings

Minority Populations

According to the criteria above, minority populations made up 36.5 percent of the study area according to the 2000 Census. Approximately 29.7 percent were black, 2.9 percent Hispanic, 3.1 percent Asian, Hawaiian, or Pacific Islander, and 0.8 percent American Indian and Alaskan Native. Approximately 63.2 percent of the study area was classified as white.

Low-Income Populations

As of 2000, 14.7 percent of the study area reported income in 1999 below the poverty level. Census tract 418.02 had a significantly higher percentage (21.7 percent) of individuals in poverty than the study area as a whole. Census tract 418.02 is located along the southwest portion of the study area. (Exhibit 2-2)

Exhibit 2-2: Study Area Census Tracts

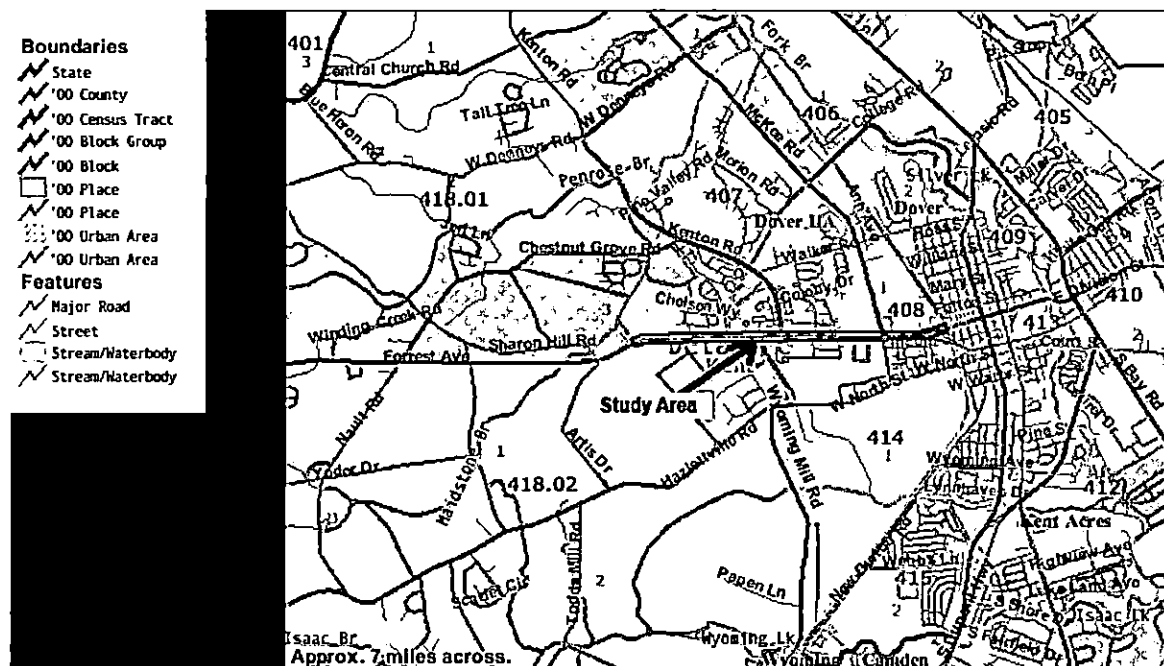


Table 2-3: Racial Distribution, Median Household Income, and Population Below Poverty Status for the State of Delaware, Kent County, and the Study Area.

Census Tract	White (%)	Black (%)	Alaskan Native/ American Indian (%)	Asian/ Pacific Islander (%)	Hispanic (%)	Total Minority (%)	Median Household Income ¹ (1999)	Population Below Poverty (%)
State of Delaware	74.6	19.2	0.4	2.1	4.8	21.7	\$47,381	9.2
Kent County	54.9	37.2	0.5	3.2	4.1	40.9	\$38,669	13.8
Study Area	63.2	29.7	0.8	3.1	2.9	36.5	\$44,1412	14.7
407	64.8	28.5	0.4	2.5	3.4	34.8	\$60,125	10.9
408	52.3	43.5	0.7	0.8	2.7	47.7	\$34,974	11.5
414	38.1	50.2	0.4	6.5	4.7	61.8	\$32,734	21
418.01	73.8	17.6	2.6	3.0	2.1	25.3	\$46,832	8.4
418.02	86.9	8.6	0.1	2.7	1.7	13.1	\$46,042	21.7

Source: US Census 2000

1. A household is defined by the U.S. Census as a place (structure) where one or more persons reside on a regular basis. A family is defined as two or more persons related by birth, marriage, or legal adoption that occupy a place on a regular basis.
2. The figure shown for the study area was determined by calculating the average of the Median Household Income values for each census tract in the study area.

The Kent County Department of Planning Services did not identify any possible low-income and minority communities within the study area. The City of Dover's Department of Planning and Permits was contacted for information regarding possible low-income and minority communities within the study area. Unfortunately, the City of Dover's Department of Planning and Permits was not available to provide any information for this inventory.

Conclusion

All of median household income is significantly higher than the DHHS threshold (\$20,000), therefore the census data would indicate that there are no low-income communities within the study area. Also, except for census tract 414, there are no disproportionately high percentages of minorities within the study area. However, it is recommended that as the project moves forward, the planning team ensure that the Lincoln Park community, located in the southeast portion of the study area (within census tract 414), be included in all public involvement activities to avoid any disproportionately high or adverse impacts to the community.

2.2 ROADWAY CHARACTERISTICS

2.2.1 Roadway Description

Route 8 can be divided into three distinct sections within the study area. In Area 1, from Artis Drive to the west of Mifflin Road, Route 8 is a two lane undivided arterial with an 8-10 foot wide outside shoulder. The adjacent land use is primarily residential with several large undeveloped parcels on both sides of the corridor. The following further describes the area:

- Length – 1.02 miles
- Posted Speed Limit – 50 mph
- AADT – 11,800 vpd

In Area 2, from west of Mifflin Road to Gibbs Drive, Route 8 is a four lane undivided arterial with a 15 feet wide center turn lane. The center turn lane reduces to 12 feet from Saulsbury Road to Gibbs Drive. The land use in the area is suburban mixed use consisting of retail, apartments and offices. There are no shoulders, although there is a sidewalk on the south side and a shared use path on the north side. The path extends from Mifflin Drive to Carver Road, just east of Saulsbury Road. The following further describes the area:

- Length – 1.43 miles
- Posted Speed Limit – 25 - 40 mph
- AADT – 16,100 vpd

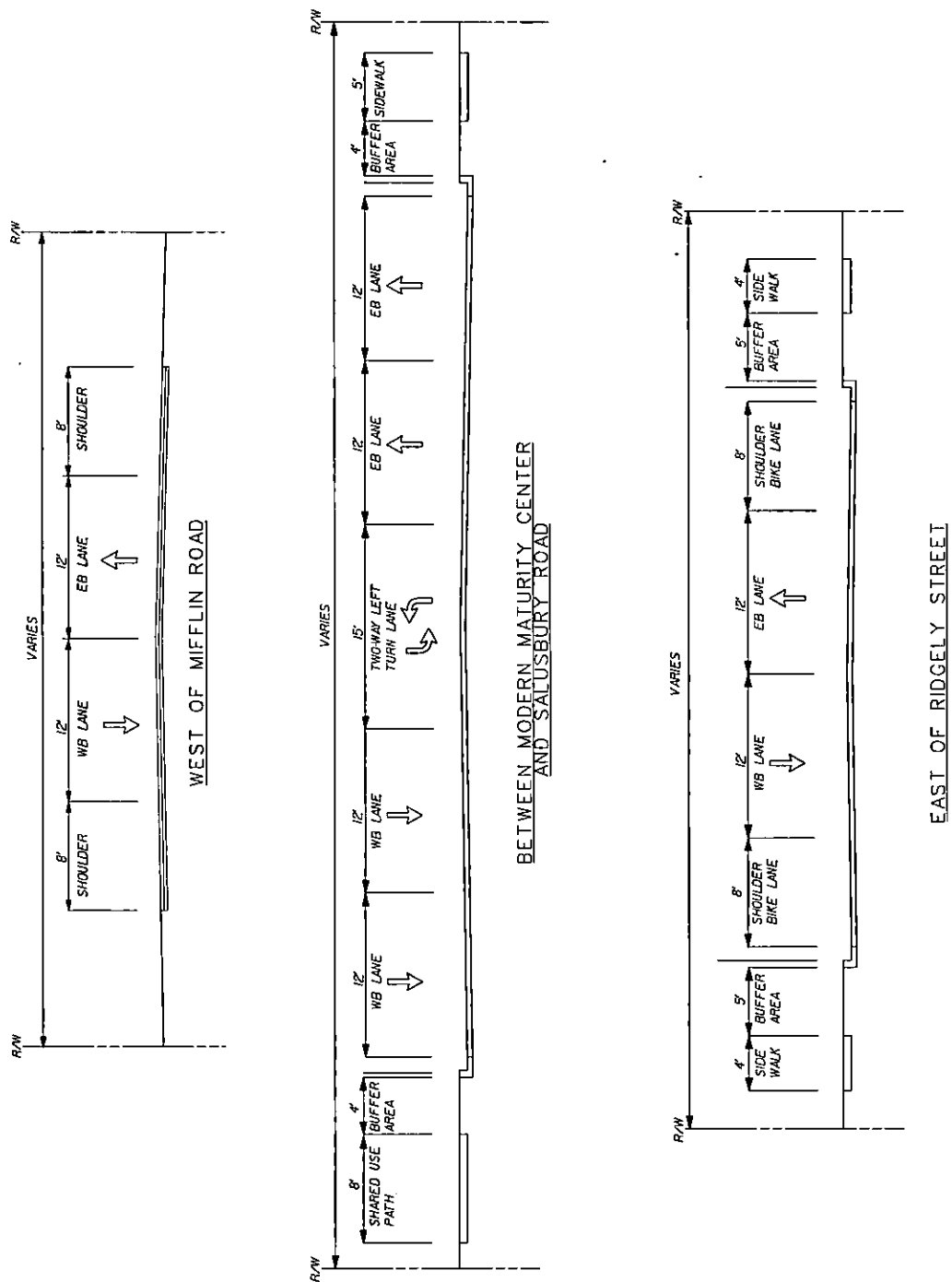
Area 3, from Gibbs Drive to the railroad crossing near West Street, Route 8 is a two lane undivided arterial with an 8-foot wide outside shoulder and curbs on both side. Route 8 splits to Division Street (Route 8) and Forest Street east of Gibbs Drive. The land use in the area is primarily residential on the south side with industrial and institutional land uses on the north side of Route 8. The following further describes the area:

- Length – 0.34 miles
- Posted Speed Limit – 25 mph
- AADT – 11,400 vpd

The entire length of the arterial section is 2.79 miles. The right of way for Route 8 varies from approximately 70 feet at the west end to 110 feet at the east end of the study area. The Norfolk southern rail track crosses Route 8 just east of Ridgely Street intersection. The at-grade rail crossing has flashing lights in conjunction with automatic gates. Typical sections for project area are shown on Exhibit 2-3.

2.2.2 Signalization

There are seven signalized intersections within the study area. Due to the frequency of signals within a short distance, the performance of the roadway is dependent on the performance of



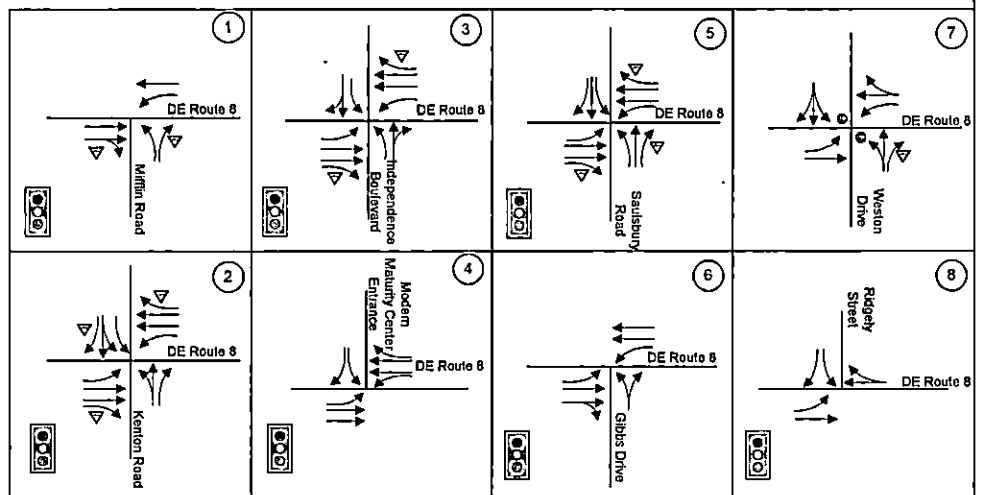
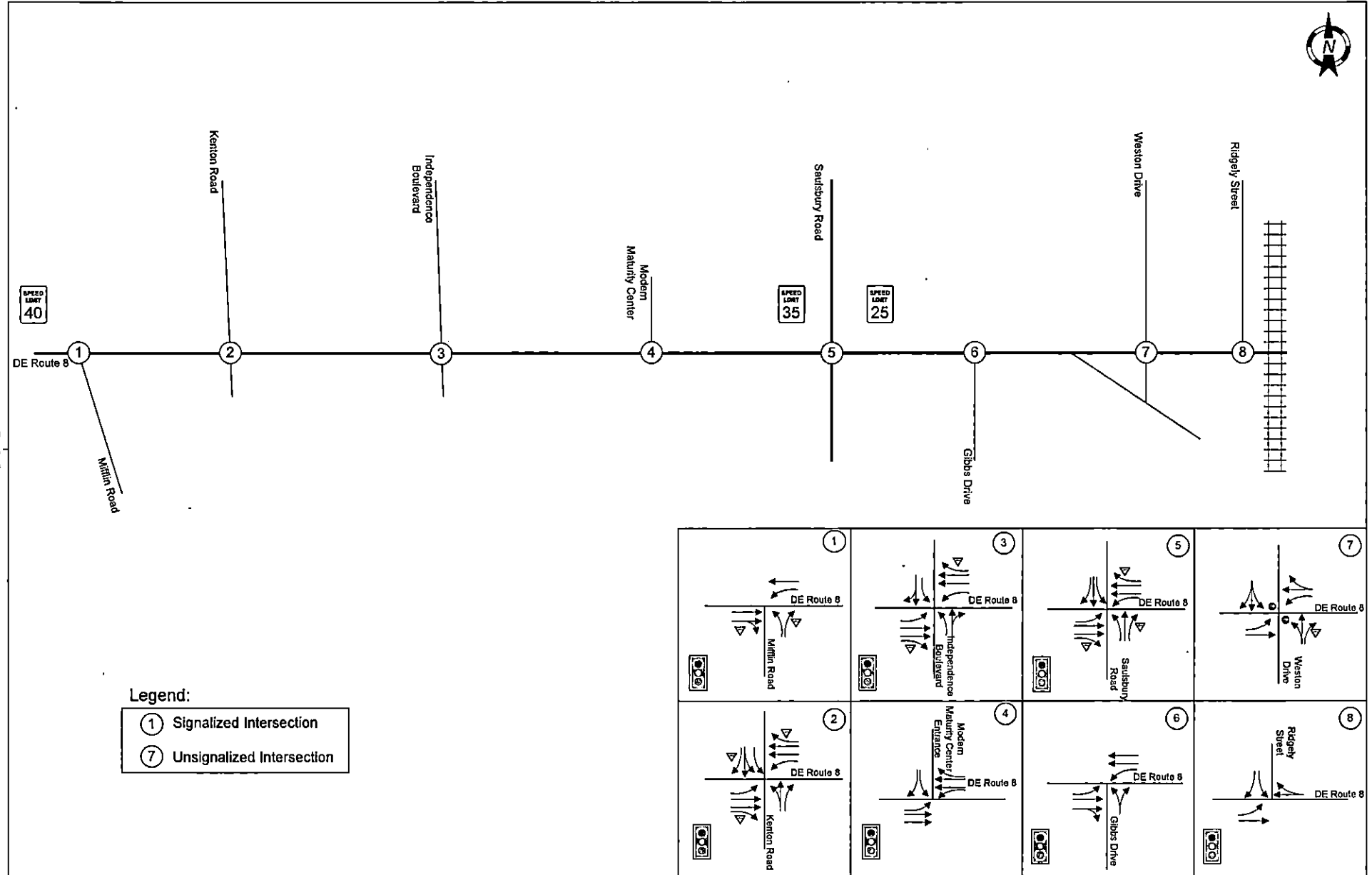
the intersections. In addition, there is a major unsignalized intersection at Forest Street which is also included as part of the corridor analysis. Exhibit 2-4 shows the location and lane configurations of the critical intersections in the study area. Turning movement counts and signal analysis were performed for all these intersections. The intersections are on Route 8 at Mifflin Road, Kenton Road, Independence Blvd, Modern Maturity Center, Salisbury Road (Route 15), Gibbs Drive, Weston Drive and Ridgely Street. All the existing signals are fully actuated and the first five signals operate in a group through a coordinated timing plan.

The intersections at Route 8 from Mifflin Road to Saulsbury Road are connected as a signal group with 120 second cycle length for morning peak hour and 150 second cycle length for afternoon peak hour. The intersection of Mifflin Road and Route 8 has a three phase signal system with protected left from westbound Route 8, concurrent through along Route 8 and concurrent left and right turning movement from Mifflin Road. The intersection of Kenton Road and Route 8 has a four phase signal with concurrent protected lefts from Route 8, concurrent through along Route 8 and split phase movement for southbound Kenton Road and northbound Shopping Plaza entrance. However, both the westbound and eastbound lefts from Route 8 have dual permissive left turn operation in addition to their protected phases. The intersections of Independence Boulevard and Saulsbury Road on Route 8 have four phase signal system with protected lefts from Route 8, concurrent through from Route 8, protected lefts from side streets and through movements from the side streets. In addition to the protected left turn phases, all the left-turn movements are allowed during permissive phases. The intersection of Modern Maturity center at Route 8 has a three phase signal system with protected lefts from eastbound and westbound Route 8, concurrent through along Route 8 and southbound left and right from the Modern Maturity entrance.

The intersection at Gibbs Drive and Route 8 has a three phase signal system with westbound protected left from Route 8, concurrent through movement along Route 8 and northbound left and right from Gibbs Drive. The westbound left is also allowed to move during permissive phase. In addition, an actuated pedestrian crossing phase is also available to access Booker T. Washington elementary school. The pedestrian phase works with activation for pedestrians crossing Route 8. Also, the pedestrian crossing phase is controlled by a crossing guard during the school opening and closing time. The unsignalized intersection at Weston Drive operates as a two way stop control intersection. The eastbound and westbound Route 8 has free flow movement and the northbound and southbound Weston Drive traffic is controlled by a stop sign.

The newly reconstructed intersection of Ridgely Street has a three phase signal with eastbound protected left, concurrent through along Route 8 and southbound left and right from Ridgely Street. However, the timing and phasing plan for this intersection may change in near future.

The analysis of all the intersections with delays and LOS tabulation will be discussed in the next chapter.



NOT TO SCALE

June 2007

Existing Lane Configuration For Signalized Intersections

Exhibit 2 - 4

2.2.3 Multi-Modal Facilities

In the area from Artis Drive to Mifflin Road, sidewalk does not exist. The exception is a short segment along the frontage of Cranberry Run. Bicycle traffic utilizes the shoulder.

From Mifflin Road to the east of the study area sidewalk exists on both side of the road. In most of the areas there is no on-road bike facility. Bicycles are only accommodated on the shared use path that exists on the north side of the road from west of Mifflin Road to the east of Saulsbury Road.

Transit is provided along the corridor by DART and several bus stops are located within the study area. All bus service is provided during weekdays only. A more detailed review and performance analysis of the existing facilities is discussed later in this report.

2.3 STUDY AREA CHARACTERISTICS

2.3.1 Land Use

Land use along the corridor is a mix of residential, commercial and institutional uses. As growth on the western side of Dover has occurred, development along the highway has evolved from individual residential homes; to a conversion of these homes to small business; to the current practice of assembling multiple smaller parcels and redeveloping them with larger commercial establishments.

Existing Land Use Patterns

Lands within the incorporated area of the city are outlined in the black dashed line shown in Exhibit 2-5. Please note that small pockets outlined in the black dashed line depict areas that have not been annexed and are subject to land use regulation by Kent County. The existing farmland located between Artis Drive and Mifflin Road on the south side of DE 8 was recently annexed by the City of Dover.



Exhibit 2-5: Existing Land Use

The corridor is characterized by historic commercial development patterns, recent commercial redevelopment of former commercial or residential parcels between Mifflin Road and Saulsbury Road, institutional uses including public schools and residential subdivisions. The trend of redevelopment of older residential development and lower class commercial space is anticipated to continue for properties fronting along the corridor between Saulsbury Road and Kenton Road. Additional lands are planned for development as well as lands are available for redevelopment.

Corridor Overlay Zone (COZ)

Land use and transportation recommendations from this study have considered land use and design regulations for the Corridor Overlay Zone (COZ) for the following purpose:

- to promote superior urban corridor development and the highest quality built environment;
- to foster coordination and linkages among corridor properties and with adjacent lands;
- to preserve the functionality and efficiency of the roadway for traffic movement; and,
- to achieve a visually balanced streetscape environment which is friendly to the pedestrian and motorist alike.

The following design standards from the COZ are important in the context of transportation improvements to support all modes of travel as well as to create a balanced streetscape environment consistent with land use patterns and characteristics.

