IV. ENVIRONMENTAL CONSEQUENCES

The environmental consequences of the alternatives under consideration are described in this chapter of the FEIS. The No-Build, Build Alternative I, and Build Alternative II were presented in the DEIS. Since the DEIS, the interchange options of Build Alternative II were modified. Build Alternative II Modified was presented in the Reevaluations and at the public meetings and has been chosen as SHA's Selected Alternative. SHA's Selected Alternative is an access controlled, four-lane, divided highway with a 34-foot median. The options for each interchange under Build Alternative II Modified include Linden Church Road Interchange Option 2, Dayton Shop Interchange Option 1M, Burntwoods Road Interchange Option 3, Rosemary Lane Interchange Option 2A, MD 144 Interchange Option 12M, and I-70 Interchange Option 2. Access to Nixon's Farm Lane and MD 144 will be provided via the MD 144 Interchange and access roads in lieu of the two separate interchanges as proposed in Build Alternative I. Refer to **Section II** for a description of the build alternatives and interchange options.

Potential impacts of the build alternatives, including SHA's Selected Alternative, to existing socio-economic, cultural, natural, and man-made features as presented in **Section III**, are discussed in this section. Detailed impacts were assessed in accordance with applicable laws and regulations for each of the environmental resources evaluated. Where appropriate, avoidance, minimization, and mitigation strategies are described. The extent of the potential project impacts as described in this section, as well as further opportunities to avoid and minimize impacts, will be refined during the design phase.

It should be noted that the impacts in the DEIS were calculated using a ten-foot offset from the preliminary engineered toe of slope to the limit of disturbance to account for drainage ditches and impacts related to construction activities. Since the time of the DEIS, SHA's construction experience has shown that a ten-foot offset does not provide an adequate area to perform the construction activities. Consequently, a 25-foot offset from the preliminary engineered toe of slope to the limit of disturbance has been used for SHA's Selected Alternative to ensure there is adequate distance to construct the roadside drainage ditch; include slope rounding; provide erosion and sediment control measures; install temporary and permanent diversion ditches for clean water as needed; and allow the contractor access to construct the side slopes. The purpose of providing the impacts with ten feet to the limit of disturbance is to allow the reader to compare the impacts of SHA's Selected Alternative to the impacts presented for Alternative I and Alternative II in the DEIS. The impacts calculated using 25 feet to the limit of disturbance are also provided. These totals represent the proposed impacts of SHA's Selected Alternative and are being used to develop appropriate mitigation for the project.

A. Social, Economic, and Land Use Impacts

1. Social Impacts

a. Displacements

Residential property acquisition and relocations would be required by the build alternatives as shown on the mapping presented in **Appendix A**. All properties would be acquired in

accordance with the requirements of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended in 1987. Residential property acquisition includes both unimproved property not owned by SHA that does not require the acquisition of a structure, as well as relocations that would require the acquisition of a structure. Most of the parcels in the study area are large-lot single-family residences.

The No-Build Alternative would not require any residential displacements. All build alternatives would require nine residential displacements. According to the Greater Baltimore Board of Realtors (December 2004) replacement housing for any displaced residents is available in the study area. The average cost of a single-family home in Howard County for 2004 was approximately $405,716.

The No-Build Alternative would not require any right-of-way impacts. DEIS Build Alternative I would require 101.6 acres of right-of-way, while the DEIS Build Alternative II would require 89.1 acres of right-of-way. It should be noted that the right-of-way impacts for the DEIS were calculated using 25 feet to the limit of disturbance, while the environmental impacts were calculated using ten feet to the limit of disturbance. SHA's Selected Alternative with either ten feet or 25 feet to the limit of disturbance would require 125.1 acres of right-of-way. Required right-of-way impacts range from 0.01 to 11.37 acres per property. All of the build alternatives, including SHA's Selected Alternative would require nine residential displacements.

Minimization Interchange Option Impacts

Several minimization interchange options were developed at Rosemary Lane and MD 144 (Refer to **Section II.D.3**.). For the eight Rosemary Lane minimization interchange options, the range of impacts to right-of-way would be 11.7 acres to 14.5 acres. The selected interchange option at Rosemary Lane, Option 2A, would impact 11.7 acres of right-of-way. Refer to **Table II-2** for the comparison of impacts for the Rosemary Lane options.

There were 13 MD 144 minimization interchange options. The range of impacts to right-of-way at this interchange location would be from 36.4 acres to 76.6 acres. The selected interchange option at MD 144, Option 12M would require 59.0 acres of right-of-way. Refer to **Table II-3** for the comparison of the MD 144 options.

b. Environmental Justice/Title VI

The purpose of Environmental Justice is to identify and address "disproportionately high and adverse impacts" on minority populations and low income populations resulting from the proposed action and to provide the opportunity for these populations to be involved in the public participation process.

A Census block group analysis was conducted to identify the potential for minority populations and low-income populations in the study area. In addition, coordination with environmental agencies, elected officials, community organizations/associations, including low-income and minority representatives, and the public has been an important part of the process. Minority families were identified in the study area; however, no minority communities were identified.

Block group 6051.012 (east of MD 32, as shown in **Figure III-1**) had the highest percentage of minority persons in the study area. Right-of-way impacts in this part of the study area are mainly to the west of MD 32. For these reasons, it is anticipated that build alternatives would not have a "disproportionately high or adverse effect" on minorities in the study area.

Numerically, Block Group 6030.3 had the highest percentage of persons under the poverty level. However, no low-income persons were identified as impacted by the build alternatives and low-income persons are not anticipated to sustain a "disproportionately high or adverse effect".

Title VI Statement

It is the policy of the Maryland State Highway Administration to ensure compliance with the provisions of Title VI of the Civil Rights Act of 1964 and related civil rights laws and regulations, which prohibit discrimination on the grounds of race, color, sex, national origin, age or , physical or mental handicap, in all State Highway Administration projects funded in whole or in part by the Federal Highway Administration. The SHA will not discriminate in highway planning, design, or construction, the acquisition of right-of-way, or the provision of relocation advisory assistance. This policy has been incorporated into all levels of the highway planning process to ensure that proper consideration may be given to the social, economic, and environmental effects of all highway projects. Alleged discriminatory actions should be addressed to the Equal Opportunity Section of the SHA for investigation. The Office of Equal Opportunity can be reached at the Maryland State Highway Administration, 707 North Calvert Street, Baltimore, Maryland 21202 or 1-800-584-5026.

The SHA Equal Opportunity Program also addresses Executive Order 13166 Limited English Proficiency -LEP (issued August 11, 2000) to improve or provide meaningful access to federally conducted and federally assisted programs and activities for persons with LEP, as well as ensure that LEP individuals receive appropriate language assistance services.

SHA held four community meetings, one Informational Public Workshop, and one locally sponsored Town Hall meeting throughout the year 2004. No minority populations with limited English proficiencies were identified. In addition, no requests were made to have language assistance services provided at any of these public meetings. Therefore, it was concluded that LEP strategies were not necessary for this project.

c. Neighborhood Impacts

The No-Build Alternative would not address the need for improved safety conditions and traffic operations on MD 32; thus the No-Build Alternative would have an impact on the quality of life in the neighborhoods in the study area. Build Alternatives I and II and SHA's Selected Alternative would have the potential to alleviate traffic congestion and delays currently experienced by residents in the study area. None of the build alternatives, including SHA's Selected Alternative, would displace an entire neighborhood. Of the nine displacements as a result of the project, two are in a neighborhood and would be impacted by any of the build alternatives. The other seven residential displacements are to residences located outside of neighborhoods.

The greatest impact to neighborhoods along MD 32 from the project would be changes in access to MD 32. All of the build alternatives, including SHA's Selected Alternative, would change the access from the neighborhoods to MD 32. Three of the 20 neighborhoods identified in the study area currently have direct access to MD 32. All of the build alternatives, including SHA's Selected Alternative, would remove the direct access to MD 32, and allow access to interchanges via frontage roads. The other 17 neighborhoods identified in the study area would have access to the MD 32 interchanges by local roads and interchange ramps. Refer to the Socio-Economic Technical Report for a description of the impacts by neighborhood.

Noise and visual impacts to the neighborhoods from the construction of SHA's Selected Alternative are expected to be minor as most of the residencies are set back away from the roadway and the design would incorporate the topography of the area. Landscape screening would also be considered in areas where the public has expressed concern about visual impacts. The exact locations, type, and amount of screening would be determined in final design.

d. Parks and Recreation Facilities

No publicly owned parks would be impacted by any of the alternatives considered, including SHA's Selected Alternative. Access to the Howard County Fairgrounds from MD 32 will be provided via the MD 32/MD 144 interchange. The improved interchange will support the volume of the traffic generated during events at the fairgrounds.

e. Effects on Community Services and Facilities

There are no community facilities located in the immediate vicinity of the project. Therefore, none of the alternatives being considered, including SHA's Selected Alternative, will involve the displacement of community facilities. Right-of-way would not be required from any community facility in the study area. MD 32 serves not only central Howard County, but provides a link between Annapolis and the central and western parts of the State. SHA's Selected Alternative will generally enhance accessibility to community services and facilities in these areas. Minimal disruption to vehicular traffic traversing the study area would occur during construction of SHA's Selected Alternative. Some lane closings with alternating one-way traffic controlled with flagging could be expected on local roads during construction.

The Howard County Department of Police expressed concerns regarding travel delays due to traffic volumes on the existing roadway. The No-Build Alternative would not address these concerns. The build alternatives, including SHA's Selected Alternative, would help alleviate traffic congestion and reduce travel times for emergency services in the area.

2. Economic Impacts

a. Regional Business

The No-Build Alternative may have an effect on regional business activity due to increased congestion. MD 32, as part of the Patuxent Freeway, is a critical commuter link and truck route in the region. Roadway improvements under the build alternatives, including SHA's Selected

Alternative, would be an incentive to businesses to relocate or remain within the region if MD 32 were a safer, more efficient transportation system.

b. Local Business

The No-Build Alternative would not require any business displacements. The build alternatives, including SHA's Selected Alternative, would require the displacement of one business, a High's Convenience Store, located on MD 144. Through communication with business and property owners, it was determined that there is an opportunity for relocation adjacent to the existing site of this business, and therefore the business and its employees would not be adversely impacted by this project. This commercial property, as with all properties acquired by SHA for construction of a project, would be compensated at fair market value and in accordance with the requirements of the *Uniform Relocation and Real Property Acquisition Act of 1970*, as amended in 1987. As noted, SHA would attempt to relocate this business to an adjacent site.

The majority of land use in the study area is low density residential and agricultural. The *Howard County General Plan 2000*, supported by the draft update, states that the County's land use objectives include encouraging growth in the existing population centers and discouraging urban types of development in the rural residential areas, such as the area surrounding MD 32 between MD 108 and I-70. The No-Build Alternative would impact local business activity due to congestion on MD 32 to the local roads. The proposed build alternatives, including SHA's Selected Alternative, would not adversely impact the local economy through the loss of any businesses required for right-of-way. The build alternatives would provide improved access to existing businesses, while future business would be limited by current master plans and zoning requirements. Also, the build alternatives, including SHA's Selected Alternative, would provide a safer roadway for commuters to travel to their places of employment as compared to No-Build Alternative.

The DEIS Build Alternative I would have a greater impact to farming operations than the other build alternatives because an additional interchange in the vicinity of Nixon's Farm would segment the farmland west of MD 32 in this area. SHA's Selected Alternative would not have a major effect on farming operations in the study area. The impacts to farmland associated with SHA's Selected Alternative would primarily be linear and immediately adjacent to the roadway, and would not impact large contiguous, actively farmed parcels.

Access to businesses located in the study area would change with DEIS Build Alternative I, DEIS Build Alternative II, and SHA's Selected Alternative. As no businesses are located directly on MD 32, few rely on drive by traffic for their business. Some businesses are located on roadways intersecting MD 32. Access to these roads would be provided via the proposed interchanges or access roads. Improved traffic operations provided by the proposed improvements are expected to enhance accessibility.

c. Tax Base

The No-Build Alternative would have no impact on the local or regional tax base. None of the build alternatives, including SHA's Selected Alternative would alter the intensity or pattern of

land use and planned growth in the area. The tax base implications of the build alternatives are related to the acquisition of private lands for highway use and to the alternatives' impacts on future growth. According to the Howard County Office of Assessment and Taxation, right-of-way acquisitions and displacements associated with DEIS Build Alternative I, DEIS Build Alternative II, or SHA's Selected Alternative would not affect the tax base (Finkelsen, 1998).

3. Land Use

a. Existing

The No-Build Alternative would not impact the existing land use in the study area. The build alternatives, including SHA's Selected Alternative would convert residential, commercial, and agricultural land to transportation use. SHA's Selected Alternative (with either ten feet or 25 feet to the limit of disturbance) would convert 69.8 acres of agricultural land, 37.0 acres of woodlands, 17.1 acres of residential land, and 1.2 acres of commercial and institutional lands. **Table IV-1** shows the right-of-way required by land use classification. **Section IV.O** discusses the potential secondary and cumulative impacts to land use that could result from the MD 32 project.

Table IV-1: Right-of-way Required by Land Use

Land Uses Impacted	No-Build Alternative	DEIS Build Alternative I	DEIS Build Alternative II	Build Alternative II SHA's Selected Alternative	
		10 feet to LOD	10 feet to LOD	10 feet to LOD	25 feet to LOD
Agriculture	0	23.6 acres[1]	21.3 acres[1]	69.8 acres[2]	69.8 acres
Woodlands	0	N/A[3]	N/A[3]	37.0 acres	37.0 acres
Commercial and Institutional	0	4.2 acres	4.2 acres	1.2 acres	1.2 acres
Residential	0	73.8 acres	63.6 acres	17.1 acres	17.1 acres
Total	0	101.6 acres	89.1 acres	125.1 acres	125.1 acres

Source: Maryland Department of Planning, 2002 Land Use

Notes: **1** Acreage totals for the DEIS Build Alternatives represent active farmland from the USDA Form AD-1006. Similar acreage totals for SHA's Selected Alternative would be 28.3 acres.