- Front yard setbacks that vary based upon locations along the corridor.
- Building placement to maximize use of building fronts along the corridor.
- Location of Parking (*primarily to the rear of buildings with some exceptions*).
- Shared access, cross access and standards for placement of entrances.
- Landscaped area 25 feet from back of curb in front yard.
- Corridor elevation standards through an architectural review.

The above design standards have been considered when identifying various transportation improvements.

Transect Concept

The following depicts a transect concept to support transportation planning and design of context sensitive solutions consistent with the concepts and standards outlined in the City's COZ. For example, the COZ identifies areas along the corridor consistent with the identified Study Area Transects with development guidelines that impact public space for various transportation improvements, as well as creates a multi-modal corridor with opportunities to create a walkable community. Exhibit 2-6 identifies the various transects consistent with areas identified in the COZ.

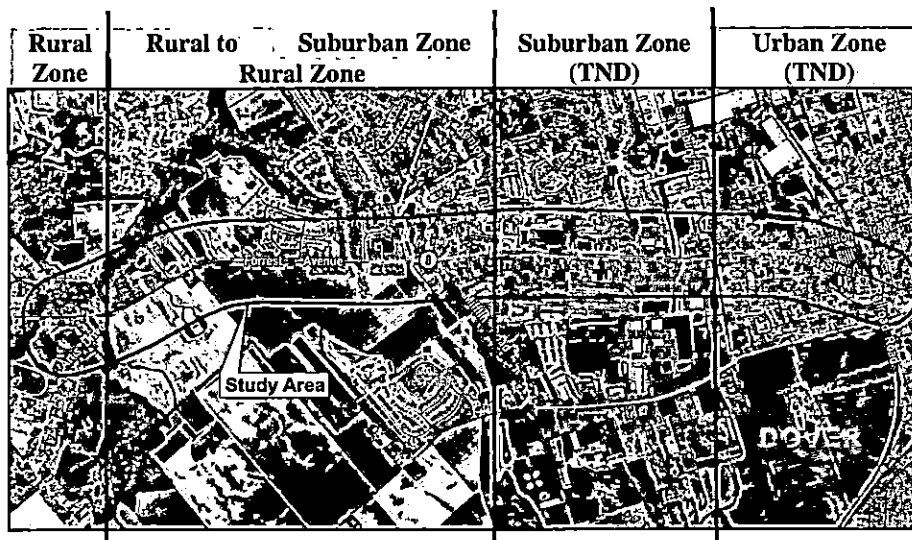


Exhibit 2-6: Study Area Transects
(TND – Traditional Neighborhood Development)

The above identified zones provide the basis for support of further development/redevelopment of the study area applying transportation principles, roadway classifications and land uses, design guidelines for roadways and pedestrian and bicycle facilities, design measures to support ordinance/code development (*to correctly locate and design to the appropriate level of intensity land uses and transportation systems*), and measurement of secondary and cumulative affects as well as development of a study process to support corridor planning. This model utilizes the concept of developing Traditional Neighborhood Development (TND) as defined by both the transect category and City/County planning documentation. The concept of zones can be utilized in modular fashion to define various rural, suburban and urban environments and the appropriate level development/redevelopment and supported by context sensitive transportation solutions. As development and redevelopment occurs along the corridor the characteristics of transects identified above may change (*e.g. it is anticipated that the rural and rural to suburban transects will become more suburban in character*). Table 2-4 on the following page further describes this concept by zone including land use characteristics and existing transportation improvements for various modes along the Route 8 Corridor within the study area. Each area is described by general land use categories as well as by transect with respective COZ Standards. The identified zones will be utilized with analysis conducted through this study to identify transportation and land use recommendations.

Table 2-4: Existing General Transportation and Land Use Characteristics

Corridor Section	Speed Limit	Traffic Volume	Roadway Cross Section	Pedestrian Facilities	Land Use Category	COZ Standards	Transect
Artis Dr. to Mifflin Rd	50 mph	11,100 aadt	1 - WB shoulder 1 - WB travel lane 1 - EB travel lane 1 - EB shoulder	No sidewalk	Farmland/ Residential	Setbacks: 60-80' Curb cuts: 275' apart	Rural to Suburban Zone
Mifflin Rd to Kenton Rd	40 mph	11,600 aadt	1 - WB shoulder 1 - WB travel lane 2 - EB travel lanes	No sidewalk	Residential	Setbacks: 40-60' Curb cuts: 275' apart	Suburban Zone
Kenton Road to Del. 15 (S. Saulsbury Road)	35 - 40 mph	15,500 aadt	2 - WB travel lanes 1 - Center turn lane 2 - EB travel lanes	S/W on both sides (one hot mix; one concrete)	Commercial	Setbacks: 40-60' Curb cuts: 105' apart	
Del 15 (S. Saulsbury Road) to Gibbs Dr.	25 mph	20,234 aadt	2 - WB travel lanes 1 - Center turn lane 2 - EB travel lanes	S/W on both sides	Commercial/ Residential	Setbacks: 20-30' Curb cuts: 105' apart	Urban Zone
Gibbs Dr. to Delmarva RR line	25 mph	11,200 aadt	Transitions from 4 lane section to 2 lane section with shoulders	S/W on both sides	Commercial/ Residential/ Institutional (school)	Setbacks: 20-30' Curb cuts: 105' apart	

Opportunities for Development/Redevelopment

The Future Land Development Opportunities shown in Exhibit 2-7 identify preserved, undeveloped or underutilized lands and proposed or planned development within and adjacent to the study area that should be considered when analyzing future land use and transportation needs as well as determining accessibility, mobility and safety for all modes of transportation along the corridor. For purpose of this study, opportunity sites are defined as sites that are undeveloped/vacant, contain dilapidated or deteriorated structures, assessed at some level of historic significance (historic or potentially historic), and/or underutilized. Opportunity sites for redevelopment and development will result in transportation impacts on the Corridor and intersecting streets. Table 2-5 identifies acreages of tracts identified based upon restrictions and development/redevelopment opportunities.

Table 2-5: Development/Redevelopment Opportunities and Restrictions

Summary of Development/Redevelopment Opportunities and Restrictions	
Type of Opportunity/Restriction	Acres
Permanent Agricultural Preservation	88.8
TOTAL RESTRICTED LANDS	88.8
Undeveloped Lands	45.6
Underutilized Lands	75.5
Proposed Land Developments	247.6
Potential Land Developments	10.7
TOTAL OPPORTUNITIES FOR DEVELOPMENT/REDEVELOPMENT	384.5

Delaware Route 8

Exhibit 2-7 Future Land Development Opportunities



Not to Scale

Planned developments are shown on Exhibit 2-8. This exhibit depicts the location of planned developments and the location of proposed ingress and egress to the sites that must be considered when exploring transportation solutions along the corridor and solutions such as interconnectivity between developments.

Opportunities for Shared and Cross Access

The following are key areas for further evaluation of shared access and cross access improvements as part of the transportation solutions.

- Modern Maturity and Dove View interconnect
- Wawa east to Independence Boulevard
- Kenton east to Independence Boulevard behind Greentree Plaza
- From Saulsbury Road to signal at Modern Maturity

State, County and City Land Use and Transportation Policies and Projects

According to the State Strategies for Policies and Spending Map, the eastern part of the study area from Mifflin Road to West Street is located in Investment Level 1. From Artis Drive to Mifflin Road, the study area transitions from Investment Level 3 to Investment Level 2. There is one property that has been permanently preserved for agricultural use.

Investment Level 1 areas (shown in red on Exhibit 2-9) are often municipalities or urbanized places in the state. In these areas state investments and policies are targeted to accommodate existing development and orderly growth through redevelopment and reinvestment. Significant new development in the study area, however, is not anticipated. Transportation

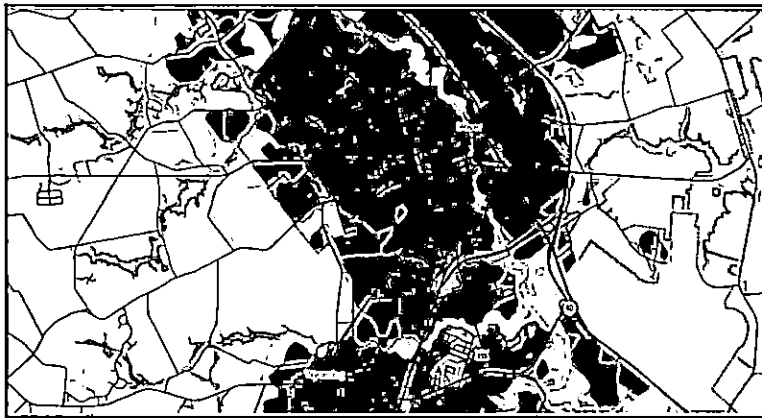


Exhibit 2-9: State Investment Levels

improvements in these areas should provide or enhance multiple modes of travel, as well as improve safety and reduce congestion.

Investment Level 2 areas (shown in orange on Exhibit 2-9) are less developed area within municipalities or rapidly growing areas within counties that do, or will have public water and wastewater services and utilities. This type of areas incorporate a mix of housing types and limited commercial uses as well as interconnecting roads and bikeways between developments. Significant new developments are happening in these areas. Transportation project should expand to provide roadways, public transportation and multi modal facilities.

Delaware Route 8

Exhibit 2-8 Proposed Land and Development Patterns



Not to Scale

Investment Level 3 (shown as yellow on Exhibit 2-9) is defined by areas with existing but disconnected developments which is not contiguous with existing infrastructure. This area may also contain high priority agricultural lands directly adjacent to natural areas. The development of these areas should reflect an orderly, phased and guided policy of infrastructure investment agreed by both local and state government. Presently any roadway improvement that is necessary to support new development activities will not be encouraged in investment Level 3 areas.

The City of Dover's Corridor Overlay Zone (COZ) is a significant planning policy affecting this corridor. As described above, the COZ is intended to help shape Route 8 into a superior urban corridor.

There have been numerous transportation studies and projects within the corridor. Various sections of the corridor have been identified as needing improvements through DelDOT's Highway Safety Improvement Program (HSIP). Safety related improvements include the installation of a median barrier west of the Kenton Road intersection to restrict left turns at the McDonald's entrance. Currently, median barriers and crosswalks are proposed at the Saulsbury Road intersection. In addition, Kenton Road is being studied for pedestrian improvements. The study area includes the intersection with Route 8.

Recommendations

Based upon the information and analysis of land use along this corridor, the following recommendations are provided:

- Development/redevelopment opportunities should target undeveloped and underutilized sites with an emphasis on assemblage of smaller tracts.
- Building setbacks, scale, use and access should promote pedestrian activity through establishment of destinations.
- All modes of transportation should be accommodated for all users including special needs groups and children.
- Development/redevelopment should include design elements that achieve interconnectivity such as connector roads or drives, continuous streets within residential subdivisions and shared access for uses with frontage along the corridor. Cul-de-sacs should be used sparingly in unique situations.
- Streetscapes should provide appropriate pedestrian amenities such as bus shelters, benches, trash receptacles, street trees, pedestrian scale lighting and wayfinding signage.
- Crosswalks should be designed with features that address safety needs of special needs groups and children.
- Intersection improvements must balance pedestrian needs with vehicular needs.

3. CAPACITY AND LEVEL OF SERVICE ANALYSIS

3.1 Traffic Data

Traffic counts were performed by JMT in October of 2006. Traffic forecast data, including link Annual Average Daily Traffic (AADT) and turning movement projections for 2030 was provided by the Delaware Department of Transportation. This projection was based on the population and employment forecasts prepared by the Center for Applied Demographic Survey & Research (CADSR) and adopted by DelDOT. The Traffic Forecast, dated December 22, 2006 and modified on January 04, 2007, is attached in Appendix A for reference.

3.1.1 Data Collection

Existing and turning movement counts for the year 2006 were collected for Route 8 and crossing roadways throughout the study area. The counts were performed on typical weekdays from October 24 to October 26 (Tuesday, Wednesday, and Thursday) and at the time when there is no unusual pattern of traffic flow. Turning movement counts and pedestrian counts were conducted from 6:30 AM to 9:00 AM and from 4:00 PM to 6:30 PM for the morning and afternoon peak hours respectively at the following intersections along Route 8: Mifflin Road, Kenton Road, Independence Boulevard, Saulsbury Road (Route 15), Gibbs Drive and Weston Drive. Additionally, heavy vehicles (buses and trucks) were counted at all the intersections. Existing link AADT data was calculated based on the hourly distribution of various traffic group data as published on DelDOT 2005 Traffic Summary report. The link ADT calculation is provided in Appendix B.

In addition, a 2-day machine classified count was performed from January 9 – January 11, 2007 east of Destiny Church on Delaware Route 8. The main objective of this count was to verify the average daily traffic (ADT), truck volume and truck percentage. In addition, we identified the FHWA 13 vehicle classification for this corridor. We also determined the directional split of traffic on Delaware Route 8. Based on the data obtained, approximately 9 percent of the total vehicles are trucks. The data was found to be consistent with the existing data.

3.1.2 Traffic Forecast Methodology

The traffic forecast for the year 2030 is based on trend regression of historical counts incorporating the 'DelDOT Peninsula Model' output. The design year peak hour turning movement volume was estimated by applying a compound growth rate (CGR) to the existing peak hour turning volume. The compound growth rates were based on the comprehensive analyses of growth from various sources including: regression analysis with historical data

and 2030 projections; potential future developments in the area; and, Traffic Analysis Zone (TAZ) population growth and TAZ employment growth.

The 2030 forecasted turning movement volumes and link AADT were provided by DelDOT Division of Planning. The 2030 forecast also included the proposed West Dover Connector volume, as well as the traffic volumes from the proposed Cavalry Baptist Church and Capital School District High School. The turning movement volumes were manually balanced between intersections. The link two-way 24-hour AADT, AM and PM peak hour turning movement volumes for existing and year 2030 are illustrated in Exhibit 3-1 and 3-2.

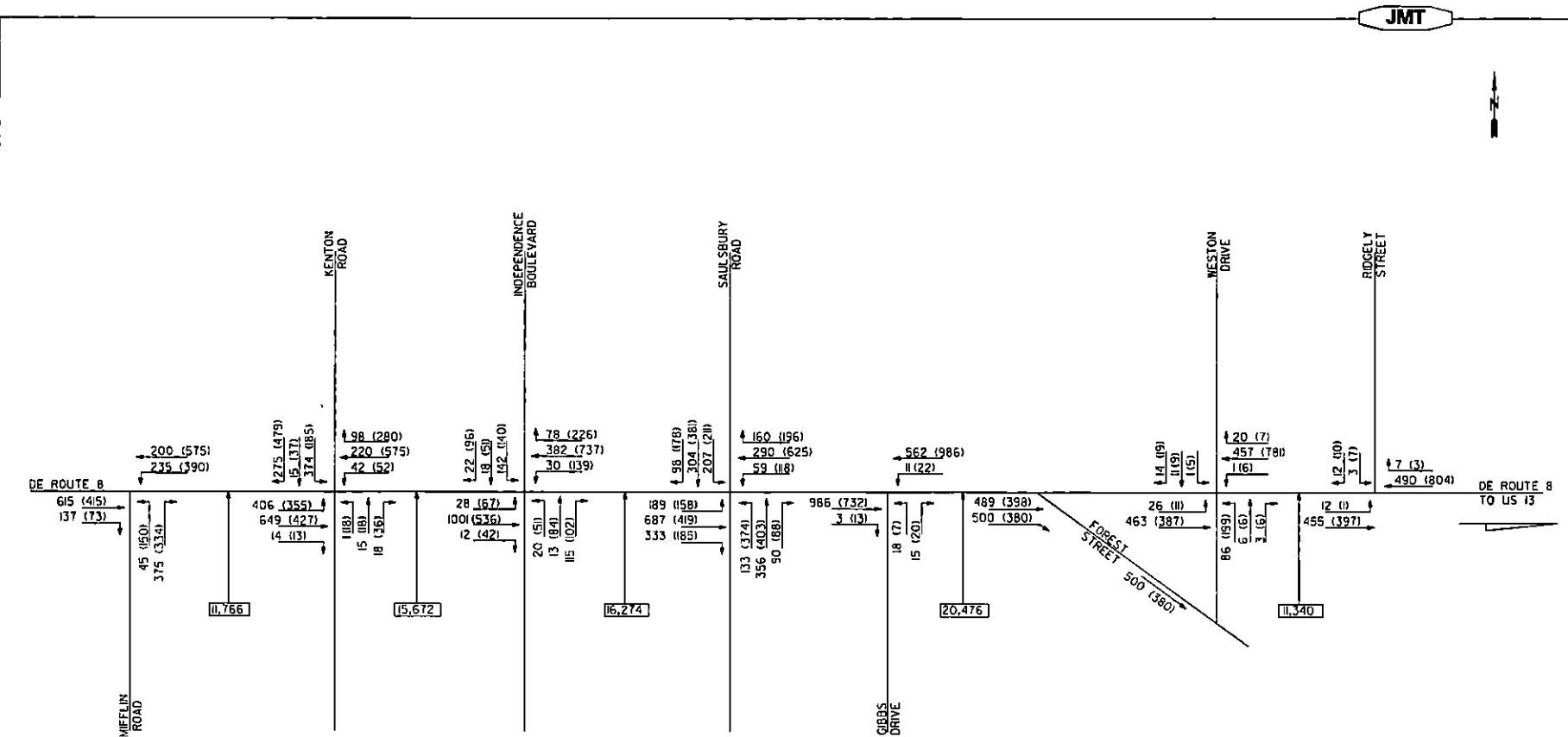
3.2 Capacity and Level of Service Analysis

3.2.1 Introduction

Capacity and level of service (LOS) analysis is used to estimate the traffic-carrying ability and quality of service provided by the roadway facility under study.

The total length of the studied portion of Route 8 is approximately 2.8 miles. The Highway Capacity Manual (HCM2000) urban street analysis methodology focused on mobility, which is assessed in terms of travel speed for the through-traffic stream. Urban streets offering mobility are typically analyzed in segments of at least 2 miles length (1 mile in downtown areas). The traffic pattern on Route 8 is a typical urban arterial with numerous access points and large turning volumes at signalized intersections. Due to the complexity of the road configuration, signalization and traffic patterns, analyzing the corridor without giving emphasis to signalized intersections will not reflect traffic performance and quality of service on Route 8. Therefore, the capacity and LOS analysis for this project focused on the intersections. The Route 8 corridor was modeled by SYNCHRO (Version 7.0), a traffic modeling/analysis program, which uses HCM arterial capacity and LOS methodology. Each signalized intersection was analyzed using SYNCHRO. For the evaluation, the existing traffic volumes, lane configurations, pedestrian volumes and signal timing were entered into SYNCHRO to develop a base case, existing conditions model. Sim Traffic, SYNCHRO's associated traffic simulation software, was used to assist in the development of a model that accurately replicates existing conditions.

There are six signalized intersections along the Route 8 corridor within the project limits. They are Mifflin Road, Kenton Road, Independence Boulevard, Modern Maturity entrance, Saulsbury Road (Route 15), and Ridgely Street. In addition, there is a major unsignalized intersection in the study area at Weston Drive. These intersections are the critical intersections in the study area based on existing traffic volumes, safety analysis and land use along the corridor. They determine the overall traffic performance and quality of service in the corridor. Other stop sign controlled intersections and driveways exist along the corridor. However, these intersections play a small role in terms of the overall traffic operation and were excluded from the analysis.



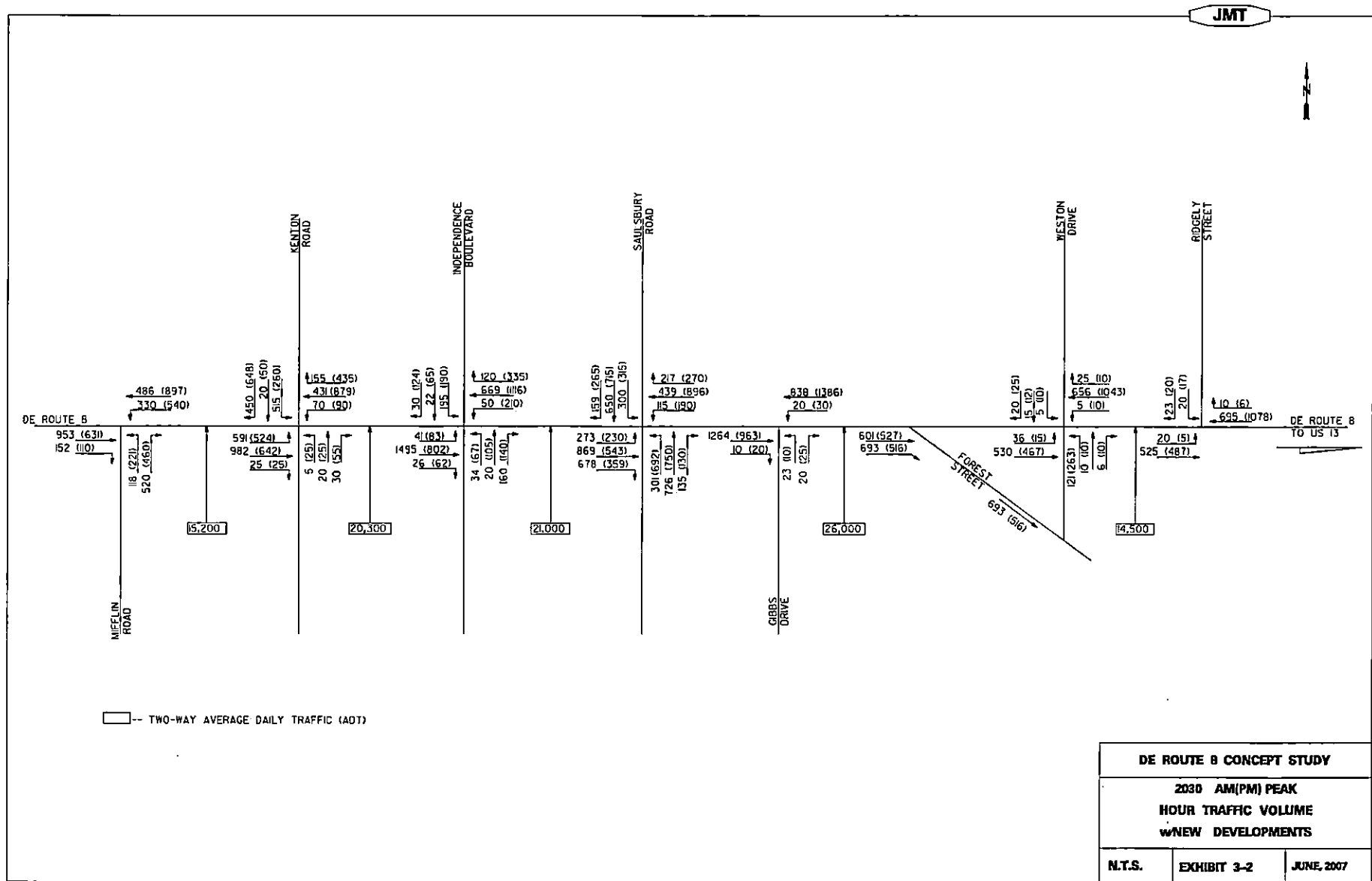
DE ROUTE 8 CONCEPT STUDY

2006
AM(PM) PEAK
HOUR TRAFFIC VOLUME

N.T.S.