2 Acreage totals for SHA's Selected Alternative with either 10 or 25 feet to the LOD represent the 2002 agricultural land use.

3 Right-of-way impacts to woodlands were not identified in the DEIS.

b. Future

The build alternatives, including SHA's Selected Alternative, are compatible with the *Howard County General Plan 2000.*

Howard County's population (247,842 in 2000) is projected to grow 0.9 percent per year to 319,500 by 2025 (Maryland Department of Planning, 2000). New residential development, businesses, community facilities, and services will be needed to accommodate this anticipated population growth. Howard County has developed a plan for future growth, in the *Howard County General Plan 2000*, that specifically directs urban development (residential development,

businesses, and services) to the eastern portion of the County. It is the County's intention to preserve the rural nature in the western portion of the County, which includes the MD 32 study area. Western Howard County is zoned either rural residential or rural conservation. This residential development is not dependent upon the proposed improvements of the MD 32 Planning Study. Although the build alternatives would change the access routes to the existing and proposed residential developments, it would not negate or change the zoned land uses. Regulating growth, development, and zoning are under the authority of the Howard County Department of Planning and Zoning.

4. Smart Growth

The MD 32 Planning Study is a growth related transportation project located outside of a certified Priority Funding Area (PFA). In accordance with the Smart Growth Priority Funding Areas Act of 1997, an exception is required for the Maryland Board of Public Works prior to funding is programmed for final design and construction. In July 2004, the Board of Public Works determined that extraordinary circumstances exist and approved an exception to the Smart Growth PFA Act thereby authorizing the Maryland Department of Transportation to provide funding for the MD 32 project.

B. Traffic and Transportation Network

SHA's Selected Alternative would provide a four-lane divided highway with a 34-foot median. Interchanges would be constructed to provide grade-separated movements and a fully access-controlled facility.

The 2025 design year traffic forecasts were prepared using the Baltimore Metropolitan Council Round 6 data. **Figure IV-1** shows the average daily traffic volumes (ADT) and level of service (LOS) for the existing condition, No-Build Alternative, and SHA's Selected Alternative. The traffic flow is measured by determining an LOS for the roadway. LOS designations, from A through F, represent conditions that drivers experience along the roadway and are used to define the traffic operations within that section of the roadway. LOS A indicates ideal conditions and LOS F indicates severe congestion with substantial delays (see **Section I.C.3.c** for a description of each level of service).

1. Impacts of the No-Build Alternative

The No-Build Alternative, as described in **Section II.A.1**, would not provide major improvements to the existing MD 32 roadway. Specific improvements recently implemented are described along with the No-Build Alternative. These routine maintenance and operational improvements would not measurably affect roadway capacity. Other spot improvements could occur as conditions warrant. Although the No-Build Alternative would not meet the project need, it has been used as a basis of comparison for the analysis of the build alternatives.

Existing (2003) and design year 2025 ADT and levels of service for the No-Build Alternative are presented on **Figure IV-1** and **Table IV-2**. In summary, the mainline MD 32 traffic would operate at LOS F during the peak periods in the 2025 No-Build. Average daily traffic would

range from 31,600 to 35,900 under this scenario. All of the intersections south of MD 144 would also operate at LOS F except for the half of Linden Church Road located on the off-peak side of MD 32. The MD 144 intersection would operate at LOS E to F and the I-70 ramp intersections would operate at LOS's ranging from C to F, depending on the peak period.

2. Impacts of SHA's Selected Alternative

SHA's Selected Alternative would provide a four-lane divided highway with a 34-foot median and would include interchanges at Linden Church Road, Dayton Shop, Rosemary Lane, Burntwoods Road, MD 144, and I-70. Typical sections are shown on **Figures II-2, II-3, and II-4** and the mapping is presented in **Appendix A**.

The 2025 ADTs and LOS for the four-lane freeway section and the interchanges are shown on **Figure IV-1A** and **1B**. The MD 32 mainline would operate at LOS D throughout the study area in the peak directions (southbound in the AM and northbound in the PM). The mainline would operate at LOS A/B in the AM/PM peak hour and during the remainder of the day.

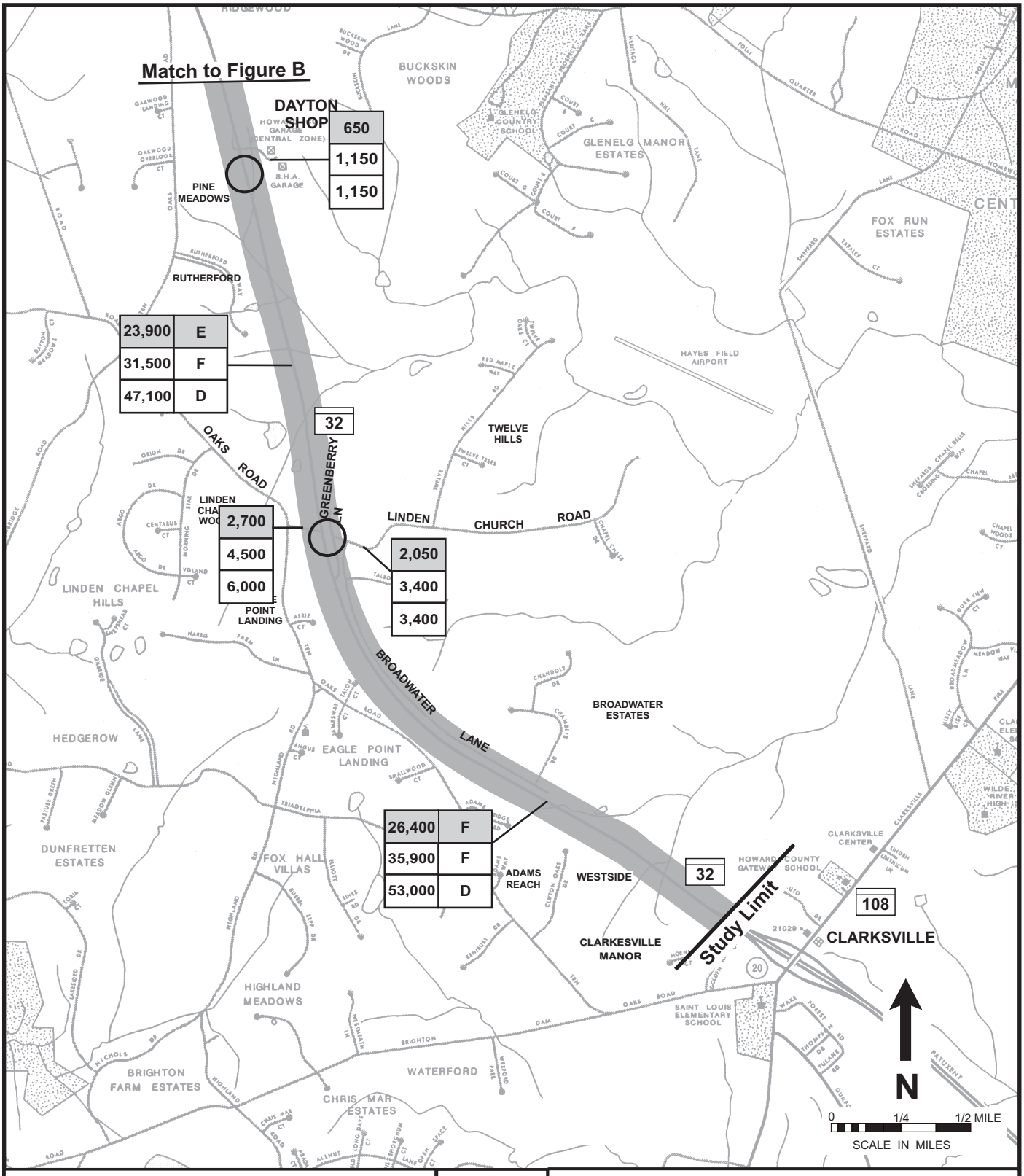
Table IV-2: Levels of Service for 2003, 2025 No-Build, and 2025 Build Intersections/ Interchanges

Intersection	2003 (AM/PM Intersections)	2025 No-Build (AM/PM Intersections)	2025 Build (AM/PM Intersections/ Interchanges)
Linden Church Road East	A/D	A/F	D/C
Linden Church Road West	F/A	F/A	not applicable [1]
Dayton Shop	not applicable	not applicable	B/C
Ten Oaks Road	E/E	F/F	not applicable [2]
Burntwoods Road	F/D	F/F	C/C
Pfefferkorn Road	E/D	F/F	not applicable [2]
Rosemary Lane	D/E	F/F	C/C
MD 144	E/E	F/F	D/C
I-70 Eastbound Ramps	C/B	F/D	C/A
I-70 Westbound Ramps	B/C	E/C	A/D

Notes: [1] Under SHA's Selected Alternative, Linden Church Road intersections would be combined to form one interchange.

[2] Under SHA's Selected Alternative, Ten Oaks Road and Pfefferkorn Road would be combined into the Burntwoods Road Interchange.

The LOS for the ramp interchange movements are shown in **Table IV-2**. All of the interchange ramps would operate at LOS C or better except for the Linden Church southbound entrance ramp and MD 144 southbound entrance and exit ramps, in the AM peak period, which would operate at LOS D. SHA's Selected Alternative includes two weaving sections, northbound and southbound between MD 144 and I-70. The LOS for these weaving areas is shown in **Table IV-3**.



LEGEND

	MD 32 ADT	MD 32 LOS	Side Roads ADT
2003	3,000	A	1,500
2025 No-Build	5,000	A	2,000
2025 Build	6,000	A	2,500

KEY MAP

B
A

MD 32 PLANNING STUDY
MD 108 TO I-70

2003, 2025 No-Build, and 2025 Build ADT and LOS

Maryland State Highway Administration

September 2005

Figure **IV-1A**

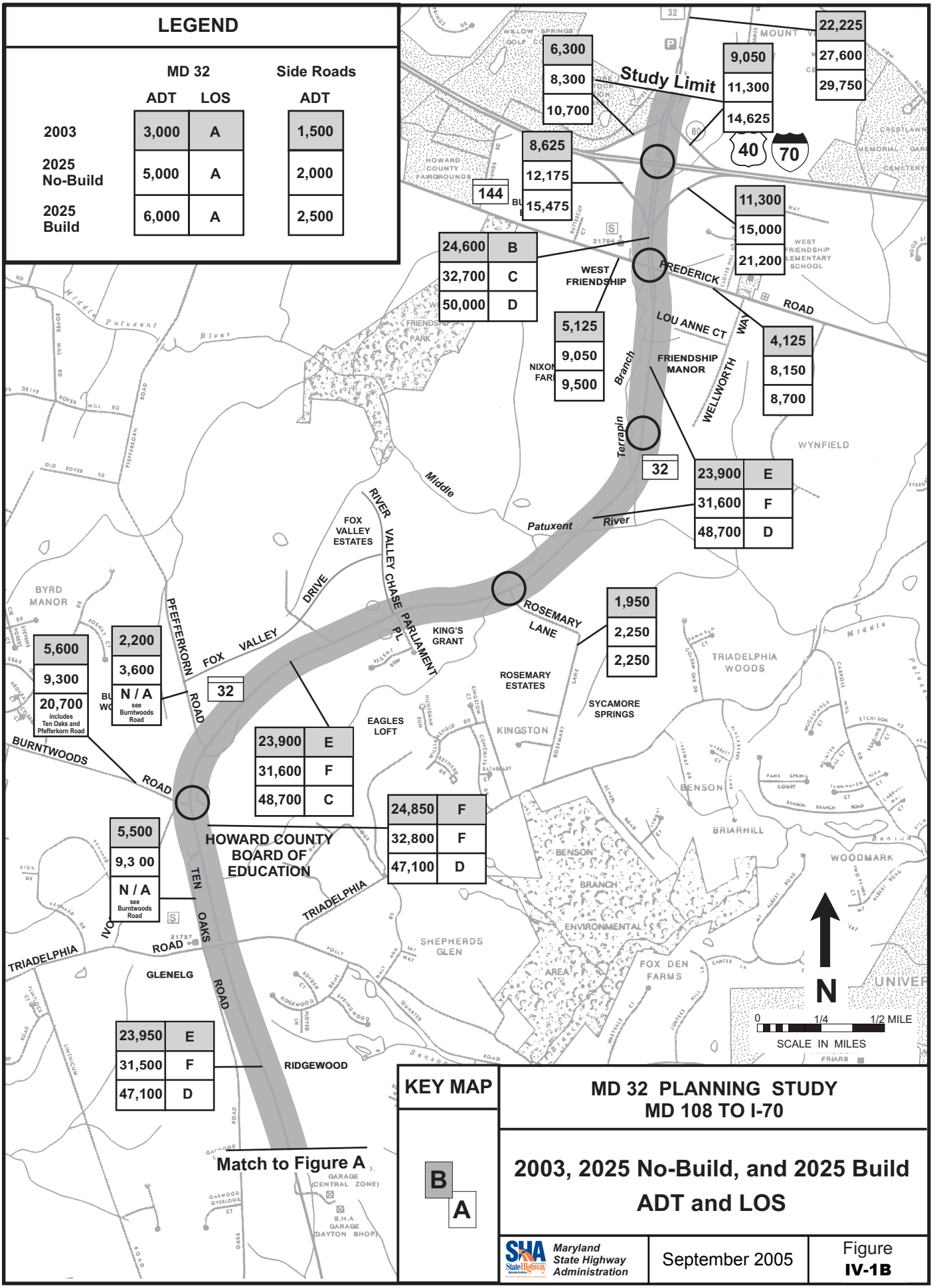

LEGEND
MD 32
Side Roads
ADT
LOS
ADT
2003
3,000
A
1,500
2025 No-Build
5,000
A
2,000
2025 Build
6,000
A
2,500
Study Limit
6,300
8,300
10,700
9,050
11,300
14,625
22,225
27,600
29,750
8,625
12,175
15,475
11,300
15,000
21,200
24,600
B
32,700
C
50,000
D
5,125
9,050
9,500
4,125
8,150
8,700
23,900
E
31,600
F
48,700
D
1,950
2,250
2,250
5,600
9,300
20,700
includes Ten Oaks and Pfefferkorn Road
2,200
3,600
N / A
see Burntwoods Road
23,900
E
31,600
F
48,700
C
24,850
F
32,800
F
47,100
D
5,500
9,3 00
N / A
see Burntwoods Road
23,950
E
31,500
F
47,100
D
HOWARD COUNTY BOARD OF EDUCATION
Match to Figure A
KEY MAP
B
A
MD 32 PLANNING STUDY
MD 108 TO I-70
2003, 2025 No-Build, and 2025 Build
ADT and LOS
Maryland State Highway Administration
September 2005
Figure
IV-1B
N
0
1/4
1/2 MILE
SCALE IN MILES
FREDERICK ROAD
WEST FRIENDSHIP
LOU ANNE CT
WAY
FRIENDSHIP MANOR
WELLWORTH
Terrapin Branch
WYNFIELD
Middle Patuxent River
RIVER VALLEY CHASE PARLIAMENT PL
FOX VALLEY ESTATES
DRIVE
PFEFFERKORN ROAD
FOX VALLEY
ROSEMARY LANE
ROSEMARY ESTATES
SYCAMORE SPRINGS
KING'S GRANT
EAGLES LOFT
KINGSTON
TRIADELPHIA WOODS
BENSON
BRIARHILL
WOODMARK
BENSON BRANCH
ENVIRONMENTAL AREA
FOX DEN FARMS
SHEPHERDS GLEN
BURNTWOODS ROAD
TEN OAKS ROAD
TRIADELPHIA ROAD
GLENELG
RIDGEWOOD
BYRD MANOR
HOWARD COUNTY FAIRGROUNDS
WEST FRIENDSHIP ELEMENTARY SCHOOL
CRESTLAWN MEMORIAL GARDENS CEMETERY
MOUNT
144
32
40
70