EXHIBIT 3-1

JUNE, 2007



A back of queue analysis was also performed along with the capacity and LOS analysis. The back of queue is the number of vehicles that are queued depending on the arrival patterns of vehicles including the vehicles that do not clear the intersection during a given green phase (overflow). The queue length analysis provides guidance in determining the proposed lengths of turn bays at intersections. In addition, corridor wide LOS (Arterial LOS) was calculated based on the speed limit and free flow speed of the corridor.

SYNCHRO (Version 7.0) was used for the capacity and LOS analysis for intersections. SIMTRAFFIC Simulation model was used in the estimation of the 95th percentile back of queue and arterial LOS analysis.

3.2.2 Methodology

The main purpose of the traffic analysis is to provide long-term traffic performance estimates to support planning decision-making in determining the need to improve the studied corridor. The input parameters for the analysis included some default values when appropriate. The important input parameters are as follows:

- ✓ Peak Hour Factor (PHF) was calculated from field collected traffic counts for each turning movement at signalized and unsignalized intersections. For 2030 peak hour analysis, a minimum value of 0.88 was used if the calculated PHF is less than 0.88.
- ✓ Heavy Vehicle Percentages (%HV) were used based on the peak hour traffic counts. During AM peak hour, westbound (10%) traffic has higher truck percentage than the eastbound (3%) traffic. During PM peak hour both eastbound and westbound traffic has the same heavy vehicle percentage (2%).
- ✓ A value of 1,900 passenger cars per hour per lane was used for the Ideal Saturation Flow Rate (SFR). According to HCM2000, approaches with a design speed higher than 30 mph and lower than 50 mph can use the default base saturation flow rate of 1,900 pc/h/ln.
- ✓ All six (6) signalized intersections along Route 8 corridor are part of the same coordination group. For existing scenario analysis, current intersection configuration with 2006 traffic volume, the existing traffic signal cycle length, patterns and splits were used for both AM and PM peak hour analyses. Optimized cycle length, patterns and splits were used for 2030 peak hour analysis.
- ✓ RTOR (Right-Turn-On-Red) numbers used in the analysis are based on field observations and professional engineering judgment.

The existing signal timing plans provided by DelDOT are attached in Appendix C.

3.2.3 Capacity and LOS Analysis

Using the HCM 2000 method, the existing traffic volumes, lane configurations, pedestrian volumes, signal treatment and timings were entered into the model to determine the existing

LOS. The same procedure was used with the future 2030 traffic volume and existing lane configuration to determine the future LOS. According to HCM 2000, "LOS is a measure of the acceptability of delay levels to motorists at a given intersection". To calculate LOS, "the average control delay per vehicle is estimated for each lane group and aggregated for each approach and for the intersection as a whole. LOS for a signalized intersection is directly related to the control delay value." The LOS criteria for an unsignalized intersection is different from the signalized intersections as a signalized intersection is designed to carry higher traffic volumes and experience greater delay than an unsignalized intersection. The criterion for levels of service is listed in Tables 3-1 & 3-2.

TABLE 3-1: LOS CRITERIA FOR SIGNALIZED INTERSECTIONS

LOS	Control Delay (sec/veh)
A	< 10
B	> 10-20
C	> 20-35
D	> 35-55
E	> 55-80
F	> 80

TABLE 3-2: LOS CRITERIA FOR UNSIGNALIZED INTERSECTIONS

LOS	Control Delay (seconds/vehicle)
A	< 10
B	> 10-15
C	> 15-25
D	> 25-35
E	> 35-50
F	> 50

The balanced 2006 turning movement volume was used as input data for existing capacity and LOS analysis. The projected 2030 future peak hour turning movement volume provided by the Delaware Department of Transportation, Division of Planning (see Exhibit 3-B) was used as input data in 2030 capacity and LOS analysis. The average control delays and LOS's for existing and base future condition for signalized and unsignalized intersections are reported based on HCM output and are shown in Table 3-3 and 3-4. The minimum acceptable level of service standard is used as LOS D. Also the detail summary of critical approach control delay is provided based on the HCM outputs on Tables 3-5 (1)-(8).

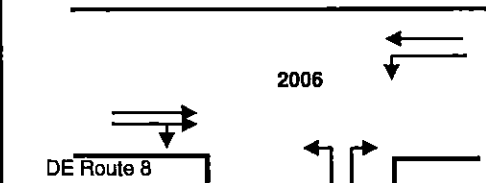
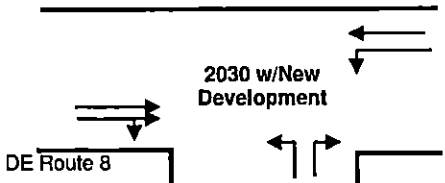
TABLE 3-3: AVERAGE HCM DELAY & LOS FOR SIGNALIZED INTERSECTIONS

Signalized Intersection	Output Type	Control Delay & LOS							
		2006				2030 w/New Developments			
		AM Peak		PM Peak		AM Peak		PM Peak	
		Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS
Mifflin Road	HCM	25.4	C	24.7	C	43.7	D	37.8	D
Kenton Road	HCM	30.4	C	30.6	C	37.3	D	57.1	E
Independence Boulevard	HCM	18.6	B	29.6	C	25.4	C	24.6	C
Modern Maturity	HCM	6.0	A	6.0	A	6.4	A	8.8	A
Saulsbury Road	HCM	38.8	D	49.5	D	95.3	F	173.4	F
Gibbs Drive	HCM	7.5	A	7.1	A	8.9	A	7.9	A
Ridgely Street	HCM	3.1	A	2.9	A	4.7	A	6.8	A

TABLE 3-4: AVERAGE HCM DELAY & LOS FOR THE UNSIGNALIZED INTERSECTION

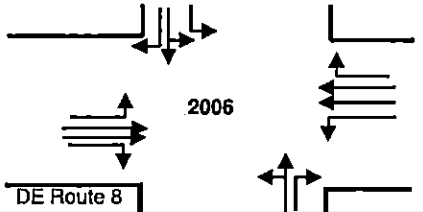
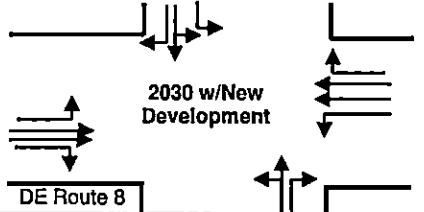
Intersection Name	Control Type	Critical Approach	Control Delay & LOS							
			2006				2030 w/New Developments			
			AM Peak		PM Peak		AM Peak		PM Peak	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
DE Route 8 and Weston Drive	Unsignalized	NB Weston Drive	436.3	F	>1000	F	839.9	F	>1000	F
		SB Weston Drive	33.7	D	>1000	F	57.7	F	>1000	F

Table 3-5(1): Summary of Control Delay and LOS at Intersections of DE Route 8 & Mifflin Road

Direction	Movement					N				
		AM Peak		PM Peak			AM Peak		PM Peak	
		Delay	LOS	Delay	LOS		Delay	LOS	Delay	LOS
Eastbound (DE Route 8)	LT	-	-	-	-	-	-	-	-	
	TH	17.2	B	18.1	B	54.9	D	37.8	D	
	RT	-	-	-	-	-	-	-	-	
Westbound (DE Route 8)	LT	27.5	C	17.9	B	43.1	D	59.5	E	
	TH	4.5	A	6.7	A	15.3	B	14.1	B	
	RT	-	-	-	-	-	-	-	-	
Northbound (Mifflin Road)	LT	40.4	D	58.8	E	39.9	D	50.0	D	
	TH	-	-	-	-	-	-	-	-	
	RT	48.7	D	56.6	E	51.2	D	52.2	D	
Southbound	LT	-	-	-	-	-	-	-	-	
	TH	-	-	-	-	-	-	-	-	
	RT	-	-	-	-	-	-	-	-	
Intersection Average		25.4	C	24.7	C	43.7	D	37.8	D	

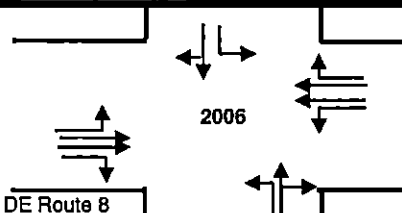
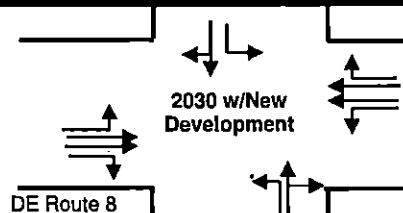
Note: Control Delay for existing condition is based on existing cycle length and existing splits.
Control Delay for proposed condition is based on optimized cycle length and optimized splits.

Table 3-5(2): Summary of Control Delay and LOS at Intersections of DE Route 8 & Kenton Road

Direction	Movement	 2006				 2030 w/New Development			
		AM Peak		PM Peak		AM Peak		PM Peak	
		Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Eastbound (DE Route 8)	LT	21.1	C	22.2	C	53.0	D	140.1	E
	TH	19.7	B	13.3	B	19.2	B	20.7	B
	RT	-	-	-	-	-	-	-	-
Westbound (DE Route 8)	LT	18.0	B	9.9	A	23.3	C	16.8	B
	TH	18.2	B	13.7	B	23.2	C	29.5	C
	RT	19.2	B	6.4	A	13.2	B	30.8	C
Northbound (Shopping Center)	LT	-	-	-	-	-	-	-	-
	TH	54.7	D	72.1	E	85.0	F	82.0	F
	RT	51.6	D	64.1	E	59.9	E	59.2	E
Southbound (Kenton Rd)	LT	58.5	E	66.7	E	66.7	E	44.7	D
	TH	58.3	E	66.5	E	65.8	E	44.7	D
	RT	41.9	D	66.4	E	44.3	D	96.6	F
Intersection Average		30.4	C	30.6	C	37.3	D	57.1	E

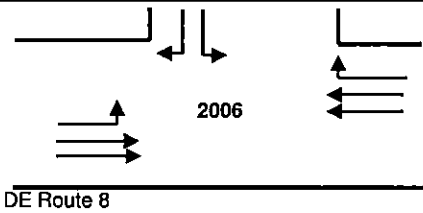
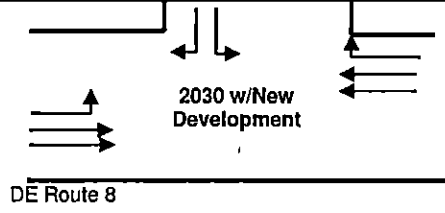
Note: Control Delay for existing condition is based on existing cycle length and existing splits.
Control Delay for proposed condition is based on optimized cycle length and optimized splits.

Table 3-5(3): Summary of Control Delay and LOS at Intersections of DE Route 8 & Independence Boulevard

Direction	Movement	 2006				 2030 w/New Development			
		AM Peak		PM Peak		AM Peak		PM Peak	
		Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Eastbound (DE Route 8)	LT	6.8	A	17.0	B	10.0	A	30.7	C
	TH	14.0	B	22.0	C	18.5	B	17.3	B
	RT	7.7	A	23.2	C	11.3	B	10.7	B
Westbound (DE Route 8)	LT	10.2	B	9.9	A	48.9	D	29.4	C
	TH	10.0	A	14.4	B	5.3	A	16.3	B
	RT	6.7	A	12.3	B	0.5	A	4.9	A
Northbound (Independence Boulevard)	LT	46.1	D	48.9	D	50.2	D	41.1	D
	TH	50.8	D	92.9	F	60.5	E	72.0	E
	RT	-	-	-	-	-	-	-	-
Southbound (Independence Boulevard)	LT	40.0	D	53.6	D	130.7	F	51.0	D
	TH	41.5	D	54.4	D	48.5	D	43.5	D
	RT	-	-	-	-	-	-	-	-
Intersection Average		18.6	B	29.6	C	25.4	C	24.6	C

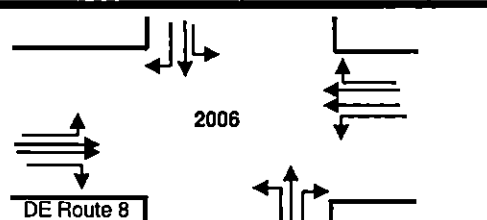
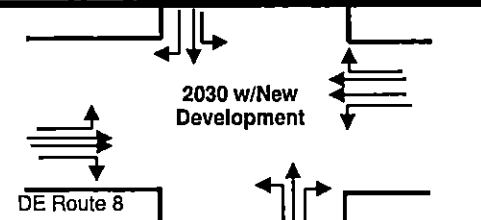
Note: Control Delay for existing condition is based on existing cycle length and existing splits.
Control Delay for proposed condition is based on optimized cycle length and optimized splits.

Table 3-5(4): Summary of Control Delay and LOS at Intersections of DE Route 8 & Modern Maturity Center

Direction	Movement	 2006				 2030 w/New Development			
		AM Peak		PM Peak		AM Peak		PM Peak	
		Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Eastbound (DE Route 8)	<i>LT</i>	4.5	A	4.0	A	2.4	A	46.3	D
	<i>TH</i>	5.7	A	2.5	A	5.4	A	10.1	B
	<i>RT</i>	-	-	-	-	-	-	-	-
Westbound (DE Route 8)	<i>LT</i>	-	-	-	-	-	-	-	-
	<i>TH</i>	3.9	A	4.6	A	3.1	A	3.7	A
	<i>RT</i>	1.9	A	2.4	A	1.1	A	0.1	A
Northbound	<i>LT</i>	-	-	-	-	-	-	-	-
	<i>TH</i>	-	-	-	-	-	-	-	-
	<i>RT</i>	-	-	-	-	-	-	-	-
Southbound (Modern Maturity)	<i>LT</i>	44.5	D	59.2	E	61.0	E	56.5	E
	<i>TH</i>	-	-	-	-	-	-	-	-
	<i>RT</i>	45.1	D	60.9	E	61.8	E	59.9	E
Intersection Average		6.0	A	6.0	A	6.4	A	8.8	A

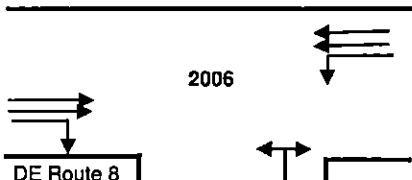
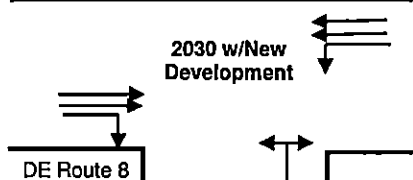
Note: Control Delay for existing condition is based on existing cycle length and existing splits.
 Control Delay for proposed condition is based on optimized cycle length and optimized splits.

**Table 3-5(5): Summary of Control Delay and LOS at Intersections of DE Route 8 & Saulsbury Road
(DE Route 15)**

Direction	Movement	 2006				N	 2030 w/New Development			
		AM Peak		PM Peak			AM Peak		PM Peak	
		Delay	LOS	Delay	LOS		Delay	LOS	Delay	LOS
Eastbound (DE Route 8)	LT	25.6	C	40.3	D		127.1	F	291.3	F
	TH	43.7	D	40.4	D		109.7	F	62.2	E
	RT	33.9	C	2.1	A		11.1	B	10.5	B
Westbound (DE Route 8)	LT	25.9	C	32.9	C		147.6	F	44.0	D
	TH	32.0	C	47.8	D		83.3	F	73.9	E
	RT	29.5	C	38.6	D		45.9	D	38.0	D
Northbound (Saulsbury Road / DE Route 15)	LT	25.3	C	94.8	F		148.4	F	385.3	F
	TH	55.2	E	36.0	D		117.9	F	228.5	F
	RT	29.4	C	28.6	C		25.5	C	33.1	C
Southbound (Saulsbury Road / DE Route 15)	LT	54.1	D	40.8	D		209.6	F	113.4	F
	TH	36.3	D	80.3	F		91.7	F	355.9	F
	RT	35.6	D	45.3	D		26.3	C	42.6	D
Intersection Average		38.8	D	49.5	D		95.3	F	173.4	F

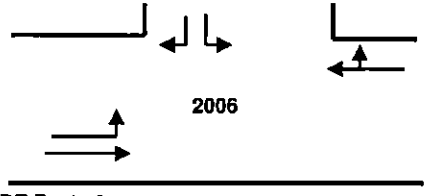

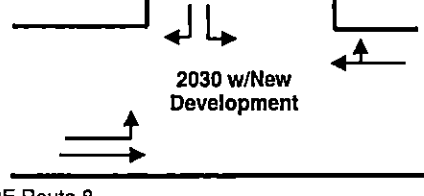
Note: Control Delay for existing condition is based on existing cycle length and existing splits.
Control Delay for proposed condition is based on optimized cycle length and optimized splits.

Table 3-5(6): Summary of Control Delay and LOS at Intersections of DE Route 8 & Gibbs Drive

Direction	Movement	 2006				N	 2030 w/New Development			
		AM Peak		PM Peak			AM Peak		PM Peak	
		Delay	LOS	Delay	LOS		Delay	LOS	Delay	LOS
Eastbound (DE Route 8)	LT	-	-	-	-	-	-	-	-	
	TH	8.0	A	7.8	A	9.9	A	8.8	A	
	RT	-	-	-	-	-	-	-	-	
Westbound (DE Route 8)	LT	4.1	A	4.4	A	7.9	A	5.4	A	
	TH	3.6	A	5.4	A	5.8	A	6.4	A	
	RT	-	-	-	-	-	-	-	-	
Northbound (Gibbs Drive)	LT	-	-	-	-	-	-	-	-	
	TH	47.4	D	42.3	D	45.9	D	43.1	D	
	RT	-	-	-	-	-	-	-	-	
Southbound	LT	-	-	-	-	-	-	-	-	
	TH	-	-	-	-	-	-	-	-	
	RT	-	-	-	-	-	-	-	-	
Intersection Average		7.5	A	7.1	A		8.9	A	7.9	A

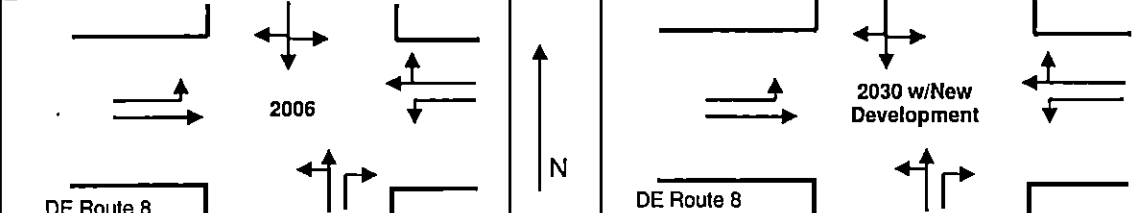
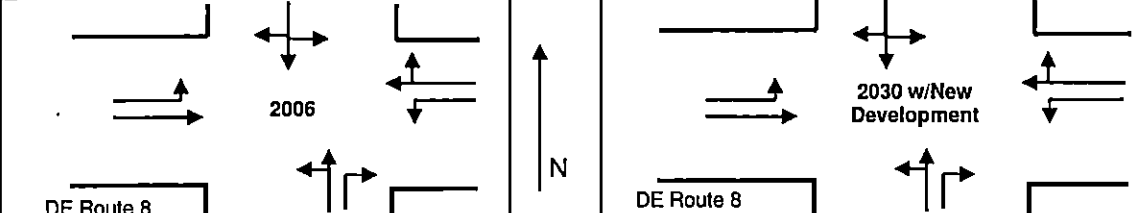
Note: Control Delay for existing condition is based on existing cycle length and existing splits.
Control Delay for proposed condition is based on optimized cycle length and optimized splits.

Table 3-5(7): Summary of Control Delay and LOS at Intersections of DE Route 8 & Ridgely Street

Direction	Movement	 2006				 N	 2030 w/New Development				
		DE Route 8		DE Route 8							
		AM Peak		PM Peak			AM Peak		PM Peak		
		Delay	LOS	Delay	LOS			Delay	LOS	Delay	LOS
Eastbound (DE Route 8)	LT	1.8	A	0.6	A			1.5	A	2.3	A
	TH	3.0	A	1.1	A			2.6	A	3.4	A
	RT	-	-	-	-			-	-	-	-
Westbound (DE Route 8)	LT	-	-	-	-			-	-	-	-
	TH	2.0	A	3.0	A			4.4	A	7.3	A
	RT	-	-	-	-			-	-	-	-
Northbound	LT	-	-	-	-			-	-	-	-
	TH	-	-	-	-			-	-	-	-
	RT	-	-	-	-			-	-	-	-
Southbound (Ridgely Street)	LT	43.0	D	43.9	D			42.8	D	42.6	D
	TH	-	-	-	-			-	-	-	-
	RT	42.5	D	42.4	D			40.8	D	40.9	D
Intersection Average		3.1	A	2.9	A			4.7	A	6.8	A

Note: Control Delay for existing condition is based on existing cycle length and existing splits.
Control Delay for proposed condition is based on optimized cycle length and optimized splits.

Table 3-5(8): Summary of Control Delay and LOS at Intersections of DE Route 8 & Weston Drive

Direction	Movement												
		2006		2030 w/New Development									
		DE Route 8		DE Route 8									
		AM Peak		PM Peak				AM Peak		PM Peak			
		Delay	LOS	Delay	LOS			Delay	LOS	Delay	LOS		
Eastbound (DE Route 8)	<i>LT</i>	8.8	A	10.2	B			10.5	B			16.5	C
	<i>TH</i>	-	-	-	-			-	-			-	-
	<i>RT</i>	-	-	-	-			-	-			-	-
Westbound (DE Route 8)	<i>LT</i>	8.7	A	8.4	A			9.1	A			8.7	A
	<i>TH</i>	-	-	-	-			-	-			-	-
	<i>RT</i>	-	-	-	-			-	-			-	-
Northbound (Mifflin Road)	-	-	-	-	-			-	-			-	-
	<i>LTH</i>	135.0	F	>1000	F			>1000	F			>1000	F
	<i>RT</i>	11.9	B	11.3	B			13.0	B			12.3	B
Southbound	-	-	-	-	-			-	-			-	-
	<i>LTR</i>	23.5	C	43.1	E			57.7	F			>1000	F
	-	-	-	-	-			-	-			-	-

Note: Control Delay for proposed condition is based on existing cycle length and existing splits.
Control Delay for proposed condition is based on optimized cycle length and optimized splits.

Based on the HCM signalized intersection analysis for the existing condition the intersections of Mifflin Road and Kenton Road operate with a LOS C during the morning and afternoon peak hours. The intersection of Independence Boulevard operates with LOS B during the morning peak hour and operates with a LOS C during the afternoon peak hour. The intersection of Saulsbury Road operates with a LOS D during both peak hours. The intersections at Modern Maturity Entrance, Gibbs Drive and Ridgely Street operate with LOS A during the morning and afternoon peak hours.

The cycle length for all the signalized intersections was provided by the DelDOT Traffic department. All the intersections from Mifflin Road to Saulsbury Road operate as a network group. The intersections at Gibbs Drive and Ridgely Street are not connected with any network system. The unsignalized intersection at Weston Drive and Route 8 was analyzed based on the HCM unsignalized intersection analysis method. The southbound Weston Drive approach operates with LOS D during the morning peak hour and operates with LOS E during the afternoon peak hour. The northbound Weston Drive left turn movement operates with LOS F during both peak hours with delays more than 400 seconds/vehicle. The LOS and delay analysis for the intersections are presented in Appendix D.

For 2030 peak hour HCM signalized intersection analysis the intersection of Mifflin Road operates with LOS D during the morning peak hour and operates with LOS D during the afternoon peak hour. The intersection of Kenton Road operates with LOS D during the morning peak hour and operates with LOS E during the afternoon peak hour, which is considered borderline acceptable and likely requiring some kind of mitigation. The intersection of Independence Boulevard operates with LOS C during the morning and afternoon peak hours. The intersection of Saulsbury Road operates with LOS F during both peak hours. The intersections at Modern Maturity Entrance, Gibbs Drive and Ridgely Street operate with LOS A during the morning and afternoon peak hours. The cycle length for all the signalized intersections between Mifflin Road and Saulsbury Road was kept as 130 seconds during both morning and afternoon peak hours based on optimization. The cycle length for the intersections at Gibbs Drive and Ridgely Street were kept at 90 seconds as existing.

The unsignalized intersection at Weston Drive and Route 8 was analyzed for 2030 projected traffic volumes. The southbound approach at Weston Drive approach operates with LOS F during both peak hours. The northbound Weston Drive left turn movement operates with LOS F during both peak hours with delays more than 800 seconds/vehicle. Detailed HCM print-outs for the intersection are presented in Appendix D.

3.2.4 Corridor Performance and LOS

In addition to the intersection analysis, a corridor analysis of Route 8 was performed using the simulation results from SIMTRAFFIC. Three one hour simulation runs were done for each analysis period and the average travel speed was calculated. The Highway Capacity Manual (HCM2000) urban street analysis methodology focuses on mobility, which is assessed in

terms of travel speed for the through-traffic stream. Urban streets offering mobility are typically analyzed in segments of at least 2 miles length (1 mile in downtown areas) with well spaced intersections. However, Route 8 is an urban arterial with closely spaced intersections. For this corridor, it is more appropriate to evaluate the performance of short urban roadway segments based on the capacity and LOS analysis for each individual intersection along the corridor. Nevertheless, an urban street analysis was performed and provided here for reference. Table 3-6 lists urban street LOS based on average travel speed and urban street class. On the basis of Table 3-6, Table 3-7 was developed for the Route 8 arterial average speed and the subsequent LOS calculation.

TABLE 3-6: URBAN STREET LOS BY CLASS

Urban Street Class	I	II	III	IV
Free Flow Speed	55 ~ 45 mph	45 ~ 35 mph	35 ~ 30 mph	30 ~ 25 mph
LOS	Average Travel Speed (mph)			
A	> 42	> 35	> 30	> 25
B	> 34 ~ 42	> 28 ~ 35	> 24 ~ 30	> 19 ~ 25
C	> 27 ~ 34	> 22 ~ 28	> 18 ~ 24	> 13 ~ 19
D	> 21 ~ 27	> 17 ~ 22	> 14 ~ 18	> 9 ~ 13
E	> 16 ~ 21	> 13 ~ 17	> 10 ~ 14	> 7 ~ 9
F	≤ 16	≤ 13	≤ 10	≤ 7

Based on the results, during the 2006 peak hour traffic condition most of the corridor segments perform well with acceptable LOS with the exception of the Mifflin Road and Saulsbury Road segments. The segments surrounding Saulsbury Road are the most congested in this corridor which explains the deteriorated condition in both approaches. The overall LOS for the Mifflin Road intersection is C; however, the eastbound arterial average travel speed and subsequent LOS is unsatisfactory. This is due to the fact that for the eastbound traffic, Mifflin Road is the first signalized intersection. For the year 2030 corridor analysis, segments of Route 8 from Mifflin Road to Saulsbury Road perform with unacceptable Arterial LOS except the intersection of Independence Boulevard. The rest of the Route 8 corridor performs with acceptable Arterial LOS. SimTraffic data is shown in Appendix E.

TABLE 3-7: Arterial Average Travel Speed & LOS

DE Route 8 (Downstream Intersections)	Direction	Average Travel Speed & LOS							
		2006				2030 w/New Developments			
		AM Peak		PM Peak		AM Peak		PM Peak	
		Speed (mph)	LOS	Speed (mph)	LOS	Speed (mph)	LOS	Speed (mph)	LOS
Mifflin Rd	EB	17	D	17	E	8	F	9	F
	WB	31	B	23	C	17	E	18	D
Kenton Rd	EB	18	D	24	C	17	E	19	D
	WB	26	B	28	C	18	D	16	E
Independence Blvd	EB	28	B	24	C	23	C	25	C
	WB	32	B	28	C	30	B	27	C
Modern Maturity Center	EB	33	B	34	B	22	D	13	E
	WB	34	B	32	B	31	B	30	B
Saulsbury Road	EB	16	E	15	E	7	F	9	F
	WB	18	D	14	E	8	F	5	F
Gibbs Drive	EB	17	D	22	B	19	C	27	A
	WB	19	D	15	C	25	B	22	B
Weston Drive	EB	19	D	19	C	19	C	20	B
	WB	24	C	23	B	23	B	22	B
Ridgely Street	EB	23	C	23	B	23	B	23	B
	WB	26	C	24	B	23	B	22	B
Total Network	EB	21	D	22	D	19	D	21	D
	WB	26	C	24	C	23	C	20	D

3.3 BACK-OF-QUEUE ANALYSIS

The back of queue analysis was performed to provide guidance regarding the queue lengths that have to be accommodated in turn storage lengths at signalized intersections. The back of queue is the number of vehicles that are queued depending on arrival patterns of vehicles, and vehicles that do not clear the intersection during a given green phase.

Tables 3-8 (1)-(4) illustrates the 95th percentile back of queue at the critical intersections for each analysis period. The 95th percentile Back-of-Queue is estimated from SIMTRAFFIC simulation results. Three runs of each one hour simulation were performed for AM and PM peak hour analysis period. For each run, an hour period was recorded after a 10-minute seeding period. This back of queue information would help to improve any geometry especially the turn bay length during the year 2030 needs analysis.

3.4 OPERATIONAL ISSUES

There are several operational issues and problems along the Route 8 corridor, both corridor-wide as well as isolated issues at several intersections. From a traffic standpoint, some of these problems are capacity-related, others are operational issues, and others are safety concerns.

Corridor-Wide

Some of the corridor-wide operational issues include illegal left-turns at right turn-only intersections, use of the outside lane for trash service, and safety concerns resulting from permissive left-turn phasing at Mifflin, Kenton, and Saulsbury Road intersections.


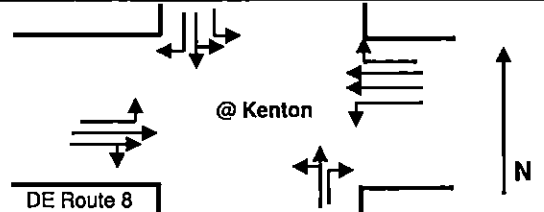
There is also a general lack of roadway connections within the study area. The developments of Cranberry Run, Heatherfield Estates, and Heatherfield East all have only one entrance and exit point on Route 8 and many residents have difficulty entering and exiting due to high volumes along Route 8. Many of the commercial establishments along Route 8 suffer from the same problem, inducing large numbers of vehicles turning into and out of these isolated, single-use developments and creating safety and operational problems along the mainline. There is also a lack of east-west roadway connectors, particularly south of Route 8 between Mifflin Road and Saulsbury Road, forcing all vehicles, even those making local trips to use Route 8.

Mifflin Road

The operation at the intersection of Mifflin Road is adversely affected by the westbound Route 8 geometry at the intersection. Just before the Mifflin Road intersection two through lanes on westbound Route 8 merge onto one through lane, creating a bottleneck on westbound approach.

Table 3-8 (1): Summary of 95th Percentile Back of Queue

(Unit: Feet)

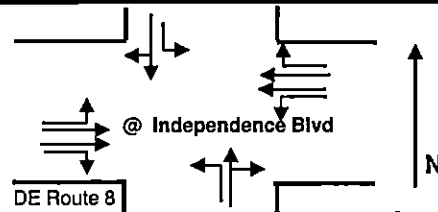
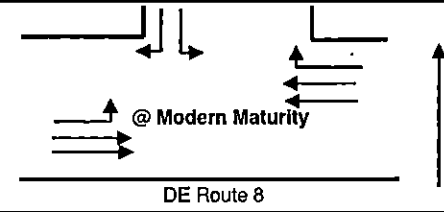
Approach	Movement					Storage Length					Storage Length
		2006		2030 w/New Dev.			2006		2030 w/New Dev.		
		AM	PM	AM	PM		AM	PM	AM	PM	
Eastbound (DE Route 8)	LT(UT)	-	-	-	-	100	308	265	374	368	280
	TH	211/180	185/117	526/513	411/356		262/204	93/96	850/609	751/447	
	RT	-	-	-	-		-	-	-	-	
Westbound (DE Route 8)	LT	191	186	286	341		30	21	64	67	200
	TH	77	144	301	269		76/70	127/121	153/146	290/259	
	RT	-	-	-	-		5	31	30	144	350
Northbound (Side Street)	LT	67	290	359	898		-	-	-	-	
	TH	-	-	-	-		45	72	50	90	
	RT	28	149	168	179		25	39	46	61	
Southbound (Side Street)	LT	-	-	-	-		218	143	346	194	175
	TH	-	-	-	-		233	142	410	299	
	RT	-	-	-	-		143	107	256	239	

Note: Back of queue for Year 2006 traffic is based on existing cycle length and existing splits.
 Back of queue for Year 2030 traffic is based on optimized cycle length and optimized splits.

211/180
 Queue Length for 1st lane/Queue length for 2nd lane

Table 3-8 (2): Summary of 95th Percentile Back of Queue

(Unit: Feet)

Approach	Movement					Storage Length					Storage Length
		2006		2030 w/New Dev.			2006		2030 w/New Dev.*		
		AM	PM	AM	PM		AM	PM	AM	PM	
Eastbound (DE Route 8)	LT(UT)	37	70	50	104	300	37	49	131	252	300
	TH	165/175	141/141	228/242	410/412		135/154	55/77	549/593	1207/1203	
	RT	9	38	49	126	200	-	-	-	-	
Westbound (DE Route 8)	LT (UT)	52	115	93	156	150	-	-	-	-	300
	TH	89/87	171/174	72/89	152/163		46/69	116/118	425/97	412/43	
	RT	-	31	15	27		21	23	25	21	
Northbound (Side Street)	LT (UT)	38	144	75	129	150	-	-	-	-	75
	TH	100	299	175	293		-	-	-	-	
	RT	-	-	-	-		-	-	-	-	
Southbound (Side Street)	LT	167	168	316	229		47	69	84	98	75
	TH	58	190	81	220		-	-	-	-	
	RT	-	-	-	-		52	136	107	152	

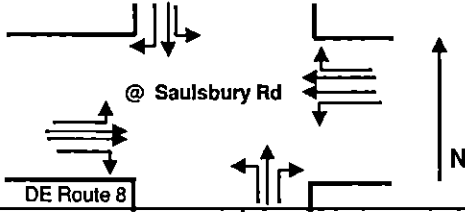
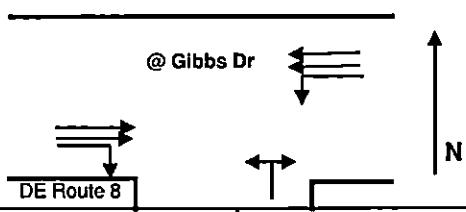
*Lengthy PM EB Queues due to backup at downstream intersection of Saulsbury Road

Note: Back of queue for Year 2006 traffic is based on existing cycle length and existing splits.
Back of queue for Year 2030 traffic is based on optimized cycle length and optimized splits.

165/175
Queue Length for 1st lane/Queue length for 2nd lane

Table 3-8 (3): Summary of 95th Percentile Back of Queue

(Unit: Feet)

Approach	Movement					Storage Length					Storage Length
		2006		2030 w/New Dev.			2006		2030 w/New Dev.		
		AM	PM	AM	PM		AM	PM	AM	PM	
Eastbound (DE Route 8)	<i>LT(UT)</i>	222	243	446	413	375	-	-	-	-	100
	<i>TH</i>	330/321	229/210	1374/1406	1867/1832		286/259	84/66	508/469	213/182	
	<i>RT</i>	204	109	399	219	285	-	-	-	-	
Westbound (DE Route 8)	<i>LT</i>	78	154	181	181	125	19	26	54	34	
	<i>TH</i>	126/145	324/324	426/428	1075/1117		86/111	63/64	236/253	173/187	
	<i>RT</i>	55	168	318	370	250	-	-	-	-	
Northbound (Side Street)	<i>LT</i>	304	442	675	646		60	45	75	70	
	<i>TH</i>	621	661	648	770		-	-	-	-	
	<i>RT</i>	166	162	112	113	150	-	-	-	-	
Southbound (Side Street)	<i>LT</i>	256	268	358	363	275	-	-	-	-	
	<i>TH</i>	409	689	765	611		-	-	-	-	
	<i>RT</i>	157	259	337	402	300	-	-	-	-	

Note:

Back of queue for Year 2006 traffic is based on existing cycle length and existing splits.

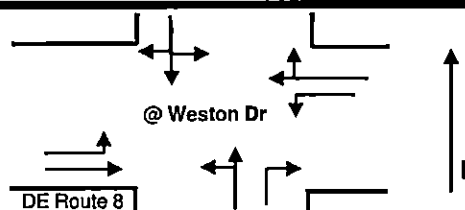
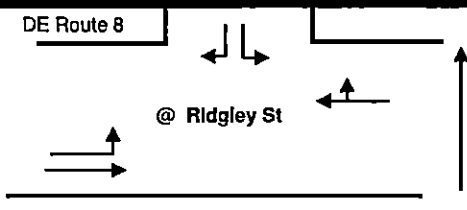
Back of queue for Year 2030 traffic is based on optimized cycle length and optimized splits.

330/321

Queue Length for 1st lane/Queue length for 2nd lane

Table 3-8 (4): Summary of 95th Percentile Back of Queue

(Unit: Feet)

Approach	Movement					Storage Length					Storage Length
		2006		2030 w/New Dev.			2006		2030 w/New Dev.		
		AM	PM	AM	PM		AM	PM	AM	PM	
Eastbound (DE Route 8)	LT(UT)	34	13	41	27	200	23	-	41	16	125
	TH	20	-	3	-		28	87	129	136	
	RT	-	-	-	-		-	-	-	-	
Westbound (DE Route 8)	LT	6	17	20	19		-	-	-	-	
	TH	29	-	14	32		61	90	207	235	
	RT	-	-	-	-		-	-	-	-	
Northbound (Side Street)	LT	-	-	-	-		-	-	-	-	
	TH	64	114	107	100		-	-	-	-	
	RT	21	21	26	23		-	-	-	-	
Southbound (Side Street)	LT	-	-	-	-		16	37	53	50	
	TH	48	46	48	82		-	-	-	-	
	RT	-	-	-	-		40	36	40	47	

Note: Back of queue for Year 2006 traffic is based on existing cycle length and existing splits.
Back of queue for Year 2030 traffic is based on optimized cycle length and optimized splits.

Kenton Road

While the Kenton Road intersection operates at LOS C during both AM and PM peak hours, there are operational problems at the intersection. There is a significant volume of EB left turns (406/355) in the AM/PM peak hours. These left turns routinely queue beyond the left turn storage lane and do not clear the intersection during the protected phase. In addition, the SB approach has very long queues during peak hours, particularly the AM peak hour.

Saulsbury Road

Saulsbury Road has very high volumes of traffic on all approaches during both the AM and PM peak hours. The existing LOS is D for both the AM and PM peak and this is expected to degrade to LOS F in the future conditions. With the additional traffic projected from the West Dover Connector combined with growth on Route 8, traffic at this intersection is projected to increase by over 90% in the AM peak hour and 75% in the PM peak hour along Saulsbury Road. As a result, congestion and safety problems will severely worsen without improvements.

Forest Street

The unsignalized intersection of Forest Street and Route 8 has very long delays and queues on the northbound approach, due mainly to the high volume of left-turning vehicles. This movement currently operates at LOS F in the existing conditions and will need to be addressed through the alternatives development.

4. PEDESTRIAN, BICYCLE & TRANSIT ANALYSIS

The pedestrian, bicycle and transit facilities within the study area were reviewed.

4.1 PEDESTRIAN FACILITIES

Route 8 is both a residential and commercial corridor in Dover. This combination of land use creates the potential to generate a high volume of pedestrian and bicycle trips each day.

On the south side of the corridor, there is no sidewalk from Artis Drive to Mifflin Road. However, as development has occurred in this area, DelDOT has created an easement for the construction of an off road shared use (pedestrian and bicycle) path. From Mifflin Road, a continuous 4 to 5 foot sidewalk exists to the east end of the study area. This sidewalk is concrete and mostly in fair condition.

A shared use path is provided on the north side of Route 8 stretching from west of Mifflin Road to Saulsbury Road. The width of the path varies between 8 and 10 feet. As shown below, the condition of the hot mix is in moderate to poor condition. East of Saulsbury Road to the end of the study area, a 4 foot wide concrete sidewalk exists.