Table IV-3: LOS for Weaving Areas

Weaving Section	Level of Service (LOS)	
	AM Peak	PM Peak
MD 32 NB Between I-70 and MD 144	B	C
MD 32 SB Between I-70 and MD 144	D	B

3. Safety

The accident history in the study area is discussed in **Section I.C.3.d**. As shown on **Table I-2**, the portion of MD 32 in the study area experienced a total of 247 accidents (95.3 accidents per million vehicle miles traveled) between January 2001 and December 2003. During this three-year period there were two fatal accidents.

Three types of accidents were significantly higher than the statewide average: rear-end, truck-related, and "other" collisions. The high percentage of "other" accidents appears to be attributed to U-turn and animal-related accidents. Rear-end collisions and truck-related accidents are roughly double in the study area compared to the statewide average. The high number of rear-end accidents can be attributed to congestion at the signalized intersections, as well as unexpected left turning vehicles in the northern portion of the study area where there are no access controls and many driveways have access directly onto MD 32. In addition, they could be attributed to the stop-and-go conditions that are associated with the high traffic volumes and LOS E and F on the MD 32 mainline during the peak period.

The No-Build Alternative would not alleviate these safety concerns; in fact, the accident rate would likely increase because the traffic volumes would increase and the roadway access and geometrics would not be modified. It is the existing traffic volumes, roadway access, and geometrics that lead to the high number of rear-end accidents.

SHA's Selected Alternative would improve traffic operation and reduce the potential for accidents. The dualization of MD 32 would improve the LOS to C and D on the mainline, thus reducing the stop and go conditions during the peak periods. As stated in **Section I**, the average statewide accident rate for a four-lane roadway with full control of access facility is 38.7 accidents for every 100 million vehicle miles traveled. This is an anticipated reduction in accident rate of 56.6 accidents for every 100 million vehicles miles traveled on a two-lane roadway. Based on these historical accident rates, the No-Build condition could result in approximately 113 accidents per year by 2025. This compares to the Build condition projected to result in only 68 accidents per year by 2025.

The four-lane facility would allow the slower moving truck traffic to travel in the right lane so faster moving traffic could safely pass on the left. The four-lane section would help to reduce rear-end accidents, which are frequently caused by vehicles slowing down due to heavy congestion or slowing/stopping to make a turn into a driveway or cross road. The use of interchanges instead of intersections would provide a grade-separated, access-controlled facility that would eliminate access via intersections, thus reducing angle collisions which occur at

intersections. The interchange ramps and acceleration/deceleration lanes would allow the vehicles accessing MD 32 to nearly reach the speed of the vehicles on the mainline thereby simplifying the merge between vehicles on MD 32 and vehicles entering MD 32.

C. Cultural Resources

1. Historic Sites

The requirements of the National Historic Preservation Act (NHPA), as described in 36 CFR 800, establish the procedures for compliance with Section 106 of the NHPA. Once an agency has identified historic properties, it must determine whether the proposed activity will impact the resources in any way. The agency consults with the State Historic Preservation Officer (SHPO) to determine this and takes into account the views of any interested parties.

The agency applies the criteria of effect to determine if an undertaking would affect characteristics qualifying the property for inclusion in the National Register of Historic Places (NRHP), and submits its findings to the SHPO for concurrence.

An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association [36 CFR 800.5(a)(1)].

a. HO-207, Westwood Methodist Episcopal Church

In the area near the Westwood Methodist Episcopal (M.E.) Church, SHA's Selected Alternative proposes the dualization of MD 32 with new lanes being added to the west side of the existing two-lane road. The Westwood M.E. Church is considered eligible for the NRHP under Criterion C for its Gothic Revivalist stylistic features. The Church's NRHP boundary is coterminous with the current legal boundary for the property. SHA's Selected Alternative would not require right-of-way from the Westwood M.E. Church. MD 32 is depressed below grade in this location. The building is not visible from MD 32 and MD 32 is not visible from the building due to the steep grade between Triadelphia Road and MD 32, and the heavy stand of trees buffering the building and the intersection. SHA's Selected Alternative would not change the grade separation of MD 32 and Triadelphia Road or the stand of trees.

SHA found that SHA's Selected Alternative would have no effect on the Westwood M.E. Church; the SHPO concurred with this finding on May 12, 2005.

b. HO6-45, Milton Shipley Farm Corncrib

SHA's Selected Alternative will not impact the Milton Shipley Farm Corncrib (HO-645). SHA's Selected Alternative proposes dualization of MD 32 to the east of the corncrib site. To the west of the corncrib, construction of a two-lane access road is proposed to allow residents on the west side of MD 32 to gain access to MD 32 via MD 144. The Milton Shipley Farm Corncrib is considered eligible for the NRHP under Criterion C. It displays a unique design as a metal, oval-

shaped corn crib. The NRHP boundary of the corncrib lies just outside the footprint of the building. Currently, the corncrib is visually buffered by trees and physically separated from MD 32 by Terrapin Branch. Although SHA's Selected Alternative calls for MD 32 to be widened to the west of the existing alignment, thereby bringing it closer to the Milton Shipley Farm Corncrib, these visual and physical buffers between the road and the resource would remain the same. The Fox Chase Estates residential neighborhood was constructed west of the corncrib with homes built as recently as 2003. This new residential development would be connected to MD 32 via the proposed access road to MD 144. As the viewshed of the corncrib has already been compromised by the new construction, the introduction of the proposed two-lane access road is not likely to further diminish the integrity of the corncrib's setting. Therefore, SHA's Selected Alternative would have no effect on the Milton Shipley Farm Corncrib (HO-645). The SHPO concurred with this finding on May 12, 2005.

Even though impacts to the Milton Shipley Farm Corncrib are not anticipated, SHA is aware of its location at the terminus of the proposed access road and its proximity to the construction of MD 32. SHA would set forth in the project specifications that protective fencing be placed around the exterior of the building and that no equipment be staged on the legal parcel of the Milton Shipley Farm Corncrib.

2. Archeological Resources

Identification of archeological resources was completed in accordance with the requirements of 36 CFR 800.4 for each alternative considered for this project, including SHA's Selected Alternative. Archeological sites 18HO232 and 18HO261 are considered potentially eligible for listing in the NRHP. The Phase I archeological investigations indicated that these sites may be important chiefly because of what can be learned through data recovery.

- Site 18HO232 is a prehistoric site with diagnostic artifacts indicative of a Late Archaic period occupation. Artifact densities on the site are moderate to high and the site is well preserved. Site 18HO232 would not be impacted by SHA's Selected Alternative or any of the build alternatives. Because of the site's close proximity, fencing to protect this site would be erected during construction.

- Site 18HO261 is an early nineteenth to early twentieth century sawmill site. The site includes the remains of the stone foundation of the mill, the wheel pit, a low retaining wall bordering the wheel race, and the mill raceway. The site appears to retain some depositional integrity in addition to the intact features. Site 18HO261 would be impacted by construction of an access road for local traffic. Although this access road would impact only a 30-foot sliver of the site, it would be located very close to the mill foundation and other features that define the core of the site. The SHPO has concurred that future archeological work will be required to conclusively define National Register eligibility if site 18HO261 is affected. SHA assumes eligibility of Site 18HO261 and accepts that SHA's Selected Alternative would adversely affect the property. A Memorandum of Agreement (MOA) between FHWA, SHA, and MD SHPO formalizes the commitment to complete identification, evaluation, and treatment as appropriate. (Refer to **Appendix C** for the MOA.)

3. Conclusion

FHWA and SHPO have been consulted regarding the potential for SHA's Selected Alternative for the MD 32 project to affect cultural resources as required by the regulations promulgated by the Advisory Council on Historic Preservation (ACHP) [36 CFR 800.5(d)]. The two National Register eligible historic properties identified in the area of potential effect (APE) Westwood Methodist Episcopal Church (HO-207) and Milton Shipley Farm Corncrib (HO6–45) would not incur direct construction impacts.

Archeological site 18HO261 is assumed eligible for the National Register and will be adversely affected by SHA's Selected Alternative. An MOA between FHWA, SHA, and SHPO formalizes the commitment to complete evaluation and treatment of this site as appropriate (**Appendix C**). The following considerations apply to this project: 1) SHA would set forth in the project specifications that protective fencing shall be placed around the exterior of the Milton Shipley Corncrib (HO6-45) and no equipment shall be staged on the legal parcel of the building; 2) Protective fencing would be placed around archeological site 18HO232 during construction; and 3) Archeological site 18HO261 will be evaluated to determine its eligibility for inclusion in the NRHP. If eligible, a data recovery plan for archeological site 18HO261 will be developed in consultation with the SHPO and will be included in any documentation developed for the project. The MOA also stipulates that, should activities be added to the project for which cultural resources studies have not been completed (e.g. wetland and stream mitigation, reforestation areas), SHA shall ensure that such studies are implemented, adhering to all relevant professional standards and guidelines.

SHA's Selected Alternative will not require the use of property from any known Section 4(f) resources, including publicly owned parks, recreation areas, wildlife and waterfowl refugees, or significant historic sites. Although one potentially significant archeological site (Site 18HO261) will be adversely affected by SHA's Selected Alternative, preliminary evaluations and coordination with the SHPO indicates that the site does not warrant preservation in place and is chiefly important for the information would be derived through excavation of the site, as outlined in the MOA (Refer to **Appendix C**). As Section 4(f) applies only to archeological sites that warrant preservation in place, a Section 4(f) evaluation is not required.

D. Physiography, Topography, and Soils

1. Physiography and Topography

The No-Build Alternative would have no affect on the physiography or topography in the study area. DEIS Build Alternative I would result in a greater amount of grade alterations than DEIS Build Alternative II and SHA's Selected Alternative due to the addition of an interchange with overpass and access roads at the Nixon's Farm Lane location.

The build alternatives, including SHA's Selected Alternative, would not substantially change the existing topographic conditions along the MD 32 corridor. For the most part, the grades of the build alternatives would follow the existing grades of MD 32 and the surrounding land except at

the proposed new interchanges and overpasses. Here, the difference in elevation between the MD 32 mainline surface and the surface of the overpasses would range from 22 to 25 feet. Exit and entrance ramps, as well as proposed access roads for new interchanges, would result in an increase in grade at these locations. Some lowering of the existing grade would occur at selected locations, but the overall impact of cutting and filling from any build alternative would be minimal on topographic and geologic features.

2. Soils

The No-Build Alternative would have no effect on soils in the area. Implementation of the DEIS Build Alternative I, DEIS Build Alternative II, or SHA's Selected Alternative would result in some soil erosion and sedimentation during construction. The removal of vegetation would expose soils and increase the probability of runoff. Removal of vegetation would reduce the ability to intercept sediment-loaded runoff.

The potential for soil erosion and sedimentation would become greater as soils are disturbed during construction. The highest potential for sedimentation to receiving waters would occur where these soils are in close proximity to surface waters. Therefore, it is important that soil erosion and sedimentation be minimized as much as possible. Measures to minimize these effects include structural, vegetative, and operational methods. These methods will be developed as part of a Soil Erosion and Sediment Control Plan for the project, which will be prepared in accordance with the *Maryland Standards and Specifications for Soil Erosion and Sediment Control*. An approved Sediment and Erosion Control and Stormwater Management Plan will be submitted to the Maryland Department of the Environment (MDE) for their review and approval. Long-term impacts to the soils in the study area would be negligible. Introduction and establishment of grasses and herbaceous vegetation would stabilize the soils as soon as possible after construction is completed.

Specific control measures will be identified as the design process continues, but may include the following:

- Staging of construction activities to permanently stabilize ditches at the tops of cuts and at the bottom of fill slopes prior to excavation and formation of embankments;
- Construction timeframe to follow seasonal restrictions to minimize adverse effect on fisheries;
- Seeding, sodding, or otherwise stabilizing slopes as soon as practicable to minimize the area exposed at any time;
- Appropriate placement and maintenance of sediment traps, temporary slope drains, and other control measures; and
- Placement of diversion dikes, energy dissipators, mulches, and netting on slopes too steep to support vegetation without these aides.

3. Farmland Soils

In accordance with the *Farmland Protection Policy Act of 1981* (FPPA), a Farmland Conversion Impact Rating Form AD-1006 was completed for this project and submitted for evaluation by the Howard County Natural Resources Conservation Service (NRCS) office to assess FPPA compliance.

The United States Department of Agriculture (USDA) Form AD-1006 provides an evaluation of farmland within the study area and determines if the farmland is suitable for protection from conversion to non-agricultural uses. Each build alternative is rated based on 12 site assessment criteria on the AD-1006 form. The completed Form AD-1006 and the rationale for site assessment criteria can be found in **Appendix B**. Site B, or SHA's Selected Alternative received a score of 145. All of the build alternatives received a score less than 160. According to the FHWA guidelines, "the SCS advises that Form AD 1006 need not be submitted to the SCS [Soil Conservation Service] in cases where the site assessment criteria (Part VI) score is less than 60 points for each project alternative. The rationale is based on its regulation (7 CFR 658.4(c)(2)) which provides that, 'Sites receiving a total score of less than 160 points be given minimal level of consideration for protection and no additional sites evaluated.' Therefore, where the site assessment (Part VI) is less than 60 points, the total score (parts V and VI) would always be less than 160 points."(*Supplemental Guidance for Implementation of Farmland Protection Policy Act* January 23, 1985.)

The No-Build Alternative would not impact farmland soils. Prime Farmland Soils or Soils of Statewide Importance would be impacted by all of the build alternatives. **Table IV-4** shows the farmland soil impacts and impacts to active farmland by alternative. These impacts would primarily be linear and immediately adjacent to the roadway, and would not impact large contiguous, actively farmed parcels. SHA's Selected Alternative would not adversely affect farming operations on any parcels.

Table IV-4: Summary of Farmland Soil Impacts

Soils	No-Build Alternative	DEIS Build Alternative I[1]	DEIS Build Alternative II[1]	Build Alternative II Modified SHA's Selected Alternative[2]	
		10 feet to LOD	10 feet to LOD	10 feet to LOD	25 feet to LOD
Prime Farmland Soil	0	155.0 acres	152.9 acres	63.3 acres	63.3 acres
Soils of Statewide Importance	0	52.9 acres	49.0 acres	56.5 acres	56.5 acres
Active Farm Parcels	0	15 parcels	15 parcels	19 parcels	19 parcels
Active Farmland	0	23.5 acres	21.5 acres	28.3 acres	28.3 acres

Notes:
1 The DEIS Build Alternatives farmland impacts included soils within existing MD 32 SHA owned right-of-way.
2 SHA's Selected Alternative farmland soil impacts do not include SHA owned right-of-way and were calculated using the 10-foot or 25-foot limit of disturbance.

E. Water Resources and Aquatic Habitat

1. Surface Water

The No-Build Alternative would cause no effects to surface water resources. The build alternatives, including SHA's Selected Alternative would cause direct surface water impacts from bridging, culverting, and relocation of streams. All streams within the study area are tributaries to the Middle Patuxent River watershed, including the mainstem and the Benson Branch, Clydes Branch, and Terrapin Branch tributary systems.

During construction of the build alternatives, including SHA's Selected Alternative, streams would temporarily be subject to increased soil erosion and sedimentation as a result of earth disturbance. A Soil Erosion and Sedimentation Control Plan, approved by the MDE, would be implemented to reduce possible effects. Effects may also include the loss of stream bottom, loss of stream length, and changes in water velocity.

Stream crossings have the potential to cause a constriction of flow at each location. This constriction may cause an increase in velocity, potentially causing stream erosion, leading to scour holes and bank instability. Bridging of streams would result in minimal stream resource impacts (bridging impacts are predominantly temporary in nature). Permanent bridging impacts would result if footings are placed in waters. Culverting of streams would cause the loss of stream bottom habitat and reduced water quality effects associated with loss of daylight. Changes in velocity would occur with the straightening of channels, resulting in potential acceleration of erosion and sedimentation. Relocation of streams would produce temporary degradation of stream habitats and water quality. However, when successfully completed, stream relocations can avoid permanent habitat and water quality impacts that would otherwise occur. The introduction of additional impervious roadway surface to the study area may increase pollutant run-off loads, thereby adversely affecting water quality. However, the magnitude of such impacts would likely be reduced by state-of-the-art designs of culverts, bridges, and restoration efforts.

Removal of trees and shrubs along stream banks has the potential to increase water temperature of the nearby streams during periods of low flow. Increases in water temperature can result in a degradation of the macro-invertebrate and fish populations. In addition, stream riffle areas are important habitat for fish species such as darters, sculpins, and trout. Loss of stream riffles would impact macro-invertebrate and fish habitat.

Increases in sediment discharges from erosion areas and solids from highway runoff can affect downstream biologically sensitive areas, resulting in a change in macro-invertebrate composition. The degree of water quality impacts from roads is related to the amount of impervious surface (and consequently the oils, grease, and road salt washing from the roadway). Impervious surfaces may also raise runoff water temperature that can degrade stream biota.

The No-Build Alternative would have no affect on existing erosion and pollution discharge. DEIS Build Alternative I, DEIS Build Alternative II, and SHA's Selected Alternative would increase impervious surfaces in the area, causing increased runoff. (As discussed in Chapter II, SHA's Selected Alternative would result in approximately 81.3 acres of new impervious surface

requiring treatment in the Middle Patuxent watershed.) However, stormwater management facilities or special construction materials that promote infiltration would be used, which are effective in controlling runoff temperature and providing a high level of pollutant removal.

2. Groundwater

The No-Build Alternative would have no impact on groundwater resources. Potential groundwater impacts from the build alternatives, including SHA's Selected Alternative, could include adverse effects upon groundwater recharge, availability (well yield), and water quality due to an increase in impervious surfaces. Reductions in groundwater recharge can be minimized by stormwater management facilities utilizing infiltration. A detailed stormwater management report was prepared for SHA's Selected Alternative. However, it is unlikely, based on the activities proposed for this project, that any of the build alternatives, including SHA's Selected Alternative would pose any substantial threat to groundwater resources.

The well yield, defined as the maximum pumping rate a well can sustain, can be affected by road grading. A road cut that extends below the elevation of the water table could potentially cause the diversion of groundwater flow to surface run-off, and away from water supply wells. A comparison of the proposed road inverts to the current topography suggests that there are several places where road cuts in excess of five feet would be made. This would not affect most wells; however, based on records and visual inspection of the site, some of the homes with private wells within 2,000 feet of the road could potentially be affected. If there are uncertainties about the effects of construction on a well, geotechnical and hydrogeologic studies would be performed to quantify those effects before the construction phase of the project, and remedial measures would be implemented.

Groundwater quality can be impaired by contaminants in run-off from roadways. The potential impacts to groundwater resources would be similar for DEIS Build Alternatives I and II and SHA's Selected Alternative. Pollutants can be channeled to groundwater by the same mechanisms that result in recharge. Suitable types of stormwater management (SWM) facility practices would be selected at each study point to detain and minimize surface runoff and maximize associated pollutants removal effectiveness. Special filters or underground best management practices (BMPs) would be considered for use during the design phase of this project. Where possible, SWM facility depth would be designed to exceed the minimum groundwater table clearance requirements. Lining for SWM facilities would also be considered as required. "Pretreatment" practices such as Vegetative Buffers, and Sediment Forebays would be provided as needed.

3. Aquatic Habitat

The No-Build Alternative would have no direct effect on fish populations. All of the build alternatives, including SHA's Selected Alternative, would have direct impacts upon fish populations. During construction, large areas of exposed soil could be eroded by wind and rain when the vegetation and other naturally occurring soil stabilizers are removed. Erosion of exposed soils could significantly increase the sediment load to receiving waters (Barret, 1995). Increased sediment loads could destroy or damage fish spawning areas and macroinvertebrate

habitat. Sediment releases could clog the respiratory organs of fish, macroinvertebrates, and other members of their food web (Barret, 1999). While the initial response to increased sedimentation due to construction can be a reduction in numbers and species of fish and macroinvertebrates, they generally repopulate within 12 months of construction.

Culvert bottoms or inverts, which are installed below the base invert of the stream channel, allow for replacement of a natural stream bottom within the culvert, minimizing long-term impacts to aquatic habitat. During construction, however, the stream channel is excavated and any organism living within the stream channel would be displaced by construction equipment. While the primary impact from this would be to benthic organisms, such as macroinvertebrates, fish mortality is also possible as they could become trapped in pools during dewatering of the channel. Although a natural stream bottom would be reestablished within the culvert, the habitat within the culvert is unlikely to support the same fish or macroinvertebrate community present before construction. Culverts are relatively straight and typically do not allow for the development of the varied habitat of an unrestrained channel. In the majority of the impacted streams, the area of channel disturbance is relatively small in comparison to the remaining habitat available, making the overall habitat and mortality impact a small one. The smaller the stream, however, the greater the relative impact to aquatic biota.

The greatest potential negative effect on aquatic biota is related to the change in land-cover associated with the build alternatives. All of the build alternatives, including SHA's Selected Alternative, would require clearing of wooded land in stream valleys that currently provide vital shading of streams; important food and habitat sources for organic detritus and coarse woody debris; and anchoring of stream banks and floodplains. The most substantial and long-term change, however, from the build alternatives would be an increase in impervious surfaces in the study area. The conversion of open-space and wooded areas to impervious surfaces has the potential to have a wide range of impacts on study area streams and their inhabitants. Scientific literature generally shows that aquatic insect and freshwater fish diversity declines within a watershed at ten to 15 percent impervious cover, with sensitive elements of the communities being affected at even lower impervious levels.

While most impacts on aquatic biota from imperviousness are apparent in the macroinvertebrate community, sensitive fish such as brown trout, sculpin, and other species that require clean and stable stream substrates typically do not survive beyond the 10 percent imperviousness threshold. The most sensitive fish species, such as Maryland's native brook trout, do not survive at thresholds of two percent (Boward et al., 1999). Historical ranges of brook trout include Maryland's Piedmont streams; however, MBSS sampling and MD 32 stream studies have not revealed the presence of any brook trout in the MD 32 study area or the Patuxent River drainage.

Perennial streams would be temporarily affected by siltation from runoff, especially near areas proposed for stream crossings and channel relocations. Time of year restrictions and other limitations would be implemented, in order to minimize impacts to aquatic habitat during construction. The increased amount of impervious road surface and resulting traffic would likely produce more runoff of pollutants typically associated with this type of highway project, including gasoline, oil, de-icing chemicals and other compounds. These would run off into drainage ditches, roadside slopes and overpasses, and ultimately into the stormwater

management facilities along the project corridor. Some temporary degradation to local water quality and consequently aquatic organisms may occur during rain events; however, it will be minimized with stormwater management facilities. Installation of vegetated median strips and infiltration basins, for example, would reduce the impacts from runoff by absorbing and filtering pollutants. Refer to the Stormwater Management discussion in **Section II.E.2** for more information.

F. Waters of the US, including Wetlands

1. Impacts

Impacts to Waters of the US, including wetlands, can be described as either direct or indirect, and these impacts can be either permanent or temporary in nature. Direct impacts are those associated with grading, filling, culverting, or the removal and manipulation of vegetation. Examples of indirect impacts include alterations to hydrology, isolation of biological communities, and water quality impacts associated with transportation facilities. Indirect impacts are more difficult to assess and must be analyzed for each resource individually. Temporary impacts occur from activities such as construction staging and access and do not require mitigation. Refer to the Natural Environmental Technical Report (NETR) for more detailed information.

a. Wetlands

The No-Build Alternative would have no impact on wetlands. DEIS Build Alternative I and DEIS Build Alternative II assumed a limit of disturbance extending ten feet to the limit of disturbance and would have 3.5 acres and 2.2 acres of impact, respectively. The total wetland impacts for SHA's Selected Alternative with 10 feet to the limit of disturbance would be 3.4 acres. SHA's Selected Alternative with a limit of disturbance extending 25 feet beyond the toe of slope to accommodate construction access, would impact 4.0 acres (173,349 square feet) of wetlands. **Table IV-5** provides acreage of impacts for each wetland type occurring in the study area including palustrine forested (PFO), scrub shrub (PSS), and emergent (PEM).

Table IV-5: Potential Wetland Impacts

Wetland Type	No-Build Alternative	DEIS Build Alternative I (10 feet to LOD)	DEIS Build Alternative II (10 feet to LOD)	Build Alternative II Modified SHA's Selected Alternative	
				(10 feet to LOD)	(25 feet to LOD)
PFO	0	1.0 acres	1.0 acres	1.1 acres	1.72 acres (70,205 square feet)
PSS	0	0.2 acre	0.2 acre	0.1 acre	0.20 acre (8,641 square feet)
PEM	0	2.3 acres	1.0 acre	1.3 acres	2.08 acres (90,503 square feet)
Total	0	3.5 acres	2.2 acres	3.4 acres	4.0 acres (173,349 square feet)

b. Streams

The most concentrated area of stream encroachments and crossings is in the northern portion of the study area within the Middle Patuxent River, Terrapin Branch tributary system. The No-Build Alternative would have no impact on streams in the study area. DEIS Build Alternative I and DEIS Build Alternative II would impact 8,940 linear feet and 8,360 linear feet of perennial/intermittent streams, respectively. Both DEIS Build Alternative I and II would have 20 crossings and seven encroachments. The perennial/intermittent stream impacts for SHA's Selected Alternative with ten feet to the limit of disturbance would be 6,742 linear feet. SHA's Selected Alternative with 25 feet to the limit of disturbance would result in 7,200 linear feet (41,150 square feet) of permanent perennial/intermittent stream impacts that would require mitigation, and 6,114 linear feet (16,912 square feet) of impacts that would not require mitigation. SHA's Selected Alternative with either ten or 25 feet to the limit of disturbance would have 39 stream crossings. **Table IV-6** summarizes the stream information.

Table IV-6: Potential Stream Impacts

	No-Build Alternative	DEIS Build Alternative I	DEIS Build Alternative II	Build Alternative II Modified SHA's Selected Alternative	
		10 feet to LOD	10 feet to LOD	10 feet to LOD	25 feet to LOD
Perennial/ Intermittent Stream Impacts	0 linear feet	8,940 linear feet	8,360 linear feet	6,742 linear feet	7,200 linear feet[1] (41,150 square feet)
Stream Crossings	Existing	20	20	39	39

Notes: 1 The total stream impacts for SHA's Selected Alternative with 25 feet to the LOD would be 13,314 linear feet, 7,200 linear feet (41,150 square feet) requires mitigation.