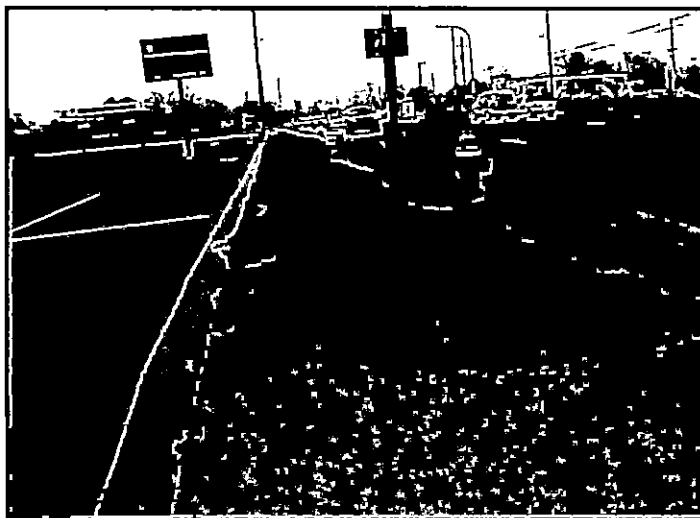


Exhibit 4-1: Hot Mix Path West of Saulsbury Road

Pedestrian signals and crosswalks exist at Mifflin Road, Independence Boulevard, and Gibbs Drive. ADA compliant curb ramps are inconsistent throughout the corridor.

Pedestrian volumes were counted at each intersection during the AM and PM peak hours. For the most part, the pedestrian volumes were not significant during the peak hours. However, the greatest

amount of pedestrian activity was observed at the intersection of

Gibbs Drive and Route 8. This intersection provides pedestrian access to the Booker T. Washington Elementary School. A crossing guard operates the signal at this intersection during the AM peak hour.

4.2 BICYCLE FACILITIES

Route 8 within the study area is designated by the Bicycle Facilities Master Plan as Route K-3. This route extends from the Maryland border to Port Mahon, and provides east-west connectivity: Dover and the Maryland border to the west, and Little Creek Wildlife Area and the Delaware Bay to the east.

West of Dover, Route 8 is a two lane rural roadway with paved shoulders. From Mifflin Road to the east end of study area, the roadway widens and the number of access points to local businesses increases. Shoulders in the area have mostly been converted to turn lanes or through lanes.

Within the study area, however, Route 8 has limited bicycle facilities. Between Artis Drive and Mifflin Road, cyclists utilize the 8 foot wide shoulder. From Mifflin Road to the east end of the study area, Route 8 lacks designated bicycle lanes, and pavement markings and signing for cyclists.

Alternatives will be evaluated to make the corridor more bicycle friendly. Both on-road and off-road facilities will be considered.

4.3 TRANSIT FACILITIES AND SERVICES

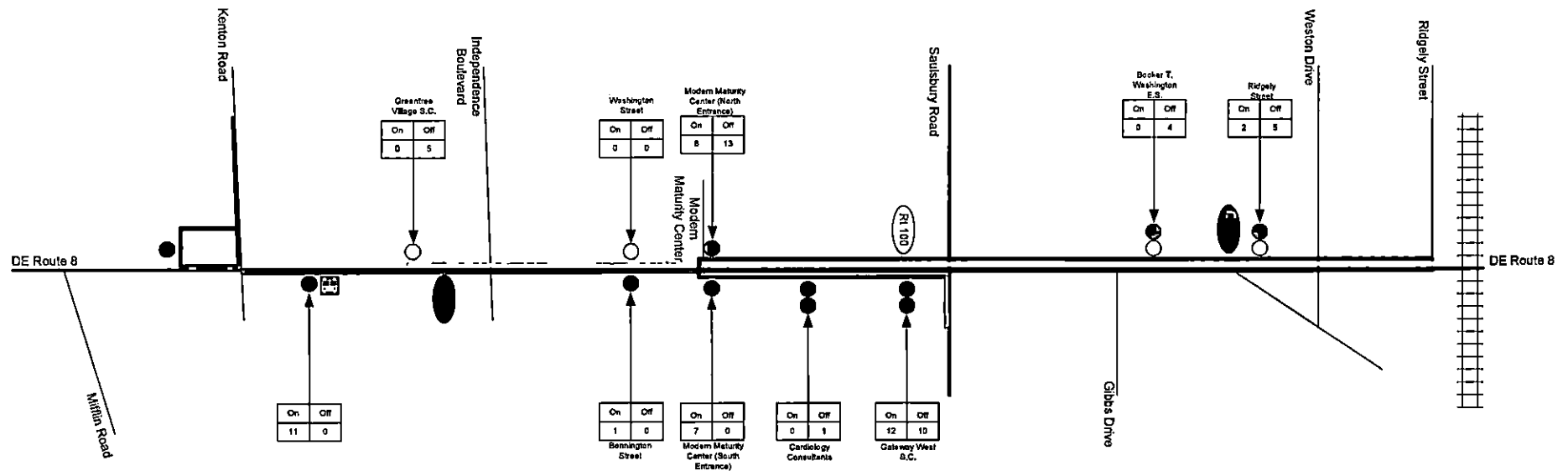
DART is Delaware's main public transportation provider. There are three DART routes which operate within the corridor study limits. These routes are DART routes 100, 101 and 102. DART Route 100, Forest Avenue Route, provides service on Route 8 during the peak hours, from 6:00AM to 9:00AM and from 3:00PM to 5:30PM, Monday through Friday. For this route, a total of five stops are within the study area. This route also provides access to the Water Street Transfer Center. AM and PM headways are thirty minutes.

DART Route 101, Walker Road Route, provides service on Route 8 from the Water Street Transfer Center to the Greentree Village Shopping Center. Service is provided Monday through Friday from 6:00AM to 6:00 PM with a constant thirty minute headway. There are a total number of five stops along the study area. Like the Route 100 bus, access to the Water Street Transfer Center is also provided for the Walker Road Route. Figure 4-2 shows the only bus shelter along the corridor. A DART sign for Route 101 is also shown near the shelter.



Exhibit 4-2: Bus Shelter at Kenton Road & Route 8

The third route in the study area is the Route 102, Gateway West, which runs from Water Street transfer center to the gateway west at Food Lion. This route has eight stops along Route 8. Like the previous two routes, access to the Water Street Transfer Center is provided. Service from 6:00AM to 6:00PM, Monday through Friday with a thirty minute headway. Exhibit 4-3 shows the location of all the bus stops, bus routes and ridership information throughout the study area.



LEGEND:

	DART Routes
	Bus Stoppage
	Bus Shelter
	DART Daily Ridership Statistics

NOT TO SCALE

June 2007

Existing Transit Facilities

Exhibit 4 - 3

As shown on Exhibit 4-3, according to the statistics (boardings and alightings) provided by DART, ridership throughout the corridor is low. The stops with the highest volume of riders are at the Gateway West Shopping Center, the Modern Maturity Center and the shelter at the southeast side of Kenton Road.



Exhibit 4-4: DART Transit Route on Eastbound Route 8, West of Saulsbury Road (Route 15)

As stated previously, there is only one bus shelter located in the study area, which is located southeast of the Kenton Road intersection. Of the 11 bus stops on the corridor, most do not have a standard concrete pad, as indicated in Exhibits 4-4 & 4-5. In addition, there are often not sufficient curb ramps and crosswalk connections from the bus stops to the nearby sidewalks and intersections where a bus stop is located.



Exhibit 4-5: DART Transit Route on Eastbound Route 8, West of Gateway West Shopping Center

5. CRASH ANALYSIS

A crash analysis was performed to obtain a better understanding of the safety needs for Route 8. Three years of crash data were reviewed within the study area. The location of each crash was plotted and clusters identified. A detailed analysis to determine the root cause of the crashes was performed for the cluster locations. The Division of Planning, Delaware Department of Transportation, provided the crash information from the crash report database. There were a total of 132 reported crashes from January 2003 to December 2005.

5.1 CORRIDOR CRASH DATA SUMMARY

Route 8 is a minor arterial that runs east-west from the Maryland state line, continues east through the City of Dover and ends at Route 9. The total study area for the corridor is 2.79 miles from the Artis Drive to the west of Ridgley Street. From Artis Drive to west of Mifflin Road, Route 8 is a two lane arterial. From west of Mifflin Road to the end of the project, Route 8 is multi lane arterial. Crash comparison rates, based on ADT and distance traveled are reported as crash per million vehicles miles traveled. Based on the comparison of study area reported crashes on Table 5-1 during the three year period the average crash rate was 2.92 per million vehicle miles. We have also obtained statewide average and Kent County average for this type of road. Based on the comparison the study area crash rate is lower than the statewide and Kent County average crash rate. Most crashes in this area are clustered at four distinct locations, all at signalized intersections. The high crash rate locations are analyzed in section 5.2.

TABLE 5-1 CRASHES BY YEAR

Year	Total Number of Crashes	Route 8 Crash Rate (per MVM)	Delaware State Average Crash Rate (per MVM)	Kent County Average Crash Rate (per MVM)
		Urban Minor Arterial		
2003	54	3.65	6.79	3.67
2004	39	2.57	6.15	3.19
2005	39	2.54	6.02	4.02
Three Year Average	132	2.92	6.32	3.63

Of the 132 total reported crashes during this given three-year period, there was one fatality reported along the corridor. Seventy two (72) crashes (54.5%) reported involved a total of 115 injuries. The remaining 59 crashes involved only property damages. The crash data given did not state that any pedestrians or bicyclists were involved in any of the 132 reported crashes. The severity of the crashes is summarized in Table 5-2.

TABLE 5-2: CRASHES BY SEVERITY

Severity	Number of Crashes	Percentage
Property Damage Only	59	44.7%
Injury	72	54.5%
Fatality	1	0.8%
Total	132	100.0%

Of the 72 injury crashes, 18 (resulting in 27 injuries) occurred at the intersection of Route 8 and Kenton Road. The intersection of Route 8 and Saulsbury Road (Route 15) had the second highest number of crashes with a total of 12 involving 19 total injuries. This intersection was the site of the only fatality in the three year time period studied.

Table 5-3 shown below depicts the crash statistics based on the light condition for the corridor. More than half of the total reported crashes (75) occurred during the daylight condition. Out of all the 57 night time crashes 49 occurred under lighted or dawn/dusk conditions.

TABLE 5-3: CRASHES BY LIGHTING CONDITIONS

Lighting Conditions	Number of Crashes	Percentage
Daylight	75	56.8%
Dark Unlighted	8	6.1%
Dark Lighted	43	32.6%
Dawn/Dusk	6	4.5%
Total	132	100.0%

The following table, Table 5-4, shows the crash statistics based on the pavement surface conditions. Seventy-six percent (76%) of the reported crashes occurred on dry surface conditions, while less than three percent (3%) transpired on snowy/icy conditions.

TABLE 5-4: CRASHES BY PAVEMENT SURFACE CONDITIONS

Surface Conditions	Number of Crashes	Percentage
Dry	101	76.5%
Wet	28	21.2%
Snowy/Icy	3	2.3%
Total	132	100.0%

Table 5-5 presents the crash summary by major collision types within the project study area for the given three year period between January 2003 and December 2005. Among the total reported crashes, the majority are attributed to left-turn crashes (37.9%). Other major types of crashes are rear-end (22.7%), angle (18.9%) and also fixed object crashes (11.4%). Detailed discussion of intersection wide collision type analysis will be discussed in the following section.

Table 5-5: CRASHES BY COLLISION TYPES

Collision Type	Number of Crashes	Percentage
Left-Turn	50	37.9%
Rear-End	30	22.7%
Angle	25	18.9%
Object	15	11.4%
Right-Turn	6	4.5%
Head-On	3	2.3%
Passing	2	1.5%
Sideswipe	1	0.8%
Total	132	100.0%

5.2: CRASH DATA AT INTERSECTIONS

Crash data was collected along Route 8 within the study area. Of the 132 total crashes reported, 107 were intersection related. The intersections of Route 8 and Mifflin Road, Kenton Road, Independence Boulevard and Saulsbury Road have the highest number of crashes and the collision diagram for these four intersections are show in Appendix E including the detailed crash reports. Table 5-6 below lists the intersections and the control type along Route 8.

TABLE 5-6: INTERSECTION AND CONTROL TYPE

Cross Street Name	Control Type
Artis Drive	Stop Control
Mifflin Road	Signalized
Kenton Road	Signalized
Independence Boulevard	Signalized
Modern Maturity Entrance	Signalized
Saulsbury Road (Route 15)	Signalized
Gibbs Drive	Signalized
Weston Drive	Stop Control
Ridgely Street	Signalized
New Street	Stop Control

Based on the crash data, crash clusters have been noted at the following four intersections. These intersections account for 53.8% of all the reported crashes from January 2003 to December 2005. The following section discusses, in detail, the high occurrence intersections shown in Table 5-7. Each description describes the types of crashes and possible reasons for the crash clusters.

TABLE 5-7: HIGH CRASH INTERSECTIONS ON ROUTE 8

Cross Street Name	Total Crashes	Percent of Total
Kenton Road	31	23.5%
Saulsbury Road	17	12.9%
Independence Boulevard	13	9.8%
Mifflin Road	10	7.6%

5.2.1 Intersection of Mifflin Road and Route 8

The intersection of Mifflin Road and Route 8 is a signalized T-intersection. At this intersection, exactly 90% of the total reported crashes were caused by angle and left-turns. All nine (9) left turn and the angle crashes were caused by westbound left-turn and the eastbound through traffic. Field observations revealed that the westbound left turn has both exclusive and permissive phase and all these crashes involved a left turn vehicle trying to cross the intersection during the permissive phase and getting hit by an eastbound through vehicle. Also, the storage length for this left-turn lane to Mifflin Road is relatively short, only allowing approximately three (3) cars for storage. Based on the field observation sight distance does not appear to be an issue. However, as there is no separate right-turn storage lane for eastbound traffic, most of the westbound left crashed vehicles operator stated that they thought the opposing vehicle was turning right instead of driving eastbound through. Table 5-8 shows the number and percentage of each crash type.

TABLE 5-8: COLLISION TYPES AT MIFFLIN ROAD INTERSECTION

Collision Type	Number of Crashes	Percentage
Left-Turn	8	80.0%
Rear-End	1	10.0%
Angle	1	10.0%
Total	10	100.0%

All ten (10) injuries at this intersection were caused by the eight (8) left-turn crashes. Please see Appendix E for the crash diagram.

5.2.2 Intersection of Kenton Road and Route 8

The intersection of Kenton Road and Route 8 is a signalized four-legged intersection. Throughout the corridor, the highest number of crashes occurred at this intersection. Twenty-two (22) of the reported crashes were caused by left-turn collisions. Of these, 18 occurred between the eastbound left-turn onto Kenton Road and the opposing westbound through movement. The eastbound left has a protected-permissive signal that has a red flashing arrow, allowing vehicles to turn onto Kenton Road. All the 18 left-turn crashes occurred during eastbound left permissive left turn movement when the left turn failed to yield to oncoming traffic. There were also six (6) rear end crashes at this intersection during the three year reporting period. Table 5-9 for additional types and percentages of crashes at this intersection.

TABLE 5-9: COLLISION TYPES AT KENTON ROAD INTERSECTION

Collision Type	Number of Crashes	Percentage
Left-Turn	22	71.0%
Rear-End	6	19.4%
Object	1	3.2%
Right-Turn	1	3.2%
Passing	1	3.2%
Total	31	100.0%

The other four (4) left turn crashes reported at this intersection occurred at the McDonald's entrance when westbound vehicles turned left into or out of the entrance. A parkway median was placed on Route 8 in front of the McDonald's entrance to eliminate these types of crashes as part of the development of Wawa. Please see Appendix E for the crash diagram.

This location was studied as part of the 1999 HSIP (Task I and IA) report. In the report, the eastbound left-turn movement to Kenton Road and the McDonald's entrance operation was analyzed in detail. The study identified that the EB left-turn operates as dual exclusive-permissive phase and, 47 percent of the eastbound left turning vehicles turn during the permissive phase. The report also identified that twenty-two (22) of the twenty-four (24) reported left turn crashes occurred during the permissive left-turn phase.

The HSIP report suggested to modify the eastbound left-turn phase to exclusive only phase during the afternoon peak periods from 2 PM to 7PM. The report also suggested limiting the left turn movement into McDonald's from westbound Route 8 which was later implemented through DelDOT.

5.2.3 Intersection of Independence Boulevard and Route 8

The intersection of Independence Boulevard and Route 8 is a signalized four-legged intersection. During the study period, there were 13 crashes reported at this intersection. Out of those, 11 were left-turn and angle crashes, which were the result of operators of vehicles disregarding the traffic control device. Please see Appendix E for a crash diagram of this intersection and Table 5-10 below for the types and percentages of crashes at this intersection.

Table 5-10: COLLISION TYPES AT INDEPENDENCE BOULEVARD INTERSECTION

Collision Type	Number of Crashes	Percentage
Left-Turn	6	46.2%
Angle	5	38.5%
Rear-End	2	15.4%
Total	13	100.0%

5.2.4 Intersection of Saulsbury Road and Route 8

A total of 17 crashes occurred at the intersection of Saulsbury Road (Route 15) and Route 8 during the three year reporting period. Of these, 11 (65%) were left-turn collisions and four (24%) were rear-end collisions. Most of the left turn crashes were due to the left turning vehicles failing to yield to oncoming vehicles during the permissive left-turn movement. The only angle crash at this intersection involved one fatality and one serious injury. This crash involved a northbound through vehicle disregarding the red light and hitting a westbound through vehicle on the passenger side. Please see Table 5-11 for additional types and percentages of crashes at this intersection.

Table 5-11: COLLISION TYPES AT SAULSBURY ROAD INTERSECTION

Collision Type	Number of Crashes	Percentage
Left-Turn	11	64.7%
Rear-End	4	23.5%
Angle	1	5.9%
Object	1	5.9%
Total	17	100.0%

As part of the 1999 HSIP study (Task I and IA) report this intersection was analyzed in detail. The study determined that, based on the crash information, the eastbound and westbound left-turn movement meet warrant criteria to change from permissive-protected phase to protected phase. However, the delay and backup queue for left-turning vehicles will increase significantly with protected only left turning phase. The report suggested to continuously monitoring the frequency of left-turn crashes.

The report also recommended the installation of raised medians on the SR 15 approaches to the Route 8 intersection. This improvement would address most of the commercial driveway related crashes in the vicinity of the Route 8 intersection along SR 15. However, the study noted that a raised median improvement would likely to divert left-turn movements into and out of the commercial driveways along SR 15 to the driveways along Route 8 which will potentially create more crashes. The study suggested monitoring the access issue after installing the median curb. As of now the curb hasn't been installed yet, however, the design is underway and the project is anticipated to be advertised in 2007.

6. ALTERNATIVES DEVELOPMENT

The need for improvements along the Route 8 corridor was identified through technical analysis of existing and future traffic data; crash analysis; field observations and public input. The alternatives proposed were developed to provide a long term comprehensive solution to the safety, capacity, aesthetic and multi-modal issues facing the corridor.

The analysis for all alternatives, including the No-Build, assumed that both the Calvary Baptist Church and the new Capital School District High School were in operation.

There were two overall framework Alternatives developed for the corridor, Alternative 1 and Alternative 2, as well as a No-Build, or “Do Nothing” scenario. Each of these scenarios has several different improvement options. While these alternatives were analyzed separately, individual improvement options from both alternatives may be combined and incorporated into the preferred alternative. Delay and LOS information with all alternatives described below are shown in Table 6-1. Several of the improvement options were common to both build alternatives.

6.1 COMMON IMPROVEMENTS

Many improvements are proposed for both Alternatives 1 and 2. These are listed below:

- a) Artis Drive realignment.
 - o Description: Realign Artis Drive to eliminate the skewed intersection.
 - o Pros: This improvement will improve the safety and operation of the intersection by eliminating the skewed approach and aligning the Artis Drive with Sharon Hill Road. This intersection has been in the HSIP (Highway Safety Improvement Program).
 - o Cons: The realignment will require the acquisition of one residential property on the south side of Artis Drive. This re-alignment may also have an impact on a potentially historic site and will need further evaluation.
- b) High School Access Points:
 - o Description: A new high school is planned for the Carey Property on the south side of Route 8. Two points of access have been identified as part of the concept plan. The western access will be located from a proposed connector road from Route 8 to Hazlettsville Road. The eastern access would be located opposite Stoney Drive and would be signalized.
 - o Pros: Locating the entrance opposite Stoney Drive will provide the residents of Heatherfield a signalized access and would address their current access problems to Route 8 during peak hours.
 - o Cons: There are residential driveways and an entrance to Heatherfield East in close proximity to Stoney Drive which could create operational problems with a signalized access. This issue needs to be addressed as part of the design of the entrance.