2. Avoidance and Minimization

Substantial avoidance and minimization measures have been included within the design of the Selected Alternative. Specific measures included adjustments to horizontal and vertical alignments and the use of 2:1 fill slopes. Reduced clear zones[1] were also used to minimize impacts to streams and wetlands. At the request of regulatory agencies the clear zone was reduced at approximately 11 different locations (a total of 26,000 linear feet) to avoid or minimize encroachment on streams, stream buffers, and/or wetlands. It is estimated that approximately 1,000 linear feet of stream and one acre of wetland impacts were avoided as a result of these measures. In addition, stabilizing fill measures and shifting the mainline were also considered and used when possible.

Avoidance and minimization measures also included the development of numerous Rosemary Lane and MD 144 interchange options as a result of regulatory agency and public coordination. Eight Rosemary Lane interchange options and thirteen MD 144 interchange options were developed in order to evaluate possible environmental resource avoidance and minimization measures (Refer to **Section II.D.3.**). The following discussion details avoidance and

1 A clear zone provides a recovery area for an errant vehicle that is free of hazards such as trees, ditches, culverts, etc.

minimization measures for wetlands and streams. All measures have been reviewed and agreed upon by USACE and MDE representatives during multiple field reviews (Refer to **Section III.G.2.**).

a. Wetlands

Multiple wetland areas are located within the study area. Potential wetland impacts were calculated based on the total area of wetland within the limit of disturbance. All wetland impacts would occur within palustrine non-tidal areas. The approximate wetland acreage impacted by the build alternatives is provided in **Table IV-5**. Avoidance and minimization measures for each of the impacted resources are addressed in the following discussion. Additional information on avoidance and minimization measures for wetlands is available in the MD 32 NETR.

Wetland A (see **Figure III-11 and Appendix A, Sheet 5**) SHA's Selected Alternative completely impacts this 0.04-acre wetland. Impacts to this wetland could not be avoided because of its proximity to MD 144. Relocating MD 144 to the north would avoid impacts to this wetland; however, it would require impacts to commercial property in the northeast and northwest quadrants of the interchange.

Wetland C (see **Figure III-11 and Appendix A, Sheet 5**) SHA's Selected Alternative impacts 0.02 acre of Wetland C; 2:1 side slopes were used to minimize impacts.

Wetland D/E (see **Figure III-11 and Appendix A, Sheet 5**) SHA's Selected Alternative impacts 0.05 acre of Wetland D/E; 2:1 side slopes were used to minimize impacts.

Wetland F (see **Figure III-11 and Appendix A, Sheet 4**) SHA's Selected Alternative impacts 0.08 acre of this wetland. A reduced clear zone and 2:1 slopes were used to minimize impacts to this 0.60-acre wetland.

Wetland G (see **Figure III-11 and Appendix A, Sheet 4**) SHA's Selected Alternative impacts all of this 0.04-acre wetland. Wetland G is located in the footprint of the proposed paving and under the proposed Terrapin Branch Bridge; therefore, no minimization is possible.

Wetland H (see **Figure III-11 and Appendix A, Sheet 4**) SHA's Selected Alternative impacts 0.03 acres of this 0.55-acre wetland. A reduced clear zone and 2:1 slopes were used to minimize impacts to this wetland.

Wetland I (see **Figure III-11 and Appendix A, Sheet 4**) SHA's Selected Alternative completely impacts this 0.14-acre wetland. Impacts to this wetland could not be avoided or minimized because it is located in the footprint of the proposed paving. Widening to the east side of MD 32 and modifying the alignment of the Rosemary Lane interchange would avoid impacts to this wetland; however, it would require additional right-of-way from residential property and could require a residential displacement. In addition, the geometric layout of the Rosemary Lane Interchange was developed to minimize impacts to the floodplains and the stream that pass through the interchange.

Wetland K (see **Figure III-11 and Appendix A, Sheet 4**) SHA's Selected Alternative completely impacts this 0.09-acre wetland. Impacts to this wetland could not be avoided because it is located in the footprint of the proposed paving. Widening to the east side of MD 32 would avoid impacts to this wetland; however, it would require additional right-of-way from residential property. In addition, the existing alignment of MD 32 was adjusted to the west side in order to provide improved geometrics for the section of roadway north of River Valley Chase.

Wetland L (see **Figure III-11 and Appendix A, Sheet 3**) SHA's Selected Alternative impacts 136 square feet of this 0.59-acre wetland. Impacts are a result of construction access. Further minimization may be possible during the design and construction phases of this project.

Wetland M (see **Figure III-11 and Appendix A, Sheet 3**) SHA's Selected Alternative completely impacts this 0.29-acre wetland. Impacts to this wetland could not be avoided because it is located in the footprint of the proposed paving. Widening to the east side of MD 32 would avoid impacts to this wetland; however, it would require reconstruction of 2,300 feet of existing MD 32, additional right-of-way from residential property, reconstruction of the Triadelphia Road bridge, and it would impact the National Register Eligible (NRE) Westwood M.E. Church.

Wetland N (see **Figure III-11 and Appendix A, Sheet 2**) SHA's Selected Alternative completely impacts this 0.10-acre wetland. Impacts to this wetland could not be avoided because it is located in the footprint of the proposed paving. Widening on the east side of MD 32 would impact the agricultural land preservation property south of the Dayton Shop and would require modifications to the site layout and roadway circulation of the Dayton Shop facilities.

Wetland O (see **Figure III-11 and Appendix A, Sheet 2**) The MD 32 mainline and the proposed Dayton Shop interchange completely impacts this 0.08-acre wetland. Impacts to this wetland could not be avoided or minimized because the location of this interchange was constrained by the residential properties on the west side of the interchange, the agricultural preservation property in the southeast quadrant, and the location and geometric constraints on the Dayton Shop site.

Wetland P (see **Figure III-11 and Appendix A, Sheet 2**) SHA's Selected Alternative impacts 3 square feet of this 0.03-acre wetland. A reduced clear zone and 2:1 slopes were used to minimize impacts.

Wetland Q (see **Figure III-11 and Appendix A, Sheet 2**) SHA's Selected Alternative impacts 0.01 acres of this 0.13-acre wetland. A reduced clear zone and 2:1 slopes were used to minimize impacts.

Wetland R (see **Figure III-11 and Appendix A, Sheet 2**) SHA's Selected Alternative completely impacts this 0.02-acre wetland. Wetland R is located in the footprint of the proposed paving and under the proposed Terrapin Branch bridge; therefore, avoidance is not possible.

Wetlands T and U (see **Figure III-11 and Appendix A, Sheet 1**) SHA's Selected Alternative impacts 0.03 and 0.03 acres of these 0.14-acre and 0.28-acre wetlands, respectively. A reduced clear zone and 2:1 slopes were used to minimize impacts to these wetlands.

Wetland W (see **Figure III-11** and **Appendix A, Sheet 1**) SHA's Selected Alternative impacts 0.93 acres of this 4.17-acre wetland. This wetland could not be avoided by the build alternatives because it is located immediately adjacent to the existing roadway. Widening to the east side of MD 32 would require reconstruction of existing MD 32 and a portion of the previously improved MD 108 interchange ramps. Direct impacts were minimized through the use of a reduced clear zone and 2:1 slopes.

Wetland Z (see **Figure III-11 and Appendix A, Sheet 2**) SHA's Selected Alternative impacts 26 square feet of this 381-square foot wetland. A reduced clear zone and 2:1 slopes were used to minimize impacts to these wetlands. Impacts are a result of construction access. Further minimization may be possible during the design and construction phases of this project.

Wetland BB (see **Figure III-11 and Appendix A, Sheet 2**) SHA's Selected Alternative completely impacts this 0.03-acre wetland. Impacts to this wetland could not be avoided or minimized because of the location and geometric constraints on the Dayton Shop site and because of the proximity of the residential properties on the west side of the MD 32.

Wetland EE (see **Figure III-11 and Appendix A, Sheet 3**) This 0.58-acre wetland is completely impacted by SHA's Selected Alternative. Impacts to this wetland could not be avoided because the location of this interchange was constrained by the residential properties in the northeast quadrant of the interchange.

Wetland GG (see **Figure III-11 and Appendix A, Sheet 3**) SHA's Selected Alternative impacts 27 square feet of this 352-square foot wetland. Impacts to this wetland could not be avoided because of the proximity of the northbound entrance ramp at Burntwoods Road, a proposed stormwater management facility, and a proposed driveway. Impacts are a result of construction access. Further minimization may be possible during the design and construction phases of this project.

Wetland KK (see **Figure III-11 and Appendix A, Sheet 5**) SHA's Selected Alternative impacts 0.01 acres of this wetland. Reduced clear zone and 2:1 slopes were used to minimize impacts to Wetland KK.

Wetland MM/NN (see **Figure III-11 and Appendix A, Sheet 5**) SHA's Selected Alternative impacts 0.17 acres of this 0.63-acre wetland. This interchange layout was designed to accommodate heavy traffic movements. Impacts to Wetland MM/NN could not be avoided because the loop ramp must be located in this quadrant and it must meet a minimum design speed of 25 mph.

Wetland PP (see **Figure III-11 and Appendix A, Sheet 5**) SHA's Selected Alternative impacts 0.16 acres of this wetland. Wetland PP is located in the footprint of the proposed paving; therefore, avoidance/minimization is not possible.

Wetland RR (see **Figure III-11 and Appendix A, Sheet 5**) SHA's Selected Alternative impacts 42 square feet of this 0.88-acre wetland. Impacts to this wetland could not be avoided because

the southbound MD 144 ramps were located to minimize impacts Wetland OO and to the contiguous woodlands surrounding the Terrapin Branch.

Wetland QQ (see **Figure III-11 and Appendix A, Sheet 4**) SHA's Selected Alternative completely impacts this 0.10-acre wetland. Impacts to this wetland could not be avoided or minimized. Realigning the Rosemary Lane interchange would avoid impacts to this wetland; however, the interchange is situated between residential properties (King's Grant and Fox Valley Estates) and the Middle Patuxent River. Modifying the options would have additional impacts to the surrounding environmental features.

Wetland SS (see **Figure III-11 and Appendix A, Sheet 5**) SHA's Selected Alternative completely impacts 0.12 acre of Wetland SS. These wetland impacts could not be avoided without further encroachment on the Terrapin Branch or causing substantial encroachment on additional residential property.

Wetland TT (see **Figure III-11 and Appendix A, Sheet 5**) SHA's Selected Alternative impacts 0.16 acre of this wetland. Impacts to this wetland were minimized by designing Access Road 1 to bisect the wetland at its narrowest point and by using small radii for the curves. This wetland cannot be avoided because access must be provided to the dispersed properties along MD 32.

Wetland UU (see **Figure III-11 and Appendix A, Sheet 5**) SHA's Selected Alternative completely impacts this 0.01-acre wetland. Impacts to this wetland could not be avoided because of its proximity to MD 144. Relocating MD 144 to the north would avoid impacts to this wetland; however, it would require impacts to commercial property in the northeast and northwest quadrants of the interchange.

Wetland BBB (see **Figure III-11 and Appendix A, Sheet 3**) SHA's Selected Alternative completely impacts this 0.08-acre wetland.

Wetland DDD (see **Figure III-11 and Appendix A, Sheet 3**) SHA's Selected Alternative impacts 0.13 acre of this wetland. Wetland DDD is located in the footprint of the proposed paving; therefore, avoidance/minimization is not feasible.

Wetland EEE (see **Figure III-11 and Appendix A, Sheet 4**) SHA's Selected Alternative completely impacts 0.04 acres (emergent) and 0.04 acres (forested) of this wetland. Although minimization was considered for this crossing no minimization is possible; even if a reduced clear zone and 2:1 side slopes were utilized, the wetland would still be a total take.

Wetland 4 (see **Figure III-11- and Appendix A, Sheet 5**) SHA's Selected Alternative completely impacts this 0.17 acres wetland. A stormwater management facility is needed in this location due to the existing topography of the area, the proposed bridge over Terrapin Branch, and extensive offsite drainage. Adjacent areas were analyzed for suitability, but offsite drainage and existing topography made other locations infeasible. The proposed facility is necessary since it will treat a large portion of impervious pavement in this point of study.

Minimization Interchange Options

For the eight Rosemary Lane minimization interchange options, the range of impacts to wetlands would be 0.2 to 0.3 acres. The selected interchange option at Rosemary Lane, Option 2A, would impact 0.2 acres of wetlands. Of the eight options, three – Options 4, 6, and 10 – would reduce impacts to wetlands compared to the Rosemary Lane DEIS Option 2. Refer to **Section II.D.3.** and **Table II-2** for a more detailed comparison of impacts for the Rosemary Lane Options.

Rosemary Lane Interchange Option 4 would reduce impacts to wetlands by providing frontage access to the south through the Burntwoods Road interchange, instead of through the Rosemary Lane interchange. However, this option was not selected because access was eliminated from southbound MD 32 to Rosemary Lane and River Valley Chase.

Rosemary Lane Interchange Option 6 would reduce impacts to wetlands by providing access to Rosemary Lane on the east side of MD 32 only. Option 6 was not selected because access was eliminated from southbound MD 32 to Rosemary Lane and River Valley Chase, which would negatively affect emergency response times.

Rosemary Lane Interchange Option 10 was developed to minimize impacts to the environment, including wetlands. The option would reduce impacts by not providing an interchange at Rosemary Lane and MD 32. Option 10 was not selected because it would re-direct additional traffic through the Burntwoods Road interchange and does not provide access for emergency response vehicles.

For the thirteen MD 144 minimization interchange options, the range of impacts to wetlands at this interchange location would be from 0.3 to 0.6 acres. The selected interchange option at MD 144, Option 12M would impact 0.6 acres of wetlands. Of the thirteen options, six – Options 8, 9, 9M, 14, 15A and 15B – would reduce impacts to wetlands compared to either Option 4 or Option 12M. Refer to **Section II.D.3.** and **Table II-3** for a more detailed comparison of the MD 144 Interchange Options.
MD 144 Interchange Option 8 would include ramps and a frontage road on the west side of MD 32, located as close to MD 32 as possible in order to reduce impacts to Terrapin Branch and associated wetlands. However, this option was not selected because of inefficient regional access to MD 144.