TABLE 6-1: ALTERNATIVE ANALYSIS-AVERAGE DELAY & LOS FOR SIGNALIZED INTERSECTIONS

Signalized Intersection	Output Type	Control Delay & LOS																			
		2030 w/New Dev-No Build				2030 Improvement Alternative 1*				2030 Improvement Alternative 1a*				2030 Improvement Alternative 1b*				2030 Improvement Alternative 2			
		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
		Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS
School/Stoney Drive	HCM	33.7	C	10.1	B	33.7	C	10.1	B	33.7	C	10.1	B	33.7	C	10.1	B	33.7	C	10.1	B
Mifflin Road	HCM	43.7	D	37.8	D	34.6	C	33.5	C	32.9	C	31.4	C	32.9	C	31.4	C	32.1	C	30.4	C
Kenton Road	HCM	37.3	D	57.1	E	40.6	D	52.2	D	36.5	D	54.9	D	36.9	D	54.5	D	33.4	C	47.0	D
Independence Boulevard	HCM	25.4	C	24.6	C	28.3	C	32.9	C	33.0	C	30.9	C	32.7	C	30.1	C	43.4	D	35.3	D
Modern Maturity	HCM	6.4	A	8.8	A	14.2	B	38.7	D	11.2	B	38.2	D	14.0	B	33.3	D	6.5	A	12.1	B
Saulsbury Road	HCM	95.3	F	173.4	F	79.4	E	98.5	F	54.0	D	63.0	E	70.3	E	83.4	F	49.2	D	58.5	E
Gibbs Drive	HCM	8.9	A	7.9	A	19.9	B	14.9	B	19.9	B	14.9	B	19.9	B	14.9	B	20.0	B	18.8	B
Weston Drive/Forrest Street	HCM/SIDRA	N/A-Unsig	N/A-Unsig	N/A-Unsig	N/A-Unsig	11.8	B	30.0	C	11.8	B	30.0	C	11.8	B	30.0	C	3.4	A	49.9	D
Ridgely Street	HCM	4.7	A	6.8	A	4.2	A	5.6	A	4.2	A	5.6	A	4.2	A	5.6	A	4.8	A	6.4	A

*Improvement Alt 1 indicates existing geometry at DE Route 8 & Saulsbury Road with Prot./Proh. LT phasing on DE Route 8, Alt 1a indicates 4-lane Saulsbury Road cross-section with Prot./Proh. LT phasing on all approaches, and Alt B indicates existing geometry with Prot./Perm. phasing on all approaches
 LOS:Level of Service is a method of describing how well traffic is moving through an intersection based on motorist delay.

- c) Connection to Artis Drive and Hazletville Road:
 - Description: Create a new local road connection from Route 8 to Artis Drive and Hazletville Road. The roadway south of Route 8 would function as a local roadway that would provide access to the new high school and inter-connect with the new residential development south of the high school.
 - Pros: This connection will improve mobility within the corridor by providing alternative routes. It will provide access to the high school without forcing trips onto Route 8.
 - Cons: Constructing this roadway network will be costly.
- d) Connection to Chestnut Grove Road:
 - Description: Create a new road connection from Route 8 to Chestnut Grove Road. This road would serve to improve the north south grid within the study area.
 - Pros: This connection would help relieve traffic from Kenton Road and provide an additional north-south connection within the study area and could help provide for future development.
 - Cons: The roadway would impact land preserved under the agricultural preservation program and would extend outside both the City and County urban growth boundary (UGB). Future construction of this road would have to be coordinated with the Dover/Kent County MPO, Kent County, and the City of Dover and DelDOT. The alignment will also impact forested areas and could include a stream crossing.
- e) Signal phasing changes
 - Description: Change the east-west left turns on Route 8 at Mifflin Road, Kenton Road, Independence Road and Saulsbury Road intersections from its current protected/permissive phasing to protected/prohibited phasing.
 - Pros: A high percentage of crashes at these intersections involved left turns. Providing protected only left turn phasing will be a significant safety improvement.
 - Cons: Without other improvements, protected only phasing will create long left-turn queues at the intersections.
- f) Eastbound right turn lane at Mifflin Road
 - Description: Currently, eastbound right turns at Mifflin Road occur from the outside through lane. This improvement would create a dedicated eastbound right turn lane at Mifflin Road
 - Pros: This change will improve the operation and safety of the intersection.
 - Cons: This improvement will impact the residential property along the south side of Route 8.
- g) On-road bike lanes through all intersections along Route 8

- Description: Route 8 is designated as a bike route, yet it doesn't have a continuous facility or any signing for bicycles. Each intersection will be improved to have a five foot striped bike lane.
 - Pros: This improvement provides a safe facility for bicycles on Route 8
 - Cons: There will be construction costs and right of way needs associated with this improvement.
- h) Shoulders along Route 8
- Descriptions: Currently, Route 8 does not have shoulders from Mifflin Road to Gibbs Road. This improvement is to widen Route 8 to include 10 foot wide shoulders from Mifflin Road to Saulsbury Road and 6 foot shoulders from Saulsbury Road to Gibbs Road.
 - Pros: Providing shoulders will provide additional space for bicycles along the mainline of Route 8. In addition, currently trash trucks occupy the outside through lane during trash collections, effectively shutting it down. The shoulder will address this problem by giving trucks dedicated space during trash collection.
 - Cons: There will be additional right of way and construction costs. In addition, a wider pavement area could induce higher travel speeds. Note that there may also be some encroachment towards potential historic sites and some further evaluation may be required.
- i) Pedestrian facilities at intersections
- Description: At each signalized intersection, crosswalks, pedestrian signals, and curb ramps will be installed.
 - Pros: This will provide a safe facility for pedestrians and help encourage pedestrian activity along this multi-modal corridor and be consistent with the City of Dover comprehensive plan. All intersections would be upgraded to meet ADA standards.
 - Cons: There will be additional installation and maintenance costs.
- j) Existing shared use path on north side of Route 8
- Description: The existing path that runs along the north side of Route 8 is in poor condition. With the improvements to Route 8, the existing shared use path would be reconstructed to be 10 feet wide and include a buffer between the roadway and the path. In addition, the path will be extended from Kenton Road to Mifflin Road.
 - Pros: Extending the path towards Mifflin Road will create a longer, more connected network. By improving the condition of the existing path, the path will be more attractive for users.
 - Cons: Additional right of way and construction costs.
- k) Interconnections between properties along Route 8
- Descriptions: A lack of connectivity between properties along Route 8 creates additional trips on Route 8. In accordance with the City of

Dover's Corridor Overlay Zone, several opportunities for interconnections have been identified. They include:

- A 2-way connection between McDonald's and the signal to Kenton Road.
- An interconnecting street from Independence Boulevard to Mifflin Road. The street would be a City street and designed to city street standards.
- An interconnection between Independence Blvd and Bennington Street.
- An interconnection between Dove View and Modern Maturity Center
- Interconnections between Heatherfield Way and Stoney Drive
- Pros: Interconnections promote mobility within the corridor and will reduce turning movements on Route 8.
- Cons: Creating these interconnections will affect the full development potential of commercial property and may impact existing homes and businesses.

l) Landscaping and streetscaping elements

- Description: The final design will include streetscaping and landscaping elements at selected intersections. These may include benches, street lighting, textured crosswalks, and landscaping.
- Pros: Improve aesthetics of corridor to maintain consistency with the City of Dover comprehensive plan.
- Cons: Additional installation and maintenance costs. (Currently, DelDOT seeks private maintenance agreements prior to installing new landscaping.)

m) Transit stops

- Description: Currently there are three transit routes along the corridor. The average headway for the routes is 30 minutes. With the corridor improvement, bus pads, shelters and benches would be installed along the corridor. Shelters and benches are most important in the area of the Modern Maturity Center.
- Pros: These changes will improve the amenities for transit riders. With the 30 minute headways, providing shelters and benches will encourage use of the transit system.
- Cons: Additional installation and maintenance costs.

n) New entrance to Brandywine Apartments

- Description: The existing access driveways to the Brandywine Apartments are located on each side of Mifflin Road and create operational problems on Route 8. This improvement will create a new entrance to these apartments opposite Mifflin Road. The existing entrances would be eliminated or converted to right turn only.

- Pros: Provides signalized access to the apartment complex. In addition, eliminating or converting the existing entrances to right turn only will improve the operation of Route 8 between Mifflin Road and Kenton Road.
 - Cons: This change may create conflicts with internal circulation and parking for the apartment complex.
- o) Pedestrian crossing at Forest Street
- Description: Currently, pedestrians and bicyclists do not have a designated route to cross Forest Street to access Route 8 eastbound. This improvement will designate a crosswalk which will be accompanied by traffic calming along Forest Street. It was noted during the public workshops that pedestrians often cross Route 8 at various different locations near this intersection.
 - Pros: Provides a designated crossing and would help pedestrians and cross at the intersection safely and would give an additional crossing for cyclists without entering the traffic stream.
 - Cons: In order to create a safe crossing for pedestrians, several traffic calming measures would be required to slow traffic and would increase costs.

6.2 ALTERNATIVE 1

a) Shared use path

- Description: With this option, a 10 foot wide shared use path would be constructed from Artis Drive to Mifflin Road on the south side of Route 8.
- Pros: A shared use path has already been planned along the frontage two properties proposed for development (the new Capital District High School and Cavalry Baptist Church) within this area. In addition, the path would compliment the development of the high school by providing an off-road facility for bicyclists to access the facility.
- Cons: The additional width of the path will have a greater impact on the residential properties fronting Route 8.

b) Landscaped median

- Description: A 16 foot wide landscaped median would be constructed from Mifflin Road to Saulsbury Road. Left turns would be permitted at the signalized intersections.
- Pros: The median will improve safety by channelizing and controlling left turns and eliminating illegal left turns. In addition, it will provide a refuge area for pedestrians at the crosswalks. Another benefit is that the reduction in impervious area will reduce the need for stormwater management. Finally, it would create the “commercial boulevard” along Route 8 in accordance with the City of Dover comprehensive plan.
- Cons: The median will eliminate direct left turns which currently exist for some businesses. In addition, the median will require additional maintenance costs.

- c) 2nd eastbound left turn lane at Kenton Road.
 - Description: The intersection at Kenton Road operates at LOS C/C (2006) in the AM/PM peak hours. Without improvement, it will operate at LOS D/E in the AM/PM peak hours in the year 2030. Currently eastbound left turns queue beyond the existing turn lane. The improvements proposed are intended to address the capacity and queuing problem.
 - Pros: The additional left turn lane improves the LOS for the intersection to D/D during the AM/PM peak hours for the year 2030. In addition, it will provide sufficient storage for the eastbound left turns.
 - Cons: Providing the left turn lane requires a second receiving lane on northbound Kenton Road. Both improvements require widening the intersection which will create longer crossings for pedestrians.

- d) Connector road behind the Gateway West Shopping Center
 - Description: A connector road built to City street standards would be constructed from the Saulsbury Road access to the Gateway West shopping center to the Route 8 access to the Modern Maturity Center and to Commerce Way.
 - Pros: Providing the connector road will divert some trips (northbound left turns and eastbound right-turns) from the Saulsbury Road/Route 8 intersection as well as provide mobility for people access the shopping center and the developing area surrounding it.
 - Cons: The connector road alone does not address the LOS problem at the Saulsbury Road/Route 8 intersection and would impact several properties and the south side of Route 8.

- e) Saulsbury Road/Route 8 intersection improvement
 - Install additional through lane in both directions on Saulsbury Road at the Route 8 intersection combined with connector road from Saulsbury Road to Modern Maturity Center intersection.
 - Description: This intersection currently (2006) operates at LOS D/D in the AM/PM peak hours. In the design year (2030), it will operate at LOS F/F without any improvement. For this alternative, a second through lane would be added to Saulsbury Road through the intersection in combination with the connector road behind the Gateway West Shopping Center. The additional lane would be tapered back to the existing section of one lane in each direction without impacting either of the adjacent intersections on Saulsbury Road. In addition, the left turn phasing would be changed to protected/prohibited.
 - Pros: The improvements will reduce delay through the intersection and improve LOS to D/E during AM/PM peak hours in the future year. By converting the signal operation to protected/prohibited phasing, the safety of the intersection will be improved.
 - Cons: Widening Saulsbury Road will be costly and will create longer crossings for pedestrians at the intersection.

- Alternative to previous option
 - Description: Maintain existing roadway geometry while extending storage capacity for left turn lanes and maintain existing protected/permissive signal phasing. This alternative assumes the same traffic diversion using connector road as previous alternative.
 - Pros: With this option, the overall intersection delay is reduced slightly more than previous option. However, the 2030 LOS would remain at E/F in the AM/PM peak hours.
 - Cons: The protected/permissive phasing creates a significant safety problem under future traffic volumes.
- f) Signalize Weston Drive/Route 8 intersection
 - Description: The unsignalized intersection of Weston Drive/Forest Street and Route 8 has significant delay for northbound left turns. Currently, the stop control movement operates at LOS F/F currently and will deteriorate further in the 2030 conditions without any improvement. With this option, the intersection would be signalized. It would also be recommended that the City attempt to create a formal connection between Weston Street and Ridgely Street and eliminate the existing signal at that intersection.
 - Pros: This improvement will reduce overall delay at the intersection and improve LOS to B/C in the AM/PM peak hours in the design year.
 - Cons: The proximity of adjacent signals at Gibbs Drive and Ridgely Street will create coordination problems and introduce more delay through the Route 8 corridor, although this would be minimized with the removal of the signal at Ridgely.

6.3 ALTERNATIVE 2

- a) Sidewalk from Artis Drive to Mifflin Road.
 - Description: With this option, a five (5) foot wide sidewalk would be constructed from Artis Drive to Mifflin Road on both sides of the road.
 - Pros: This option improves mobility by providing a facility for pedestrians. In addition, the width of the improvement reduces the impact on the homes fronting Route 8 in comparison to the alternative shared use path.
 - Cons: Bicyclists are required to use the shoulder along Route 8. This option is inconsistent with previous planning efforts for properties with approved site plans. The sidewalk (in comparison to the path) will not fully service the proposed high school by providing an off-road facility for bicycles.
- b) Connector road between Kenton Road and Independence Blvd behind Green Tree Plaza.
 - Description: The purpose of this road is to shift the southbound left turns from Kenton Road to Independence Road, where more capacity exists. This would allow more green time to be allocated to the eastbound left-

- turn movement, eliminating the need for an eastbound double left-turn lane.
- Pros: With the assumed diversion in traffic, the LOS at the Kenton Road intersection will improve to LOS C/D in the AM/PM peak hours (in comparison to a No Build 2030 LOS D/E). In addition, this improvement will relocate the access to shopping center on Kenton Road further north from the Route 8 intersection. This intersection is problematic and separating the apartment access (currently opposite the shopping center entrance) from this entrance would improve traffic flow through this area.
 - Cons: This option does not completely eliminate queuing beyond the storage capacity for the existing eastbound left turn lane on Route 8 at Kenton Road. It also would negatively impact traffic operations at Route 8 & Independence Boulevard, reducing the AM/PM peak hour LOS from C/C to LOS D/D due to the diversion of traffic, although this is still considered as operating satisfactorily. Finally, relocating the entrance to the north eliminates one potential building lot within the shopping center.
- c) Two-way center turn lane from west of Mifflin Road to Saulsbury Road
- Description: With this option, the existing two way center turn lane would be maintained.
 - Pros: This option provides the increased access to and from business along Route 8.
 - Cons: With the widening to add shoulders, the roadway would be extremely wide, creating aesthetic problems and hindering pedestrian crossings. In addition, the lack of channelization of left turns does not address the problems associated with illegal and unanticipated left turns and would create very disorderly traffic pattern, reducing safety throughout this section of the corridor.
- d) Saulsbury Road/Route 8 widening
- Description: This improvement assumes the connector road behind the Gateway West shopping center is not constructed. With this option, an additional through lane in both directions on Saulsbury Road and double left turn bays on both northbound and southbound Saulsbury Road in lieu of new interconnection to Modern Maturity would be constructed. The new four-lane cross-section on Saulsbury Road would likely need to be extended south through the intersection at Gateway Boulevard and north through the intersection at Carver Road.
 - Pros: This option reduces delay the most versus the other options. However the LOS is still in the D/E range during the AM/PM peak hours.
 - Cons: Providing an additional left turn lane and through lane will expand the intersection considerably. The size of the intersection will impede pedestrian crossings and have significant impact on adjacent properties.
- e) Roundabout at Weston Drive/Forest Street/Route 8 intersection

- Description: In order to address the side street delay from Forest Street, a one-two lane hybrid roundabout at Forest Street/Route 8 split would be constructed. The westbound (northern half of roundabout) move will maintain two through lanes through the roundabout
- Pros: This option will improve the flow of traffic through the intersection while providing an opportunity to create an aesthetic gateway into Dover.
- Cons: The roundabout will not have conventional geometry and may cause confusion to motorists unfamiliar with roundabouts. The cost of the roundabout will be significantly higher than installing a signal.

6.4 ALTERNATIVE 3 – NO BUILD

With this alternative, no improvements are proposed. However, the future year includes projected traffic from the new high school and the Calvary Baptist Church.

Additional descriptions and some of the pros and cons of each improvement option are indicated in Tables 6-2, 6-3, and 6-4. Table 6-2 describes the common improvements, Table 6-3 discusses Alternative 1 improvement options, and Table 6-4 includes options in Alternative 2.

Table 6-2: Common Improvements Analysis

Common Improvements	Description	Pros	Cons
Re-align Artis Dr	This improvement would remove the existing skewed angle at this intersection at add turn-lanes on all approaches	<ul style="list-style-type: none"> •Improved safety & sight lines •Improved operations 	<ul style="list-style-type: none"> •Construction & ROW costs •Acquisition of a residence •Potential historic property impact
Signalize Stoney Dr	This improvement would be done in conjunction with construction of the new High School and serve as the school's main entrance.	<ul style="list-style-type: none"> •Required to safely provide for entering and exiting vehicles & pedestrians •Provide signalized entrance/exit for Heatherfield Estates 	<ul style="list-style-type: none"> •Increased delays on Route 8 (could be minimized w/signal coordination) •Proximity of driveways on Route 8 near signal could create operational problem
New north/south roadway connections	The new roadway connections would be from the proposed western high School entrance south to Hazletville Road and north to Chestnut Grove Road. It could also include additional connections to Artis Drive. The northern connection should be constructed in conjunction with proposed development and a change in the growth boundary.	<ul style="list-style-type: none"> •Provide relief for Route 8 by providing alternative routes •Create grid system of roads •Allow additional access points for existing developments including Cranberry Run which has difficulty accessing Route 8 during peaks 	<ul style="list-style-type: none"> •Impact protected agricultural land and proposed development •Very high costs •Require signal and increase delays on Route 8 •Wetland/Stream Impacts
Alter LT phasing from protected/permmissive to protected/prohibited	This improvement would alter the existing protected/permmissive left-turn phasing at Mifflin, Kenton, Independence, and Saulsbury to protected/prohibited	<ul style="list-style-type: none"> •Improved safety for turning vehicles 	<ul style="list-style-type: none"> •Reduced intersection capacity
Install EB RT lane at Mifflin Rd	Install a right-turn lane at the eastbound Route 8 approach to Mifflin Road	<ul style="list-style-type: none"> •Improved Safety for EB vehicles •Reduced vehicular delays at intersection 	<ul style="list-style-type: none"> •Construction & ROW costs
Provide on-road bike lane through all ints	Bike lanes would be striped and installed at all intersections in the study area.	<ul style="list-style-type: none"> •Improved safety and access for bicycles 	<ul style="list-style-type: none"> •Construction costs
Install shoulders along Route 8	10' shoulders would be installed Between Mifflin Road & Saulsbury Road and 6' shoulders would be installed between Saulsbury Road & Gibbs Road	<ul style="list-style-type: none"> •Improved safety for vehicles (provides recovery zone) •Allows area for trash collection outside of traveled way •Provides additional space for bicyclists 	<ul style="list-style-type: none"> •Construction & ROW costs •Wider roadway can induce higher speeds and negatively affect pedestrian crossings
Install pedestrian accommodations at signals	Pedestrian improvements would include crosswalks, handicap ramps, pedestrian signals, and pedestrian push-buttons at existing and proposed signals	<ul style="list-style-type: none"> •Improve pedestrian safety and walkability •Would meet ADA requirements 	<ul style="list-style-type: none"> •Installation costs and maintenance

Table 6-2: Common Improvements Analysis

Common Improvements (cont)	Description	Pros	Cons
Improve existing shared use path	Widen existing shared-use path on north side of Saulsbury and include additional pedestrian and bike amenities	•Improves pedestrian and bicycling amenities along corridor	•Construction & ROW costs
Create interconnections between properties along Route 8	Some of the interconnections that should be considered are a two-way connection between McDonalds and shopping center at Kenton Road, and between properties between Mifflin Road and Independence Boulevard	•Improves mobility and could remove some traffic from Route 8	•May impact existing or proposed businesses
		•Could be constructed gradually over time and partially funded by future developments and re-developments	•McDonald's entrance is close to existing signal; potential operational problems
Landscaping and Streetscaping elements	This could include installing a variety of aesthetic treatments such as street trees, pedestrian lighting, benches, signal poles, etc, along the corridor	•Would improve the pedestrian environment, walkability, and appearance of roadway	•Construction costs and potential maintenance issues/costs
Update Transit Stops	Improvements to existing transit stops would include concrete pads, shelters, trash receptacles, and benches, as well as bus pull-off areas where feasible	•Improve transit rider amenities to "reward" transit users	•Installation costs and maintenance
		•Could increase ridership	
Re-align Mifflin Road	Mifflin Road would be re-aligned with a new primary access point to the Brandywine Apartment complex that would connect to Courtside Drive. The existing access points east and west of Mifflin Road could be removed or re-designed as right-in/right-out driveways.	•Simplify and consolidate access points	•Would require construction through private development
		•Would give a signal controlled access for apartment residents, allowing easier left-turns in and out of complex	•May face opposition from apartment owners and residents
Install Unsignalized Crossing and traffic calming at Forest Street west of Weston Drive	This unsignalized crossing would be installed to provide a safe route for bicycles that want to continue eastbound on Route 8 and for pedestrians that currently cross at random locations.	•Provides a permanent high visibility location for pedestrian crossings.	•May result in more pedestrian crossings, conflicts, and possibly crashes
		•TC measures would lower vehicle speeds and create a more pedestrian-friendly environment	•Construction costs and potential maintenance issues/costs
		•Crossing required for eastbound cyclists	