The MD 144 Interchange Option 9 would reduce impacts to wetlands as compared to DEIS Option 4 by providing additional access at Nixon's Farm Lane; however, this option was not selected because it would require four additional crossings of Terrapin Branch.

MD 144 Interchange Option 9M would also reduce impacts to wetlands as compared to DEIS Option 4 by providing additional access at Nixon's Farm Lane and shifting the southbound right-in, right-out ramps south compared to Option 9. This option was not selected because it would require an additional residential displacement and potential historic impacts.

MD 144 Interchange Option 14 would reduce impacts to wetlands compared to Option 12M by shifting the southbound interchange ramps south 600 feet and using bridges to protect the

Terrapin Branch ramp crossing. This option was not selected because of undesirable access road location in front of residences and lack of support from the regulatory agencies.

MD 144 Interchange Option 15A would reduce impacts to wetlands compared to Option 12M by shifting the mainline configuration, shifting the interchange ramps 300 feet south, and using bridges to protect the Terrapin Branch ramp crossing. This option was not selected because it would have greater impacts to streams and woodland.

MD 144 Interchange Option 15B would reduce impacts to wetlands compared to Option 12M by shifting the mainline configuration, shifting the interchange ramps 450 feet south, and using bridges to protect the Terrapin Branch ramp crossing. This option was not selected because it would have greater impacts to streams and woodland.

b. Streams

There are 39 streams crossed by the Selected Alternative, and 7,200 linear feet of stream impacts. Each stream crossing was reviewed to evaluate avoidance and minimization options. Streams traversed by the MD 32 mainline generally lie perpendicular to the existing roadway; therefore, alignment shifts would not be a practical avoidance or minimization option. However, based upon recommendations by the regulatory agencies, retaining walls, bridging, 2:1 fill slopes, and reduced clear zones were evaluated at specific stream locations to avoid or minimize impacts. In addition, minimization interchange options were evaluated to minimize stream impacts at the Rosemary Lane and MD 144 interchanges. Additional information on avoidance and minimization efforts for streams is included in the MD 32 Natural Environmental Technical Report (NETR).

Minimization Interchange Options

For the eight Rosemary Lane minimization interchange options, the impacts to streams would range from 2,227 to 2,757 linear feet. The selected interchange option at Rosemary Lane, Option 2A, would impact 2,277 linear feet. All of the interchange options at Rosemary Lane would have two stream crossings, except for Option 7, which would have three crossings, and Option 10, which would have one crossing. Of the eight options, two – Options 4 and 10 – would reduce stream impacts compared to Rosemary Lane DEIS Option 2. Refer to **Section II.D.3.** and **Table II-2** for a more detailed comparison of impacts for the Rosemary Lane options.

Rosemary Lane Interchange Option 4 would reduce impacts to streams by providing frontage access to the south through the Burntwoods Road interchange, instead of through the Rosemary Lane Interchange. However, this option was not selected because access was eliminated from southbound MD 32 to Rosemary Lane and River Valley Chase.

Rosemary Lane Interchange Option 10 would minimize impacts to streams by not providing an interchange at Rosemary Lane and MD 32. Option 10 was not selected because it would re-direct additional traffic through the Burntwoods Road interchange and does not provide access for emergency response vehicles.

There were 13 MD 144 minimization interchange options. The range of impacts to streams at this interchange location would be from 1,254 linear feet to 1,932 linear feet. The selected interchange option at MD 144, Option 12M, would impact 1,830 linear feet of streams. The stream crossings range from one to five; SHA's Selected Alternative would have two crossings. Of the thirteen options, six – Options 5, 5M, 8, 12, 13 and 14 – would reduce impacts to streams compared to either Option 4 or Option 12M. Refer to **Section II.D.3.** and **Table II-3** for a more detailed comparison of the MD 144 Interchange Options.

MD 144 Interchange Option 5 would reduce stream impacts compared to DEIS Option 4 by realigning the proposed access road west of Terrapin Branch. This would reduce the number of crossings and amount of impacts to Terrapin Branch, however, this option was not chosen because it would result in increased property impacts and greater stream buffer impacts.

MD 144 Interchange Option 5M would reduce stream impacts compared to DEIS Option 4 by improving the geometry of the access road and reducing the median along MD 32. This option was not selected because it would compromise the geometry of the interchange ramps.

MD 144 Interchange Option 8 would include ramps and a frontage road on the west side of MD 32, located as close to MD 32 as possible in order to reduce impacts to Terrapin Branch. However, this option was not selected because of inefficient access to MD 144.

MD 144 Interchange Option 12 would reduce impacts to streams compared to Option 12M by shifting the mainline configuration, shifting the interchange ramps 1200 feet south, and using bridges to protect the Terrapin Branch ramp crossing. This option was not selected because it would create inefficient access to MD 144 and impact Wetland OO.

MD 144 Interchange Option 13 would reduce impacts to streams compared to Option 12M by shifting the mainline configuration, shifting the interchange ramps 850 feet south, and using bridges to protect the Terrapin Branch ramp crossing. This option was not selected because it would create inefficient access to MD 144 and an undesirable access road location in front of residences.

MD 144 Interchange Option 14 would reduce impacts to streams compared to Option 12M by shifting the southbound interchange ramps south 600 feet and using bridges to protect the Terrapin Branch ramp crossing. This option was not selected because of an undesirable access road location in front of residences and lack of support from the regulatory agencies.

3. Conceptual Wetland and Stream Mitigation

SHA's Selected Alternative permanently impacts approximately 13,314 linear feet of streams and 4.0 acres of wetlands (1.7 PFO, 0.2 PSS, and 2.1 PEM). The environmental agencies have determined there are 7,200 linear feet of the total permanent perennial/intermittent stream impacts. Both stream and wetland impacts will require mitigation. SHA's Selected Alternative would also impact 6,114 linear feet of ephemeral channels, which will not require mitigation from USACE or MDE. The total wetland mitigation required for the MD 32 project is 5.88 acres of wetlands.

A mitigation site search was conducted to determine potential on-site areas that could meet the mitigation needs. The site search first involved completing an In-House Resource Analysis (IHRA) of available documents such as the Middle Patuxent River Stream Corridor Assessment (DNR 2004); available mapping and GIS coverage; and correspondence/communication with Howard County and the regulatory agencies. Following the site search, preliminary field investigations were performed and the most suitable sites were ranked.

A total of 32 potential mitigation sites were identified through the IHRA as meeting specific minimum criteria required to meet the mitigation needs of the MD 32 Planning Study. After preliminary field investigations were completed and sites were ranked, a total of 17 potential mitigation sites remained. Several adjoining sites were then combined in order to ensure that a more holistic, watershed-based mitigation approach was being completed. The top rated sites were then field reviewed with regulatory agency personnel. Agency recommendations were provided during this field review and five areas were selected for further mitigation investigations and preliminary concept plan development. The following summarizes the preferred potential mitigation sites selected for further study.

a. Proposed Wetland Mitigation Site

Site 4A – Nixon Farm Property

Wetland creation is proposed along the Middle Patuxent River on the southern portion of the Nixon Farm, an area approximately 32 acres in size. Efforts to purchase this area under a perpetual easement are currently underway. For the creation of approximately 12 acres, it is estimated that a typical excavation depth would range from 0 to 4 feet. The primary hydrologic source would be provided by groundwater, with secondary hydrologic sources provided by overland flow, an outfall of a future SWM facility for a proposed development upslope of the site, possible redirection of a small tributary stream, and flood flows from the Middle Patuxent River.

b. Proposed Stream Mitigation Sites

Terrapin Branch (3,300 feet at 1:1 credit)

Riparian Buffer Plantings - Buffer planting is proposed along the Terrapin Branch between reconstructed MD 32 and the access road from MD 144, from the southbound entrance ramp to where the Terrapin Branch crosses under MD 32.

Geomorphic work - Other stream restoration and enhancement opportunities to improve conditions throughout the entire stretch of channel could be possible. More detailed study will be done to determine what and how much opportunity exists. Particular areas of concern are the sinuous sections of the stream near both the Nixon Farm driveway and the entrance and exit ramps.

Rosemary Lane (1,000 feet of credit)

Fish Blockage Removal - The most significant stream mitigation opportunity at this site includes the extension of the culvert beneath MD 32, which may involve the introduction of in-stream grade, alignment controls, and nature-like fishways (i.e., rock ramps, riffle grade controls, step-pool structures, vanes) or manmade fishways (fish ladders) to promote desirable hydraulic conditions conducive to fish passage.

Geomorphic work - Other stream restoration and enhancement opportunities to improve conditions throughout the entire stretch of channel could be possible. More detailed study will be done to determine what and how much opportunity exists after the design of the culvert extension and bridge are complete.

Terrapin Branch north of MD 144 (1,500 feet of credit)

Stream relocation and Geomorphic work - Stream relocation is being recommended near the High's store, approximately station 530 to 534. Stream restoration and enhancement opportunities to improve conditions throughout the entire stretch of channel are possible from MD 144 to the I-70 interchange. More detailed study will be done to determine what and how much opportunity exists. Particular areas of concern are the relocation area near the High's and the concrete trapezoidal channel between the I-70 and MD 32 exit ramps.

Riparian Buffer Plantings - Buffer plantings are also proposed along Terrapin Branch north of MD 144 to the I-70 interchange.

Nixon Farm Middle Patuxent Stream work (1,500 feet of credit)

Riparian Buffer Plantings - 1,500 linear feet of 50-foot wide riparian buffer enhancement plantings are proposed along the Middle Patuxent River.

c. Backup Wetland and Stream Mitigation Sites

Sites 7, 8, 13, and 14 – Gossage/O'Malley/Hahn/Gossage, Jr. Properties

Wetland Mitigation - These four adjoining parcels are located along the Middle Patuxent River and Terrapin Branch, east of MD 32 and immediately downstream of Site 4A. Potential wetland mitigation work could include non-tidal wetland creation, wetland enhancement/ restoration, and preservation. For the creation acreage, it is estimated that a typical depth of excavation would likely range from 1 to 4 feet, but possibly less if tile drains in the open field areas are discovered during detailed site investigations. The primary hydrologic source would be provided by groundwater, with secondary hydrologic sources provided by overland flow, outfalls of proposed SHA SWM facilities, and flood flows from Terrapin Branch and the Middle Patuxent River. Enhancement/restoration of existing non-tidal wetlands could be achieved in wet areas along the riparian buffer of the Middle Patuxent River that have become overgrown with invasive vegetation and appear to be drying up due to the stream down-cutting. Preservation of higher

quality non-tidal wetlands could be accomplished along the forested floodplain of the Middle Patuxent River in the eastern portion of the Gossage and O'Malley properties.

Stream Mitigation - Potential stream mitigation work could take place along the Middle Patuxent River and Terrapin Branch. Problems initially identified within these channels included incision or down-cutting resulting in the dewatering of the adjacent floodplain, lateral bank migration resulting in channel over-widening, highly eroded banks producing excess sediment during storm events, and a relatively narrow and poor quality riparian forest buffer in many locations in the western and central portions of the sites. These problems are at a somewhat smaller scale along Terrapin Branch than on the Middle Patuxent River. Stream mitigation opportunities could include bank patching and riparian buffer plantings as well as the possible removal of a ford and several debris dams/blockages.

Nixon Farm Property

Stream Mitigation - The Nixon's Farm property which SHA is proposing to acquire is approximately 32 acres in size. Roughly half of the sites' potential 12 acres of creation will be available as out-of-kind stream mitigation.

Nixon Farm and Valenti Properties

Wetland Mitigation - Potential wetland mitigation work could include non-tidal wetland creation, wetland enhancement/restoration, and preservation. For the creation acreage, it is estimated that a typical depth of excavation would likely range from 0 to 4 feet, but possibly less if tile drains are discovered in the open fields during detailed site investigations. The primary hydrologic source would be provided by groundwater, with secondary hydrologic sources provided by overland flow, pre-treated runoff from MD 32, and flood flows from Terrapin Branch. Enhancement/restoration of existing non-tidal wetlands could be achieved in an area situated along the riparian buffer of Terrapin Branch that has become overgrown with invasive vegetation and appears to be drying up due to the stream down-cutting, although some of these wetlands may be situated where a proposed access road is planned. Preservation of existing higher quality non-tidal wetlands could be accomplished along the forested floodplain of Terrapin Branch.

d. Wetland/Stream Mitigation Summary

A summary of the estimated mitigation potential for all sites is provided in **Table IV-7.** Further detailed site analysis, including formal wetland delineations, would be needed to confirm the final acreages available for creation, enhancement/restoration, and preservation. Further detailed site analysis would also be required for stream mitigation sites. This would include fluvial geomorphologic assessments, stream classification, and preliminary hydrologic analysis/modeling for the contributory watersheds will be needed to more precisely define the linear footage of mitigation available. Based on these estimates, the wetland and stream mitigation potential for these selected locations exceeds the estimated project impacts and required mitigation ratios for the project.

Further detailed site analysis, including formal wetland delineations, would be needed to confirm

the final acreages available for creation, enhancement/restoration and preservation. Further detailed site analysis, including fluvial geomorphologic assessments, stream classification, and preliminary hydrologic analysis/modeling for the contributory watersheds will be needed to more precisely define the linear footage of mitigation available.

Based on these estimates, the wetland and stream mitigation potential for these selected locations exceeds the estimated project impacts and required mitigation ratios for the project. The next step in the process will be to initiate contact with the property owners to determine their interest in the project then to proceed to detailed site analysis.

Table IV-7: Estimate Wetland Mitigation Quantities

Site	Wetland Creation Potential (Acres)	Stream Restoration Potential (Linear Feet)	Riparian Enhancement Potential (Linear Feet)	Mitigation Credit	
				Wetland (Acres)	Stream (Linear Feet)
Proposed Sites					
Nixon's Farm Property	12	0	0	6	0
Terrapin Branch	0	2,000	3,300	0	3,300
Rosemary Lane	0	1,000	0	0	1,000
Terrapin Branch (north of MD 144)	0	1,500	1,500	0	1,500
Middle Patuxent (West Friendship/ Nixon Farm)	0	0	1,500 (Nixon Farm)	0	1,500
Backup Sites					
Gossage, O'Malley, Hahn, and Gossage, Jr. Properties	8-14	1,000 [MP, 1]	1,500 [MP] 1,000 [TB]	0	0
Nixon Farm and Valenti Properties	3-7	0	0	0	0
Total Estimate	**23-33**	**5,500**	**8,800**	**6**	**7,300**

Notes: [MP] = Middle Patuxent River, [TB] = Terrapin Branch

[1] A ford crossing that over-widens the channel resulting in shallow flow depths difficult for fish to pass may need removal.

G. Floodplains

The No-Build Alternative would not adversely affect floodplains in the study area. Effects to floodplains in the study area under SHA's Selected Alternative would occur at Middle Patuxent River, Benson Branch, Clydes Branch, and some tributaries of Clydes Branch. Pursuant to the *Flood Hazard Management Act of 1976* an in accordance with *Executive Order 11988*, the SHA has determined that all highway projects should not restrict the flow of the 100-year storm event. Potential impacts to FEMA floodplains would be least with the No-Build Alternative (zero acres of floodplain impact). Impact acreage for DEIS Build Alternatives I and II assumes a limit of disturbance extending ten feet beyond the toe of slope. DEIS Build Alternative I would impact

612,734 square feet (14.1 acres) of 100-year floodplains and DEIS Build Alternative II would impact 612,896 square feet (14.1 acres). The total floodplain impacts for SHA's Selected Alternative with 10 feet to the limit of disturbance would be 500,942 square feet (11.5 acres). SHA's Selected Alternative with a limit of disturbance extending 25 feet beyond the toe of slope would impact 642,139 square feet (14.7 acres) of floodplains. The significance of the encroachment on floodplains was evaluated with respect to the criteria in *Executive Order 11988-Floodplain Management*, and with regard to the provisions in the *Federal Aid Highway Program Manual* (FHPM), which recommends that longitudinal encroachment be avoided whenever possible.

Minimization Interchange Options

Several minimization interchange options were developed at Rosemary Lane and MD 144 (Refer to **Section II.D.3**). There were eight Rosemary Lane minimization interchange options. The range of impacts to floodplains at this interchange location would be 1.3 acres to 1.6 acres. The selected interchange option at Rosemary Lane, Option 2A, would impact 1.3 acres of floodplains. Refer to **Table II-2** for the comparison of impacts for the Rosemary Lane Options.

None of the MD 144 minimization interchange options have impacts to the 100-year floodplains. Refer to **Table II-3** for the comparison of the MD 144 Options.

In designing stream crossings, all possible measures would be included to reduce or mitigate the impact of flooding. Generally, the construction of stream crossings tends to increase the risks of upstream flooding and flood elevations, reduce flood conveyance of the stream, and increase downstream discharge. In order to mitigate these problems, standard engineering practices use design and construction techniques to limit the change in flood elevation and estimate downstream flood discharge. Some of these techniques include increasing the span and/or height of the structures, thereby providing a larger area for the flow; decreasing the length; and enhancing the hydraulic characteristics of the entrance.

With the exception of proposed impacts to the Terrapin Branch tributary system, all other stream crossings proposed under the build alternatives are extensions of existing crossings. The hydraulic characteristics of waterways with existing crossings have already been impacted. All proposed crossing designs would focus on minimizing encroachment to the floodplain, and would provide for hydraulic characteristics that are compatible with the existing structure.

H. Terrestrial Ecosystem

1. Flora

The No-Build Alternative would have no effects on the plant communities in the study area. Impacts to flora include direct losses associated with clearing within the right-of-way and changes in plant community structure and composition. Direct losses of plant communities caused by DEIS Build Alternative I, DEIS Build Alternative II, and SHA's Selected Alternative are listed in **Table IV-8**. DEIS Build Alternatives I and II assumed a limit of disturbance area extending 10 feet beyond the toe of slope. DEIS Build Alterative I would impact 73.1 impacts

on woodlands and 23.5 acres of agricultural land. The DEIS Build Alternative II would impact 71.5 acres of woodland area and 21.5 acres of agricultural land. The total plant community impacts for the SHA Selected Alternative with 10 feet to the limit of disturbance would be 71.0 acres of woodlands and 28.3 acres of farmed agricultural land. SHA's Selected Alternative that assumes 25 feet to the limit of disturbance and would result in a loss of 87.4 acres of woodland and 28.3 acres of farmed agricultural land.

Table IV-8: Plant Community Impacts

Community	No-Build Alternative	DEIS Build Alternative I	DEIS Build Alternative II	Build Alternative II Modified SHA's Selected Alternative	
		10 feet to LOD	10 feet to LOD	10 feet to LOD	25 feet to LOD
Woodlands	0 acre	73.1 acres	71.5 acres	71.0 acres	87.4 acres
Active Agricultural Land	0 acre	23.5 acres	21.5 acres	28.3 acres	28.3 acres

Minimization Interchange Options

Several minimization interchange options were developed at Rosemary Lane and MD 144 (Refer to **Section II.D.3**.). For the eight Rosemary Lane minimization interchange options, the range of impacts to woodlands would be 14.7 acres to 16 acres. The selected interchange option at Rosemary Lane, Option 2A, would impact 14.7 acres of woodlands. Refer to **Table II-2** for the comparison of impacts for the Rosemary Lane Options.

There were 13 MD 144 minimization interchange options. The range of impacts to woodlands at this interchange location would be from 20.1 acres to 27.2 acres. The selected interchange option at MD 144, Option 12M would impact 20.4 acres of woodlands. Refer to **Table II-3** for the comparison of the MD 144 Options.

Wildlife abundance and diversity in this region are primarily a function of the quantity, condition and interspersion of habitat components within not only the project corridor, but more importantly, the regional landscape. The change in land use over the past several decades in this part of Howard County with increased rural residential areas has caused corresponding changes in local wildlife abundance and species composition. This habitat conversion is likely to continue to have more long-term consequences for wildlife than the loss of vegetated areas from this highway improvement project. Since this project is an upgrade of an existing roadway rather than a new alignment, impacts would primarily result from removing vegetation and habitat along a narrow strip of land adjacent to the present roadway, as well as more substantial earthmoving and habitat disruption at interchange locations. At interchanges, larger blocks of upland habitat would be removed, including woodland, scrub-shrub, old fields and pasture, as well as some wetlands and floodplains. The amount of woodland habitat and agricultural land use (including cropped as well as pasture/field areas) to be disturbed for the build alternatives is shown in **Table IV-8**. These values were based on 2002 Howard County land use mapping.

The *Maryland Forest Conservation Act of 1991* includes Section 2 (the "Reforestation Act"), which requires the minimization of cutting or clearing trees, replacement of wooded areas

affected and/or contributions to a Reforestation fund for highway construction projects. Since forest impacts are greater than one acre, reforestation will be provided at a one-to-one ratio on publicly owned land. Reforestation would be provided within the project limits or where possible, or off-site within the same sub-watershed. Potential woodland mitigation sites will be located during final design.

2. Fauna

Direct and indirect impacts from the alternatives on fauna include habitat loss and alteration, changes in animal populations and communities, and mortality from wildlife-vehicular collisions.

The No-Build Alternative would have no impact on fauna. The build alternatives, including SHA's Selected Alternative, would have the greatest impact to fauna through habitat loss. Alteration of existing habitats rendering them unsuited to their original faunal assemblages is also considered habitat loss. Construction activities would result in actual acreage losses of habitats and habitat alterations.

Habitat fragmentation or compartmentalization, especially in relation to large woodland tracts is often a concern for transportation corridor projects because new roadways criss-cross habitat and form barriers to wildlife travel and needed resources. Because most of the landscape along the proposed project corridor consists of a mosaic of open fields with hedgerows interspersed with wooded tracts and scattered residential areas, fragmentation due to widening of the main road would be minor. However, at interchanges, especially Rosemary Lane, Nixon's Farm Lane (for DEIS Build Alternate I only) and MD 144, local woodland fragmentation and wildlife travel barriers would occur due to new access roads and ramps. Presently, terrestrial animals use the woodland areas and woody hedgerows for cover as they disperse locally eastward and westward. When they encounter the present two-lane MD 32 a barrier of sorts is found, but crossing, while frequently hazardous, is often achievable for many species.

Development of interchanges proposed by the build alternatives would make this activity much more difficult because the overall barrier width would be substantially increased, and an increase in roadkills is likely to result, especially for smaller animals. The severity of such impacts cannot be quantified without extensive studies of existing and post-construction animal movement patterns. However, the increased barrier width and habitat fragmentation would cause larger animals, such as deer, as they encounter the outer edge of the initial interchange access road or ramp, to travel parallel to it until bridges or crossing points are found beyond the interchange area. This may be particularly problematic for animals traveling eastward and westward between the northern edge of the I-70 interchange under the proposed DEIS Build Alternative I scenario. These proposed interchanges in combination with the existing I-70 interchange would create an almost continuous wider swath of disturbance to forest and other habitat; hence, fewer suitable crossing areas for a length of approximately 9,000 linear feet along MD 32, compared to the present situation. SHA policy includes fencing along access controlled facilities. Fencing would protect animals from interfering with the potential hazards of roadway traffic.

Between the southern terminus of the Nixon's Farm Lane interchange (DEIS Build Alternative I only) and the northern portion of the Rosemary Lane interchange there would be relatively more suitable wildlife crossing areas for a length along MD 32 of about 2,000 linear feet, which includes the main wildlife corridor adjacent to the Middle Patuxent River. Nevertheless, the increased width of habitat disturbance from the additional lanes would make wildlife crossings more difficult here, as elsewhere along the mainline. The Rosemary Lane interchange itself would disturb or eliminate forest habitat on the north side of Rosemary Lane, which currently links the forest cover on the west side of MD 32 as a suitable wildlife corridor. Since it eliminates the Nixon's Farm Lane interchange, SHA's Selected Alternative would likely have less impact to habitat and wildlife corridors than DEIS Build Alternatives I and II.

On the whole, while disturbances to wildlife corridors and increased crossing barriers would occur, the proposed improvements would be made to an existing roadway and adjacent areas at interchange locations, rather than from a new alignment through an undisturbed landscape. Some localized habitat fragmentation would occur at the interchange areas where several access roads and ramps are constructed, leaving small patches of vegetation between the main road and these access roads. Cutting off or blocking of travel access for terrestrial wildlife would not impact regional wildlife populations because, despite the increased difficulty many animals would still cross successfully and many suitable crossing areas would remain. These habitat and wildlife consequences are expected to be typical in type and severity to those encountered on similar transportation projects.

Forest Interior Dwelling Species (FIDS) habitat lies adjacent to the MD 32 corridor. Impacts associated with any of the build alternatives, including SHA's Selected Alternative, would affect the edges of this habitat. Of the 87.4 acres of woodland affected by the Selected Alternative, 16.1 lie within areas that meet the DNR criteria for FIDS habitat. The build alternatives would result in a loss of FIDS habitat acreage, however, because the improvements occur along the existing MD 32 alignment, habitat loss due to fragmentation would be minimal.

3. Rare, Threatened, or Endangered Species

Coordination with the US Fish and Wildlife Service (USFWS) and the Maryland Department of Natural Resources (DNR) indicates that there are no Federal or State listed rare, threatened or endangered species within the study area.

I. Air Quality

1. Objectives and Type of Analysis

A summary of the air analysis is presented in this section. A detailed Air Analysis Technical Report has been prepared in accordance with the EPA, FHWA, and SHA guidelines and is available at the Maryland State Highway Administration, 707 North Calvert Street, Baltimore, Maryland 21202. Carbon monoxide (CO) impacts are analyzed as the accepted indicator of vehicle-generated air pollution.

The EPA CAL3QHC dispersion model is used to predict carbon monoxide (CO) concentrations for air quality sensitive receptors for both the build year (2015) and design year (2025). The detailed analyses predict air quality impacts from carbon monoxide vehicular emissions for both the No-Build and the build alternatives, including SHA's Selected Alternative at each receptor location. Modeled 1-hour and 8-hour average CO concentrations are added to background CO concentrations for comparison to the State and National Ambient Air Quality Standards (S/NAAQS). The S/NAAQS for the one-hour is 35.0 ppm. The S/NAAQS for the eight-hour average is 9.0 ppm.

2. Construction Impacts

The construction phase of the proposed project has the potential to impact the local ambient air quality by generating fugitive dust through activities such as demolition and materials handling. SHA has addressed this possibility by establishing *Standard Specifications for Construction and Materials*, which specifies procedures to be followed by contractors involved in site work.

The Maryland Air and Radiation Management Administration was consulted to determine the adequacy of the "Specifications" in terms of satisfying the requirements of the *Regulations Governing the Control of Air Pollution in the State of Maryland*. The Administration found the specifications to be consistent with the requirements of these regulations. Therefore, during the construction period, all appropriate measures (Code of Maryland Regulations 26.11.06.03D) would be incorporated to minimize the impact of the proposed transportation improvements on the air quality of the area.

Specifically, applying water or appropriate liquids during demolition, land clearing, grading, and construction operations would minimize fugitive dust. Water would be applied on dirt roads, material stockpiles, and other surfaces capable of producing airborne dust. At all times when in motion, open-body trucks for transporting materials would be covered, and all excavated material would be removed promptly.

Mobile source emissions could be minimized during construction by not permitting idling delivery trucks or other equipment during periods of unloading or other non-active use. The existing number of traffic lanes should be maintained, to the maximum extent possible, and construction schedules should be planned in a manner that would not create traffic disruption and increase air pollutants. Application of these measures will ensure that construction impact of the project is insignificant.

3. Receptor Site Locations

Fifty-nine air quality receptors were selected to represent air quality sensitive locations within the study area. The receptor sites chosen for these receptors are residences or historic sites. The receptor sites were defined as locations on either side of the proposed alternatives that would be affected by changes in air quality.