Table 6-3: Alternative 1 Improvements Analysis

Alternative 1 Improvements	Description	Pros	Cons
Construction of shared-use path	Construct a shared use path from Artis Drive to Mifflin Road along the south side of Route 8	<ul style="list-style-type: none"> •Extends and improves cycling and walking environment •Provides compatible amenity to proposed high school •Provides separated bike lanes for less experienced cyclists 	<ul style="list-style-type: none"> •Construction & ROW costs
Landscaped Median	Installs a 16' wide landscaped median island from just west of Mifflin Road to east of Saulsbury Road, with periodic openings at selected roadways and businesses entrances for left-turning vehicles	<ul style="list-style-type: none"> •Can provide a pedestrian refuge islands at crossings •Reduces visual impact of wide roadways •Access control measure can logically control traffic patterns, improving safety and eliminating existing illegal left turns •Reduces impervious surface for better stormwater management •Reduce "side friction," improving through movement on Route 8 •Improved roadway aesthetics 	<ul style="list-style-type: none"> •Construction & additional ROW costs over TWLTL •Additional maintenance responsibilities •Eliminates direct LT access into business driveways •Potential historic property impact
Install double LT lane at Kenton Rd	This includes the installation of a 2nd left-turn lane on the eastbound Route 8 approach to Kenton Road. This would also require slight re-alignment of Route 8.	<ul style="list-style-type: none"> •Improves capacity at intersection from LOS E to LOS D •Provides sufficient LT storage 	<ul style="list-style-type: none"> •Construction & ROW costs •Need to re-align Route 8 •Requires moving existing transit shelter •Requires widening of Kenton Road for 2nd receiving lane
Install connector road behind Gateway West Shopping Center	This connector road would extend from Saulsbury Road & Gateway Blvd to the signal at Modern Maturity and would also include a connection south to Commerce Way	<ul style="list-style-type: none"> •Would remove NB LT and EB RT vehicles from Saulsbury Road, improving operations •Potential for other connections to adjacent development 	<ul style="list-style-type: none"> •While operations improve, future AM peak at LOS E and PM peak at LOS F •Construction & ROW costs
Alternative 1a (Additional improvements to Saulsbury & Route 8)	This alternative includes the installation of an additional through lane on Saulsbury Road through Route 8, tapering back to one-through lane in each direction just past the intersection.	<ul style="list-style-type: none"> •Would improve operations to acceptable in the AM Peak and LOS E in the PM Peak •Less ROW impacts than Alt 2 	<ul style="list-style-type: none"> •Additional construction & ROW costs

Alternative 1

Table 6-3: Alternative 1 Improvements Analysis

Improvements (cont)	Description	Pros	Cons
Alternative 1b (Additional improvements to Saulsbury & Route 8)	This alternative maintains the existing protected/permissive signal timing and, while several of the turning lanes would be extended, it includes no changes to the existing lane configuration	<ul style="list-style-type: none"> •Reduces delay at intersection compared to Alt 1, although LOS still not at acceptable level •Fewer ROW impacts than Alt 1a 	<ul style="list-style-type: none"> •Future AM peak still LOS E and PM peak still LOS F •Major safety concerns with protected/permissive LT on Route 8
Install signal at Forest St./Weston Dr.	This includes installation of a signal in place of the existing stop-control at Route 8 & Forest St and could also include the removal of the existing signal at Ridgely Street.	<ul style="list-style-type: none"> •Delay on Forest St. approach is greatly reduced •Improved pedestrian safety 	<ul style="list-style-type: none"> •Will introduce another Route 8 signal very close to existing signal at Gibbs' •Would increase overall delay along Route 8
Shared use path from Gibbs to Weston Dr.	The proposed shared-use path would run along the north side of Route 8	<ul style="list-style-type: none"> •Provides for bikes and peds between Gibbs and Weston 	<ul style="list-style-type: none"> •Construction & ROW costs

Table 6-4: Alternative 2 Improvements Analysis

Alternative 2 Improvements	Description	Pros	Cons
Sidewalk from Artis Dr to Mifflin Rd	Constructs a sidewalk from the terminus of the shared-use path at Mifflin Road west to Artis Drive	<ul style="list-style-type: none"> •Less required ROW than shared-use path 	<ul style="list-style-type: none"> •Does not provide bike lane separated from traffic
Connector Road between Kenton Rd and Independence Blvd	This connector road would run behind Greentree Plaza, connecting Kenton Road & Independence Boulevard.	<ul style="list-style-type: none"> •Would remove some SB LT vehicles from Kenton Road, giving more green time to EB LT move •Provides acceptable operations w/o double EB LT lanes •Creation of grid network connections 	<ul style="list-style-type: none"> •Construction & ROW costs •Occasional EB LT overflow during surges in peak hours •Signal evaluation at Kenton & Green Tree Connector
Maintain two way center turn lane from west of Mifflin Rd to Saulsbury Rd	Maintains a 14' wide two way center-left-turn lane from just west of Mifflin Road to Saulsbury Road.	<ul style="list-style-type: none"> •Slightly less required ROW than median island •More access to businesses 	<ul style="list-style-type: none"> •Limited opportunities for landscaping along roadway •Longer pedestrian crossings •Less control of intended traffic patterns for vehicles entering/exiting businesses
Construct additional through lanes and turn lanes on Saulsbury Rd	These improvements include the construction of additional through lanes and double left-turn lanes on the northbound and southbound approaches of Saulsbury Road.	<ul style="list-style-type: none"> •Minor improvement in operations over other alternatives 	<ul style="list-style-type: none"> •Future PM peak still operates at LOS E •Additional construction and ROW costs than other alternatives •2nd through lane would likely be carried through adjacent intersections on Saulsbury Rd •Longer pedestrian crossing distances on Saulsbury Rd •Increase of impervious surface •Potential air-quality issues
Construct Roundabout at Route 8 & Forest St./Weston Dr.	This roundabout would be a one/two lane hybrid, with two continuous westbound lanes through the roundabout.	<ul style="list-style-type: none"> •Generally Improved safety for vehicles and pedestrians over signalized intersections •Typically provide 50%-70% reduction in crashes and less severe crashes than conventional intersections •Reduced vehicle delays, particularly during off-peak hours •More aesthetic and could act as downtown Dover "Gateway" •Slows and calms traffic •Less maintenance than signal •Center landscaped island allows better stormwater infiltration 	<ul style="list-style-type: none"> •Roundabouts can be harder to navigate for peds with vision impairment •Hybrid roundabout design could be confusing to unfamiliar drivers •Increased initial cost and ROW acquisition over signal •Potential historic property impact

6.5 CONTEXT-SENSITIVE-DESIGN (CSD) TECHNIQUES FOR PEDESTRIANS, BICYCLES, AND TRANSIT FACILITIES

6.5.1 Introduction

In addition to the operational improvements described above, there are a variety of other improvements that need to be considered in order to encourage modes of transportation other than single-occupancy vehicles, such as bicycling, walking and mass transit. This can be accomplished through the use of Context-Sensitive-Design (CSD), or Context-Sensitive-Solutions (CSS) that can create an environment that is more conducive to these modes of travel. Many of these improvements can be installed as part of the overall improvements and would likely require little additional investment. *All of these design techniques discussed below should be considered and incorporated where appropriate into the preliminary and final design of any and all improvements along Route 8 and should be closely coordinated with the City and other relevant stakeholders early and often in the design process.*

CSS incorporate non-traditional solutions to approach in the planning and design of transportation projects. CSS is a process of balancing many of the competing needs along a corridor, as well as promote flexibility in the application of design controls, guidelines, and standards to design a facility that is safe for all modes of travel. While there are many different definitions of CSS, many of the basic tenets are the same. It is defined by DelDOT as "...to plan and design transportation projects so they fit well into the communities they are supposed to serve. Projects designed this way blend into the community and make the place look nicer and work better than it did before the project was done. People who live in the community are happier."

Some of the other tenets¹ of CSS include:

- Balance safety, mobility, community and environmental goals in all projects
- Involve the public and stakeholders early and continuously throughout the planning and project development process
- Use an interdisciplinary team tailored to project needs
- Address all modes of travel
- Apply flexibility inherent in design standards
- Incorporate aesthetics as an integral part of good design

¹Principles from the Minnesota Department of Transportation as published on the University of Minnesota's Center for Transportation Studies Web Site

According to the 2003 *Dover Comprehensive Plan Update*, Route 8 is intended to serve as a "Commercial Boulevard" with enhanced landscaping, improved transit stops and shelters, better pedestrian paths and sign control." Residents in the area "...agreed 100% with continued enhanced landscape, urban design, sidewalk, and bike paths along the Route 8 corridor." To accomplish this, improvement options must go beyond merely accommodating existing or expected pedestrian, bicycle, and transit users, but should rather seek to encourage and support these travel modes in order to increase their usage as an alternative to vehicular travel. Therefore, several techniques intended to enhance

the pedestrian environment, provide bicycle facilities, and improve the accessibility and efficiency of transit system were examined and incorporated into the alternatives analysis.

6.5.2 Crosswalk and Pedestrian Crossing Improvements

While there are several crosswalks at selected locations along the Route 8 corridor, they are not present at all intersection approaches or crossings. In addition, the existing crosswalks tend to vary in both size and style. Some of the styles are continental (or piano keys), some are ladder, and others are simply 4-inch parallel white lines.

Crosswalks should be provided at every crossing at signalized intersections, unless it would create severe adverse effects on traffic operations or safety. Even if they cannot be located at all crossings of an intersection, crosswalks should be provided at all intersections. The safest type crosswalks are typically crosswalks that are highly visible to drivers, such as transverse 24-inch lines (continental, piano key, or ladder designs). In more urban areas of the corridor, from Saulsbury Road east to the end of the study area, treatments such as colored, textured crosswalks should be considered. These types of crosswalks are also highly visible to motorists, accommodating to pedestrians with visual impairments, and are more aesthetically pleasing than painted crosswalk. These types of crosswalks can also help signify a change in the character of a roadway such change from a lower-density suburban character to a more urban character. An example of a textured crosswalk is shown in Exhibit 6-1.



Exhibit 6-1: Textured Crosswalk

In addition to crosswalk improvements, there are also improvement options that can be used along the sidewalks at driveways along the corridor. Many driveway access points have no pedestrian indications at all, as shown in Exhibit 6-2, implying vehicular right-of-way over pedestrians. These driveways break up the sidewalk network and create obstacles for pedestrians. At these locations, sidewalks should be provided over the vehicle paths to maintain continuity throughout the sidewalk network. An example of this is shown in Exhibit 6-3. This type of treatment gives clear priority for pedestrians over vehicles, and provides a more continuous network creating a more pedestrian-friendly, walkable environment.



Exhibit 6-2: Driveway with no pedestrian amenities

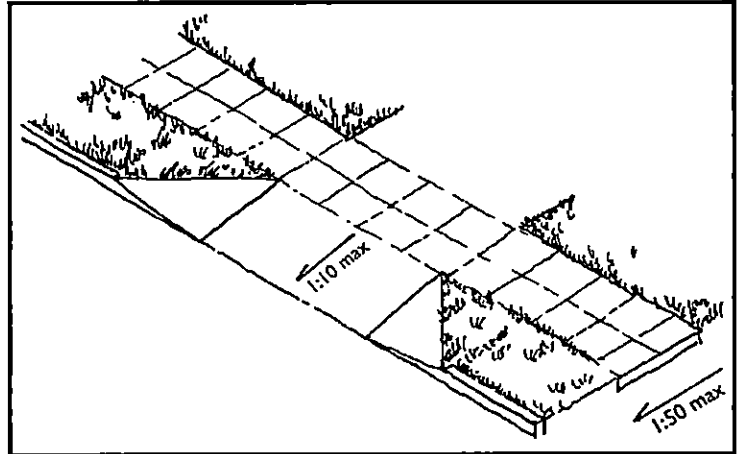


Exhibit 6-3: Preferred design of driveway crossings

6.5.3 Pedestrian Refuge Islands & Medians

Pedestrian refuge islands are located in the middle of a pedestrian crossing and can provide a protected waiting area for pedestrians who do not have time to complete a crossing. They also act to separate vehicular traffic, may slow traffic speeds in some cases, provide an aesthetically pleasing landscaped area, and can reduce the visual impact of wide roadways. Refuge islands can be provided at spot crossing locations, as shown in Exhibit 6-4, or within the landscaped area of a boulevard, as shown in Exhibit 6-5.

These islands should be a minimum of six-feet wide to give enough buffer room so pedestrians can feel safe while waiting at these islands. Along the Route 8 corridor, providing this width for refuge islands may require either widening of intersections, narrowing of travel lanes, or a combination of both. These islands would be particularly applicable in conjunction with the landscaped median strip proposed in Alternative 1.

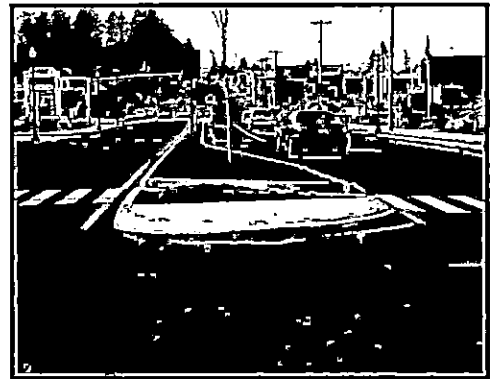


Exhibit 6-4: Pedestrian refuge island



Exhibit 6-5: Pedestrian refuge island within landscaped boulevard

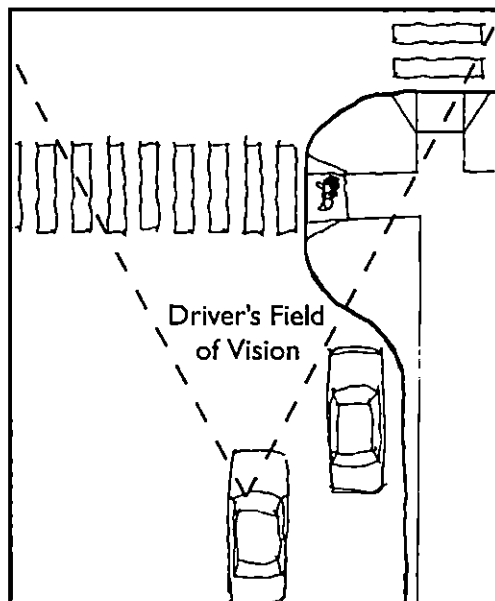


Exhibit 6-6: Schematic of bulb-out and pedestrian visibility

6.5.4 Bulb-Outs

Bulb-outs are typically located at intersections or selected mid-block locations along roadways. Bulb-outs are essentially extensions of the curbs into areas of the roadway that are not used by vehicles, as shown in Exhibit 6-6. These can have several advantages for pedestrians including reducing crossing distance, increasing visibility of pedestrians to drivers, slowing vehicle speeds, and providing more space for pedestrian and bicycle amenities. They can also be designed to provide protection for bus pull-off areas, shielding transit riders.

Along Route 8, these curb extensions can be provided at appropriate signalized intersections, extending out into the shoulder area where right-turn lanes do not exist. While these bulb-outs would be relatively small (5'), they would increase the visibility of pedestrians and make motorists more aware of crossing locations.

6.5.5 Channelized Right-Turn Lanes

Channelized right-turn lanes are somewhat of a mixed blessing when it comes to providing for pedestrian safety and creating a pedestrian-friendly environment. In one respect, channelized turn lanes are usually installed in conjunction with a raised "pork chop" island, which can be used by pedestrians as a refuge and shorten crossing distances. They can also, however, induce high vehicle turning speeds and drivers tend to look to their left for opposing vehicles while making turns, often not being attentive to crossing pedestrians. One design technique that can help reduce vehicle speeds and improve pedestrian visibility is by designing these channelized right-turn lanes with a tighter turning angle, as shown in Exhibit 6-7. This design slows vehicles and puts the pedestrian crossing directly in a driver's cone of vision.

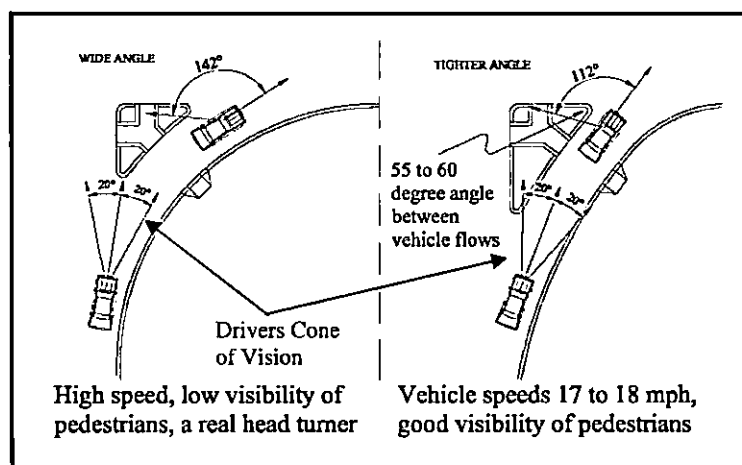


Exhibit 6-7: Tighter angle channelized right-turn lane design



Exhibit 6-8: Pork Chop Island with textured surface and ADA compliant curb cuts

Along Route 8, many of the channelized right-turn lanes could be redesigned in this manner, unless it would severely impact right-of-way or traffic operations. The pork chop islands could also be designed with textured or colored surfaces and pedestrian signal poles to increase their visibility to drivers, and their attractiveness and perceived safety for pedestrians, as shown in Exhibit 6-8.

6.5.6 Bicycle Lanes and Shared-Use Paths

Dedicated, striped bicycle lanes are a very important element to include along multi-modal corridors. Dedicated striping for bicycle lanes can add to the safety and comfort for cyclists, as well as provide a buffer between vehicular traffic and pedestrian traffic on adjacent sidewalks. Striping can also help provide right-of-way indication at intersections with right-turn lanes, where conflicts between cyclists and turning vehicles occur more often, as shown in Exhibit 6-9.

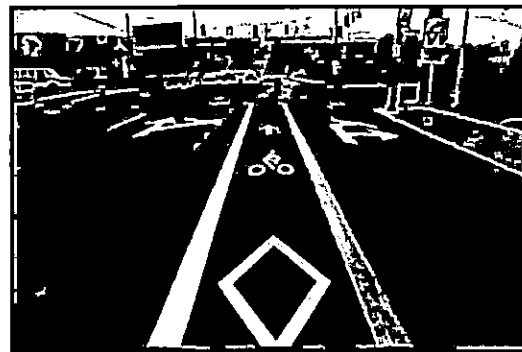


Exhibit 6-9: Bike lane and right-turn lane combination

Along DE Route 8, providing facilities for bicycles along the corridor was identified as a priority in the Dover Comprehensive Plan and are included in both Alternatives. While these bicycle lanes can be used by experienced cyclists, consideration should also be given to less experienced cyclists, such as children. A shared use path can completely separate cyclists from vehicular traffic by providing dedicated bike lanes outside of the traveled way. A shared use path is included in both Route 8 alternatives from Saulsbury Road to Mifflin Road and this shared-use path is continued west to Artis Drive in Alternative 1. Secure bicycle lock-up parking should also be provided periodically along the shared-use path, especially at major trip origin and destination points along the corridor.

6.5.7 Transit Stops and Amenities

There are three transit routes in the area, the Route 100, Route 101, and Route 102 lines, and a total of eleven bus stops along the corridor. Only one stop, located just west of Independence, currently has a bus pad, bench, shelter, and trash receptacle, as shown in Exhibit 6-10. In order to be a truly multi-modal corridor, transit use along the corridor must be safe, attractive, and convenient. Transit riders, in essence, need to be rewarded for using transit.



Exhibit 6-10: Bus stop at Independence Blvd with amenities

Other stops along the Route 8 corridor have only a sign indicating their location, such as the stop west of Saulsbury Road, shown in Exhibit 6-11. Ideally, all major stops should have amenities for transit uses and, where possible and practical, should have bus pull-off lanes so passengers have time to board and alight without disturbing traffic flow along the mainline. Note that the proposed shoulder along Route 8 can be effectively used by buses as a de facto pull-off lane. Many amenities can be funded by selling advertising on the shelters and benches, reducing costs to the public.



Exhibit 6-11: Bus stop at Saulsbury Road without amenities

6.5.8 Countdown Pedestrian Signal Heads

Countdown signal heads are signal heads that indicate to pedestrians as to how much time green time remains for a pedestrian to cross, as shown in Figure 6-12. This allows pedestrians to judge whether they have enough time to complete a crossing. Countdown signal heads have been installed in several major cities such as Washington D.C., Sacramento, San Francisco, and several others. A before and after study in San Francisco indicated that these treatments have indicated greater pedestrian compliance with

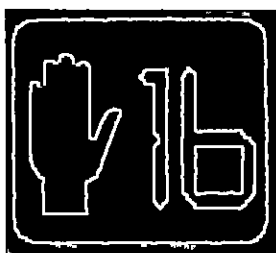


Figure 6-12: Countdown Signal Head

Walk/Don't Walk indications, a substantial reduction in pedestrian-vehicle conflicts when compared to "control" intersections, and 78% pedestrians surveyed reported that countdown signal heads are "very helpful."

DE Route 8 is a very wide roadway and some pedestrians may become "trapped" in the roadway if the signal changes and they are unable to complete a crossing. This is especially true for intersections with pedestrians who may need additional crossing

time, such as children near the schools and the elderly near areas such as Modern Maturity. Countdown signals could increase the safety of pedestrians crossing at intersections along DE Route 8. Some locations to consider would be near bus stops, shopping centers, and school crossings.

7. RECOMMENDATIONS

The improvement options discussed in Alternative 1 and Alternative 2 were presented to the Route 8 Working Group and a presented to the public through a Public Workshop held on August 1st, 2007. Through discussions with the working group members and the public, improvement options from each alternative were refined and a combination of these options was included to create the Preferred Alternative.

In addition, a preliminary implementation plan was developed. The implementation plan identifies a general phasing plan for all the improvement and the sequential order of the major items of work. Achieving the goals of this plan will require significant coordination and cooperation between the City of Dover, Kent County and DelDOT. It is suggested that these agencies enter into a Memorandum of Agreement to highlight the goals of the concept plan and the roles of each agency in achieving these goals.

7.1 PREFERRED ALTERNATIVE

The preferred alternative will include all of the Common Improvements described in the previous chapter as well as the several of the improvement options from Alternative 1 and Alternative 2. Maps detailing all improvements in the Preferred Alternative are located in the Appendices. All of the improvement options that will be included in the preferred alternative are described in detail below:

Artis Drive Realignment - This option would re-align the intersection of Artis Drive and Route 8. Currently, Artis Drive enters Route 8 at a skewed angle and is located less than 50' east of the intersection of Route 8 and Sharon Hill Road. The re-alignment would remove the skewed angle, align Artis Drive with Sharon Hill Road, and add right and left-turn lanes at both Route 8 approaches. This would remove the skewed angle and simplify the intersection, improving the overall safety of the intersection. This re-alignment would, however, would result in the acquisition of one residence located directly south of Sharon Hill Road.

Responsible Agency: DelDOT will be responsible for the planning, design and construction of this improvement.

High School Access at Stoney Drive - The signalization of the Stoney Drive in conjunction with the new high school construction and would serve as access to the new school. This will provide signalized entrance/exit for Heatherfield Estates and the proposed High School and the safe access for pedestrian crossings. However, nearby driveways along Route 8 could create operational problems. It is recommended that as this improvement moves forward, the design address the issues regarding the adjacent entrances. This improvement was supported during the public workshop.

Responsible Agency: DelDOT will be responsible to approve the access to the high school through the land development process. DelDOT would perform the signal design at the intersection.

North-South Connector Roads - These roads include several different roadway connections and are intended to create an improved grid system of roads as development occurs. These roads, which should be designed in accordance with DelDOT or City of Dover standards for local roads, will enhance the distribution of traffic and relieve some trips from Route 8. These roadways should not be fronted by individual residential lots.

The connection of Route 8 to Chestnut Grove Road would be planned for as development occurs within the west end of the study area. While this area is currently outside the growth boundary for Kent County, the connection should be planned for in the event development is proposed. The benefit of this connection will be to offer an alternative route for trips from the west that currently use Route 8 to Kenton Road to travel north. It is the intent of the alignment to minimize the impact to the property that has been permanently protected for farmland preservation.

The connection of Route 8 with Artis Drive and Hazlettsville Road is a higher priority connection than the link from Route 8 to Chestnut Grove Road. The area that will be served is currently developing and making these connections is imperative to effectively distributing traffic.

The intersection of the proposed connector and Route 8 would be located midway between Artis Drive and Cranberry Run Road. The road would provide access to the high school and will also include a connection to an existing stub road that is part of a residential development currently under construction south of the high school site.

Dedication of right of way and/or construction of these roadways needs to be coordinated through the land development review process.

Responsible Agency: The roadways need to be planned for and coordinated through the land development process which will include Kent County or City of Dover and DelDOT. The roadways need to be designed in accordance with DelDOT standards unless they are completely within the City of Dover. If so, these collector roads should be designed in accordance with city street standards.

Left-Turn Phasing at signalized intersections - This improvement would alter the existing protected/permissive left-turn phasing to protected/prohibited phasing at the intersections of Mifflin Road, Kenton Road, Independence Boulevard and Saulsbury Road. It is intended to reduce the number of left-turning vehicle crashes at these intersections, although it will have a negative impact on the capacity at these locations. This improvement needs to be coordinated with improvements that increase capacity or divert trips through the intersection.

Responsible Agency: DelDOT is responsible for making this change.

Eastbound Right-Turn Lane at Mifflin Road - An eastbound right-turn lane at this location, while not required from a capacity standpoint, was included to remove turning

vehicles from the through travel lanes, improve intersection safety, and reduce overall delay.

Responsible Agency: DelDOT is responsible for the planning, design and construction of this improvement.

Bike Lanes Through all Intersections - Route 8 is identified as a regional Kent County bike route by DelDOT; therefore on-road bicycle facilities should be provided throughout the corridor. In addition to the shoulders which would provide an on-road facility for bike lanes, 5' bike lanes should be striped through all intersections in the study area.

Responsible Agency: DelDOT is responsible for the planning, design and construction of this improvement.

Shoulders along Route 8 - Shoulders were identified early in the public involvement process as a desirable element along the Route 8 corridor for several reasons. First of all, they would provide a separated area for trash collection outside of the traveled way. Currently, trash collection takes place in the outside travel lane, presenting a safety hazard and negatively affecting traffic operations. Shoulders would also provide additional space beyond the 5' required for a bike lane, improving operations and safety for cyclists. They can also be used as a recovery/pull-off lane for disabled vehicles, passing lanes for emergency vehicles, and pull-off lanes for buses. Shoulder construction does, however, require widening which may induce higher speeds along the roadway and lengthen pedestrian crossing distances. Therefore, several treatments, such as bulb-outs, high-visibility crosswalk treatments, and landscaping should be considered during the design phase in order to reduce speeds, prevent the shoulder from being used as a passing lane or a de facto turn lane, and improve the safety of pedestrian crossings.

Responsible Agency: DelDOT is responsible for the planning, design and construction of this improvement.

Pedestrian Accommodations at Signals - Pedestrian accommodations at signals should include, at minimum, high-visibility crosswalks, possibly textured crosswalks at selected locations, pedestrian push buttons, and pedestrian signal heads. In addition, countdown signals should also be considered at locations near major pedestrian generators or specific pedestrian safety concerns. These would include Independence Boulevard near Green Tree Plaza, Saulsbury Road near the Gateway West Shopping Center, Modern Maturity due to the presence of elderly people using the intersection, and Gibbs Drive near Booker T. Washington Elementary School and William Mary Middle School. Countdown signals should also be considered at the proposed signal at Stoney Drive/High School Entrance. It is noted that currently DelDOT has not approved these types of signal heads, although they are in testing and, if approved by DelDOT should be considered during the design phase of the project. As mentioned above, another treatment proposed at selected intersections are bulb-outs, or curb extensions. These bulb-outs improve the visibility of pedestrians to approaching vehicles, reduce pedestrian crossing distance, and provide additional space for pedestrian amenities.

Responsible Agency: DelDOT is responsible for the planning, design and construction of this improvement.

Existing Shared-Use Path Improvement- The existing shared-use path that extends from Mifflin Road to just east of Saulsbury Road varies in width and is in a state of disrepair. Improvements would include repairing and widening the shared use path to a consistent 10' width, providing a separated path for both pedestrians and cyclists who are not comfortable or experienced enough to use the bicycle lanes in the roadway. A buffer from the back of the roadway curb would also be provided.

Responsible Agency: DelDOT is responsible for the planning, design and construction of this improvement.

Interconnections between properties along Route 8 - The longer-term improvement option that should be explored would be a continuous service road connection between Mifflin Road all the way through to Independence Boulevard. This would allow local trips to use this service road to access businesses without the need to use Route 8. As redevelopment occurs the following connections should be made:

- A 2-way connection between McDonald's and the signal to Kenton Road.
- An interconnecting street from Independence Boulevard to Mifflin Road. The street would be a City street and designed to city street standards.
- An interconnection between Independence Blvd and Bennington Street.
- An interconnection between Dove View and Modern Maturity Center
- Interconnection between Heatherfield Way and Stoney Drive; and Heatherfield and Cranberry Run

The major obstacle to this improvement is one of the buildings in the shopping center just east of the McDonald's across from Kenton Road. Should this lot be re-developed in the future, however, a service road connection through this lot should be revisited.

A shorter-term improvement would be re-striping the existing service road from the McDonald's to the shopping center at Kenton to a two-way road. While this small improvement falls short of construction of a continuous service road, it does provide interconnections with all properties south of Route 8 between Mifflin Road and Kenton Road. These connections could be extended farther east as properties along the south side of Route 8 are redeveloped, eventually extending to Independence Boulevard.

Connections between Dove View and Modern Maturity should be pursued. The two developments both serve an older population. Providing an interconnection between the senior center and the senior housing eliminate unneeded trips on Route 8.

A connection between Heatherfield Way and Stoney Drive would improve the operation of the proposed signal at Stoney Way. Cooperation and agreement among the communities and affected property owners will be needed to make this connection.

These changes will occur over a long period of time. It is recommended that DelDOT and the City have a mutual understanding of the short term goals of interconnecting property and the long term goal of creating city streets that will connect these properties.

Responsible Agency: The City of Dover is responsible for the planning and coordination of this improvement including working with property owners. DelDOT should support this process through their review of the land development proposals.

Landscaping and Streetscaping elements - Among the prime objectives of the City of Dover's 2003 Comprehensive Plan update include transforming the Route 8 corridor into a "Commercial Boulevard" between Independence Boulevard and Saulsbury Road and clustering commercial development around Green Tree shopping center and the Saulsbury Road intersection to create Village Shopping Centers. Landscaping and urban design elements should be included in these Village Shopping areas to encourage pedestrian activity, bike racks to encourage cycling to these locations, and updated transit stops where applicable.

In addition, corridor-wide improvements such as street trees, pedestrian-scale lighting, aesthetic signal poles, and trash receptacles should be included to encourage and foster pedestrian activity throughout the corridor. Landscaping along the proposed median island should also be included to create an aesthetic "gateway" into the City of Dover for vehicles as well. This is especially important at the Route 8 split, which acts as another gateway into the downtown area of Dover. Although these amenities will increase the cost of the project, according to the 2003 Comprehensive Plan, local residents agreed 100% with enhanced landscaping and urban design along the corridor.

Responsible Agency: This should be a combined effort between the City of Dover and DelDOT.

Transit Stops - Updating transit stops along the corridor include, at minimum, concrete pads and shelters at all existing bus stops within the study area. These include stops at George Washington Drive/Bennington Street, Modern Maturity, Booker T. Washington Elementary School, and Ridgely Street. Other stops along the corridor are within shopping centers or other developments, and the stop just west of Independence Boulevard already has these amenities, which should be maintained. At Saulsbury Road, while one transit stop exists at Gateway West Shopping Center, which is south of Route 8, another stop should be installed on the north side of Route 8 just west of the intersection near the proposed bank, drug store, and the Dove View housing development to provide transit access to these developments.

Responsible Agency: DelDOT is responsible for the planning, design and construction of these improvements.

New Entrance to Brandywine Apartments - This improvement would create a new access point for the Brandywine Apartment complex at Mifflin Road. This access point

could connect to Courtside Drive and would provide residents a controlled, signalized driveway, which would allow them to make easier left-turns in and out of the complex and eliminate uncontrolled left-turns in and out of the existing driveways. The other two existing access points could then be eliminated or re-designed as right-in/right-out driveways. This would consolidate access points and improve safety in this area. Internal circulation issues will need to be addressed with the apartment complex owner.

Responsible Agency: DelDOT is responsible for the planning, design and construction of this improvement. The City will need to assist with the project to address any issues related to the internal site design.

Pedestrian Crossing at Forest Street - An unsignalized crossing of Forest Street in the area of the Route 8 split would serve two purposes. First of all, due to the Route 8 split, there is currently no designated way for cyclists traveling in the eastbound travel lanes to get to the northern leg of Route 8 (Division Street). An unsignalized crossing would fill in this missing link and create a continuous bike route along the corridor. Secondly, during working group meetings, it was noted that many of the residents along the southern Route 8 split currently cross the street to go to the dry cleaning shop located just east of Weston Drive. Installation of a crossing along with appropriate traffic calming measures would alert motorists to the presence of crossing pedestrians and help slow vehicular speeds. Furthermore, desired crossings of Forest Street at this location may increase with future developments and redevelopments along Forest Street such as the proposed Lincoln Park Center located between Railroad Avenue and the proposed Clarence Street Extension.

Several traffic calming and pedestrian improvement measures would be recommended at this location in order to slow vehicle speeds. The traffic calming measures for vehicles at this crossing should include, at minimum, a curb extension on the south side of the road, a textured, colored crosswalk, and additional signing. Other measures, such as flashing beacons and possibly in-pavement flashing lights should also be considered during preliminary design.

Responsible Agency: DelDOT is responsible for the planning, design and construction of this improvement.

Shared Use Path - This improvement includes constructing a 10 foot wide shared use path from Artis Drive to Mifflin Road. The path would serve both pedestrians and provide a facility for off-road cyclists. While the path would have a greater impact on the residential properties fronting Route 8, the benefit of providing an off road facility to the proposed high school outweighs the difference in impact. In addition, two properties, have already dedicated an easement and planned to construct the path along the frontage of their properties.

Responsible Agency: DelDOT is responsible for the planning, design and construction of this improvement. Portions of this path, though, may be accomplished through the development process which would involve coordination through the City of Dover.

Landscaped Median – This improvement includes the installation of a 16' wide landscaped median along DE Route 8 from just west of Mifflin Road to just east of Saulsbury Road. This median is consistent with the vision in the City of Dover's 2003 Comprehensive Plan of Route 8 as a "Commercial Boulevard." A properly landscaped median would enhance the aesthetics of the roadway, create pedestrian refuge islands at crossing locations, and reduce impervious surface. In addition, it would improve overall safety and traffic operations through better access control by restricting left-turns into and out of driveways along Route 8, which was also discussed as a primary concern along Route 8 in the Dover Comprehensive Plan. Left-turns would be provided at signalized intersections which are spaced no further than 1400 feet apart.

Responsible Agency: DelDOT is responsible for the planning, design and construction of this improvement.

Kenton Road – In the area of Kenton Road a combination of improvements are included in the Preferred Alternative. First, a connector road from Kenton Road to Independence Boulevard is needed to help divert southbound left turns and westbound right turns from the Kenton Road/Route 8 intersection. The connector road would relocate the Kenton Road entrance to the Green Tree shopping center to the north. This change would address existing operational problems at the existing intersection; however it will impact an existing undeveloped commercial lot. Because the diversion of traffic to the connector road is uncertain; it is recommended that the intersection should be widened to accommodate a future 2nd eastbound left turn lane.

Responsible Agency: DelDOT is responsible for the planning, design and construction of improvements along Kenton Road and Route 8. It is assumed that development of the connector road will be a collaborative effort between the City of Dover and DelDOT.

Connector Road behind Gateway West Shopping Center and Additional through lane on Saulsbury Road - These improvements are related to one another as they both are intended primarily to improve operations at the intersection of Route 8 & Saulsbury Road. By allowing northbound left-turning vehicles along Saulsbury and eastbound right-turning vehicles along Route 8 to use a roadway connection behind the Gateway West Shopping Center, they could avoid this congested intersection. Supplemental signing would also be required to properly direct these vehicles to establish desired vehicular patterns. This improvement option would create an additional connection south to Commerce Way, continuing to Hazletville/West North Street, which would help establish a grid system road network.

While this connector road is a critical step toward improving operations at this intersection and should be considered a very high-priority option, it is not quite a fix-all at this intersection, since unsatisfactory LOS would still result with this improvement alone. Therefore, an additional "sub-option" at this intersection, identified as Alternative 1a, would include the installation of an additional through lane in each direction along Saulsbury Road to further improve operations. These through lanes would be tapered

back to existing geometry north and south of the intersection and would not affect geometry at nearby adjacent intersections.

Although the 2030 PM peak hour still indicates borderline LOS E conditions with Alternative 1a, the overall delay at the intersection would be reduced from 173 seconds/vehicle to 63 seconds/vehicle. Without the connector road, the improvements described in Alternative 2, which include double left-turn lanes and a four-lane cross section of Saulsbury Road for nearly a ½ mile segment, would be required in order to achieve similar reductions in delays at the intersection. Alternative 2 brings vehicular delays down to 58.5 seconds/vehicle, less than 5 seconds more than Alternative 1a. Alternative 2 would require much greater impacts and cost, would create a much larger intersection, and would negatively affect pedestrian safety, pedestrian mobility, and aesthetics. All of these effects directly contradict many of the goals outlined in the Dover 2003 Comprehensive Plan. As such, Alternative 1a was chosen as the Preferred Alternative.

Responsible Agency: DelDOT is responsible for the planning, design and construction of improvements along Saulsbury Road and Route 8. It is assumed that development of the connector road will be a collaborative effort between the City of Dover and DelDOT. Ultimately, the connector road will be designed and constructed in accordance with City street standards and will be maintained by the City.

Signalization of Forest Street/Weston Drive & Route 8 - A signal at the intersection of Route 8 & Weston Drive would provide better operations and shorter queues for left-turning vehicles along the Weston/Forest Street approach to the intersection. Another component of this option would be the removal of the signal at Route 8 and Ridgely Street in order to eliminate issues related to closely-spaced signalized intersections, and not add additional undue delay along Route 8. Since both Weston Drive and Ridgely Street lead to the same place (a large parking lot for a nearby industrial facility), removal of one signal in favor of another less than 600' away appears achievable.

Responsible Agency: DelDOT is responsible for the planning, design and construction of this improvement.

7.2 IMPLEMENTATION PLAN

Memorandum of Understanding – Many of the improvements included in the concept plan require coordination and cooperation between land use and transportation agencies as properties are developed or redeveloped within the corridor. Therefore, prior to moving forward with any improvements it is recommended that the City of Dover, Kent County and DelDOT enter into a Memorandum of Understanding to facilitate implementation of the plan. The MOU would do the following:

- Adopt the concept plan as the goal for improvements along the corridor.

- Establish a protocol for requiring r/w dedication, cross access easements, shared access, and local road construction for land development projects within the corridor
- Identify development plans at the initial stage of the review process that will be subject to the goals of the concept plan
- Ensure that entrance permits are not granted and site plans are not approved unless the needs of the project are properly addressed

Phase I – Potential Early Action Contracts

Phase I should include potential early action contracts that have independent benefit and can be designed and constructed as stand alone projects. In addition, early contracts should include improvements that need to be in place prior to mainline construction on Route 8.

- Install signal at Weston Drive/Forest Street/Route 8
 - This improvement will address a current problem along the corridor, specifically the delay for northbound left turns. Along with this improvement, the existing signal at Ridgely Street should be removed and a connection between Ridgely Street and Weston Street developed.
- Mifflin Road intersection improvement
 - This improvement should include the construction of a dedicated eastbound right turn lane on Route 8; a new access to the Brandywine Apartment complex; and the channelization of westbound left turn at Mifflin Road by constructing a concrete island and pedestrian improvements.
- Artis Drive Realignment
 - This improvement will address an existing operational and safety problem at the current intersection. It also can be done in coordination with the development of the Calvary Baptist Church which is proposed for the property on the southeast corner of the intersection.
- Connector road behind Green Tree Shopping Center
 - This improvement will provide additional mobility through and around the Route 8 corridor and will help relieve an existing problem at the Kenton Road intersection. It will be important to have this connection in place before the mainline of Route 8 is constructed. The relocation of the Kenton Road entrance to the shopping center will address a current problem with turning movements and congestion at this intersection. This road will be maintained by the City of Dover and should be designed to City street design standards.
- Connector road from Modern Maturity signal to Saulsbury Road (around Gateway West Shopping Center)
 - An important roadway connection that should be included in an early action contract is the connector roads from Saulsbury Road at the Gateway Boulevard to the signal at Modern Maturity, and the connection south to Commerce Way. These roadways will provide some relief to the existing

congestion at the intersection and will be critical to improve traffic operations once the West Dover Connector is constructed. The proposed northbound approach to the signal at Modern Maturity will consist of an exclusive left-turn lane and a shared left/through/right lane with split phasing at the signal. This road should be constructed as quickly as possible so that traffic can adjust to traffic patterns prior to construction of the West Dover Connector.

- **Interconnections**
 - The preferred alternative calls for interconnections that should be created as redevelopment occurs. The City of Dover and DelDOT should have a mutual understanding of the properties where interconnections are proposed, an understanding of the process that will achieve the ultimate plan.

Phase II – Mainline Route 8

- **SR 8, Artis Drive to Mifflin Road**
 - While the improvements along this section of Route 8 are significantly less than the remaining section, it would be efficient to combine the Route 8 improvements with the development of the new high school.

Phase III – Mainline Route 8

- **SR 8, Mifflin Road to Forest Street**
 - Corridor-wide improvements along this roadway segment would also be included in this construction phase. These would include shoulder widening, construction/reconstruction of the shared-use path, construction of a landscaped median in the middle of the roadway, crosswalk improvements at intersections, striping of bicycle lanes through intersections, and signal optimization/coordination.

Phase IV – North/South Connector Roads

- **Connector roads from Route 8 to Chestnut Grove Road**
 - It is assumed that development along Chestnut Grove Road, where the alignment for the connector road is planned, will not occur until far into the future, due to the fact that the area is outside the growth boundary. However, once development is proposed, a right of way will need to be reserved that creates this local road connection.
- **Connector road from Route 8 to Artis Drive and Hazlettsville Road**
 - The planning and design for this road will be dictated by the proposed development adjacent to the roads. The intersection with Route 8 will be constructed with the proposed high school. The Development in this area is fairly active and will increase the need for this connection.