In addition, 76 air quality receptors were used to analyze five signalized intersections in the study area. At these intersections, receptors were placed using the guidance of *Guidance for*

Modeling Carbon Monoxide from Roadway Intersections (EPA, November 1992). The receptors for these intersections were placed at the edge of right-of-way along both sides of roadways at least ten feet from the travel way and six feet above the ground where queue lengths form. The CO concentration listed for the intersection is the maximum concentration from the receptors used to analyze the intersection. The locations of the receptors are described in **Section III.I** and are presented on **Table III-23** and **Figure III-12**.

4. Results of Microscale Analysis

A summary of the CO concentrations is shown on **Table IV-9**. **Table IV-10** shows the maximum differences in CO concentrations when comparing the build alternatives, including SHA's Selected Alternative to the No-Build Alternative. The receptor's concentrations for all alternatives are below the State and National Ambient Air Quality Standards (S/NAAQS) in the one-hour and eight-hour analyses.

The highest CO concentrations are expected to occur at the MD 32/MD 144 signalized intersections for the No-Build Alternative and at Receptor R-18 of SHA's Selected Alternative. For the No-Build Alternative, the projected maximum 1-hour CO concentration is 6.1 ppm in 2015 and 6.3 ppm in 2025, and the projected maximum 8-hour CO concentration is 3.6 ppm in 2015 and 3.5 ppm in 2025. For SHA's Selected Alternative, the projected maximum 1-hour CO concentration is 4.4 ppm in 2015 and 2.5 ppm in 2025, and the projected maximum 8-hour CO concentration is 4.8 ppm in 2015 and 2.6 ppm in 2025.

The maximum 1-hour increase in CO concentrations is 0.7-ppm in 2015 and 1.0-ppm in 2025. The maximum 8-hour increase in CO concentrations is 0.2-ppm in 2015 and 0.3-ppm in 2025. The maximum 1-hour decrease in CO concentrations is 0.3-ppm in 2015 and 0.2-ppm in 2025. The maximum 8-hour decrease in CO concentrations is 0.1-ppm in both 2015 and 2025. Changes in CO concentration levels occur due to several factors. Factors that increase CO concentrations are widening roadways and alignment shifts that move vehicles closer to the receptors. Factors that decrease CO concentrations include decreasing idling vehicles at signalized intersections and alignment shifts that move vehicles away from receptor sites.

Table IV-9: CO Concentration (ppm)

Receptor	2015				2025			
	No-Build		Build		No-Build		Build	
	1-Hour [1]	8-Hour [2]	1-Hour [1]	8-Hour [2]	1-Hour [1]	8-Hour [2]	1-Hour [1]	8-Hour [2]
R1	3.0	1.8	3.1	1.8	3.0	1.8	3.3	1.9
R2	2.7	1.6	2.8	1.6	2.7	1.6	2.8	1.6
R3	2.8	1.7	2.9	1.7	2.8	1.7	3.0	1.7
R4	2.6	1.6	2.6	1.6	2.6	1.6	2.7	1.6
R5	2.9	1.7	3.0	1.7	2.9	1.7	3.1	1.8
R6	3.2	1.9	3.5	2.0	3.1	1.8	3.6	2.0
R7	2.7	1.6	2.8	1.7	2.7	1.6	2.9	1.7
R8	3.3	1.9	3.6	2.0	3.3	1.9	3.8	2.0
R9	2.8	1.6	2.9	1.6	2.8	1.6	2.9	1.7
R10	3.2	1.8	3.1	1.8	3.2	1.9	3.2	1.8
R10a	2.7	1.6	2.7	1.6	2.9	1.6	2.9	1.6
R36	2.9	1.7	3.0	1.7	3.1	1.7	3.2	1.7
R36a	3.2	1.8	3.5	1.9	3.2	1.8	3.7	1.9
R36b	3.5	1.9	3.5	1.9	3.5	1.9	3.8	1.9
R37	3.4	1.9	3.7	2.1	3.4	1.9	4.0	2.1
R38	2.9	1.6	2.7	1.6	2.8	1.6	2.8	1.6
R39	3.0	1.8	3.7	2.0	3.0	1.8	3.9	2.0
R40	2.9	1.7	3.2	1.8	2.9	1.7	3.2	1.8
R41	2.9	1.7	3.3	1.8	2.9	1.7	3.4	1.8
R42	2.8	1.6	2.9	1.7	2.7	1.6	2.9	1.7
R43	3.0	1.8	3.3	1.8	3.0	1.7	3.4	1.9
R44	2.8	1.7	3.1	1.8	2.8	1.7	3.3	1.8
R45	3.0	1.7	3.3	1.7	3.0	1.7	3.5	1.8
R46	3.3	1.8	3.5	1.9	3.3	1.8	3.7	1.9
R47	3.2	1.8	3.7	1.9	3.2	1.8	3.7	1.9
R48	3.5	1.9	4.0	2.1	3.5	1.9	4.3	2.2
R48	3.0	1.7	3.2	1.7	3.0	1.7	3.3	1.8
R50	3.0	1.8	3.5	1.9	3.0	1.8	3.8	2.0
R51	2.8	1.6	2.8	1.6	2.7	1.6	3.0	1.7
R52	3.3	1.9	3.6	2.0	3.3	1.8	4.0	2.0
INT-LC	5.6	2.8	-	-	5.8	2.9	-	-
INT-WLC	5.4	2.8	-	-	5.3	2.8	-	-
INT-Ten Oaks	5.8	3.1	-	-	5.9	3.0	-	-
INT-BW	6.0	3.1	-	-	5.9	3.1	-	-
R11	3.1	1.9	3.4	2.0	3.1	1.9	3.6	2.1
R12	2.8	1.8	3.1	1.8	2.8	1.7	3.2	1.8
R13	2.8	1.6	2.8	1.6	2.8	1.6	3.1	1.6
R14	3.2	1.9	3.6	1.9	3.2	1.9	4.0	2.0
R14a	3.0	1.8	3.4	1.8	3.0	1.8	3.6	2.0
R15	2.7	1.6	2.8	1.6	2.7	1.6	2.9	1.7
R16	3.5	2.0	3.8	2.1	3.4	1.9	4.4	2.2
R17	2.9	1.7	3.0	1.6	2.8	1.7	3.1	1.7
R18	4.1	2.3	4.4	2.5	4.0	2.3	4.8	2.6
R19	2.6	1.6	2.7	1.6	2.6	1.6	2.9	1.6
R20	3.5	1.9	3.6	2.0	3.4	1.9	3.7	2.1
R21	3.1	1.8	3.0	1.7	3.2	1.8	3.1	1.7

Receptor	1-Hour [1]	8-Hour [2]	1-Hour [1]	8-Hour [2]	1-Hour [1]	8-Hour [2]	1-Hour [1]	8-Hour [2]
R22	2.7	1.6	2.8	1.6	2.7	1.6	2.8	1.6
R25	3.2	1.8	3.0	1.7	3.2	1.8	3.1	1.7
R26	2.9	1.7	2.8	1.7	3.0	1.7	2.9	1.7
R27	3.1	1.7	2.8	1.6	3.1	1.7	2.9	1.6
R28	2.6	1.6	2.7	1.6	2.6	1.6	2.8	1.6
R28a	2.6	1.6	2.8	1.6	2.6	1.6	2.9	1.6
R29	2.6	1.6	2.7	1.6	2.6	1.6	2.8	1.6
R30	2.7	1.7	3.0	1.8	2.7	1.7	3.1	1.8
R30a	2.9	1.7	3.2	1.8	2.8	1.7	3.4	1.8
R31	2.8	1.7	3.5	1.9	2.8	1.7	3.8	1.9
R31a	2.9	1.7	3.5	1.9	2.9	1.7	3.5	2.0
R32	2.6	1.6	2.7	1.6	2.6	1.6	2.8	1.6
R33	2.8	1.6	2.8	1.6	2.8	1.6	2.9	1.7
R34	2.9	1.8	3.3	1.9	2.9	1.8	3.6	1.9
R35	2.7	1.6	2.8	1.6	2.8	1.6	2.8	1.6
R35a	3.1	1.8	3.2	1.8	3.1	1.8	3.4	1.8
R35b	3.2	1.9	3.5	2.0	3.2	1.8	3.8	2.0
INT-MD 144	6.1	3.6	-	-	6.3	3.5	-	-

Notes: [1] 1-hour CO concentrations include a 2.4-ppm background level. Worse Case (a.m. or p.m.) shown. The S/NAAQs for the 1-hour average is 35.0-ppm.
[2] 8-hour average CO concentrations include a 1.5-ppm background level. The S/NAAQs for the 8-hour average is 9.0-ppm.

Table IV-10: Maximum Differences in CO concentration under Build Alternative

Alternatives		Maximum Increase		Maximum Decrease	
		Value	Receptor(s)	Value	Receptor(s)
2005	1-Hour	+0.7	R31, R39	-0.3	R27
	8-Hour	+0.2	R16, R18, R31, R31a, R37, R39, R48, R50, R52	-0.1	R21, R25, R27
2025	1-Hour	+1.0	R16, R31	-0.2	R27
	8-Hour	+0.3	R16, R18, R31a, R48	-0.1	R10, R21, R25, R27, R36

5. Conformity with Regional Air Quality Planning

The MD 32 Planning Study is located in Howard County, Maryland. This county is not designated as non-attainment for carbon monoxide (CO), Nitrogen Dioxide (NO_2), Sulfur Dioxide (SO_2), Lead (Pb) or particulate matter (PM_{10}), but it is designated as a severe non-attainment area for ozone (O_3). Since the project is located in an ozone non-attainment area, conformity to the State Implementation Plan (SIP) is determined through a regional air quality analysis performed on the Transportation Improvement Plan (TIP) and transportation plan. This project conforms to the SIP as it originates from a conforming TIP and transportation plan.

6. Analysis Input

a. Traffic Data

The traffic data used for this air quality analysis included average daily traffic volumes (ADTs), design hour volume (DHV), percent daily distributions (diurnal traffic curves) and peak and off-peak vehicle speeds for all the alternatives. Traffic volumes and diurnal curves were used for the 2015 and 2025.

Five signalized intersections were included in the air quality analysis for the No-Build Alternative. The location of the signalized intersections that were also used in the analysis are listed on **Table IV-11**. The signal timing was assumed to be optimized based on current and future traffic volumes and existing and anticipated lane configurations. SHA's Selected Alternative does not include proposed traffic signals at the ramp terminal intersections. As mentioned in results of the microscale analysis, the highest CO concentrations are expected to occur at the MD 32/MD 144 signalized intersection for the No-Build Alternative.

Table IV-11: Signalized Intersections Analyzed

Receptor	Address / Location	Description
INT-LC	MD 32 at Linden Church Road	Matrix of 13 Receptors
INT-WLC	MD 32 at West Linden Church Road	Matrix of 15 Receptors
INT-Ten Oaks	MD 32 at Ten Oaks Road	Matrix of 13 Receptors
INT-BW	MD 32 at Burntwoods Road	Matrix of 15 Receptors
INT-MD 144	MD 32 at MD 144	Matrix of 20 Receptors

b. Vehicular Emissions

Mobile source emission factors were obtained for use in the CAL3QHC CO prediction models using the latest version of the EPA Mobile Source Emission Factors Model, MOBILE6 (Version 6.2.03), which was released in September 2003. The emission rates associated with individual vehicles are influenced by factors such as ambient air temperature, engine temperature, operation mode, average speed, and maintenance. The average emission rate for a fleet of vehicles operating on a highway is further influenced by the composition of the fleet, vehicle type, and vehicle age. The fleet emission rate reflects changes in vehicle, engine, and emission control system technologies; changes in applicable regulations and emission standards; and realistic driving patterns. Most of the assumptions and factors used for the MOBILE6 models were obtained from the MDE air quality staff. MDE assumptions include enhanced Inspection and Maintenance (I/M) programs, Clean Air Act controls, and the National Low Emission Vehicle Standards. MDE supplied alternate diesel sales fractions for Maryland counties. A low altitude of 500 feet above mean sea level was assumed. January was modeled as the month of evaluation because violations of the S/NAAQS for CO are more likely to occur in the colder months.

Vehicle CO emission rates increase with decreasing ambient temperature. A minimum temperature of 27.6°F and a maximum temperature of 47.5°F were used to determine both the

one-hour and the eight-hour impacts. MDE directs use of MOBILE6 default values for vehicle miles traveled (VMT), trip length distributions, and starts per day.
Vehicle maintenance is factored into the emissions rate calculation as the rate of compliance with the Maryland Vehicle Emissions Inspection Program (VEIP). The VEIP was modeled using two tests: the Idle Test and the On-Board Diagnostic Test. The Idle Test (tailpipe test) is given for model-year 1977 through 1983 vehicles and for gasoline powered trucks weighing 10,001 through 26,000 pounds. The I/M 240 Test (treadmill test) is given for vehicles weighing up to 10,000 pounds (model-year 1984 through 1995) and vehicles weighing 8,501 pounds to 10,000 pounds (model-year 1996 and newer) powered by gasoline, propane or natural gas. The On-Board Diagnostic Test (OBD) is required for model-year 1996 and newer vehicles, weighing less than 8,500 pounds, and powered by gasoline, propane or natural gas. Vehicles not included in the VEIP are vehicles less than 24 months old, vehicles powered solely by diesel fuel, motorcycles, vehicles weighing over 26,000 pounds and 1976 model-year and earlier vehicles. A biennial test was assumed, with a centralized inspection test-only station. The start date used for the I/M 240 Test was January 1, 1998 and the start date for the OBD was January 1, 2003. The cutoff points used for the VEIP in MOBILE6 were supplied by MDE.

The Anti-Tampering Program (ATP) was assumed to start in 1989 and covered model-years 1977 to new vehicles. All gasoline vehicles up to 26,000 pounds were assumed to be subject to ATP inspections and only testing, not repairing, was assumed. The testing frequency was assumed to be biennial with inspections of the catalyst, the fuel inlet restrictor, and the gas cap only.

The phase-in of low emitting vehicles (LEVs) was also included in the MOBILE6 model. Maryland is one of nine states that opted into the National Low Emission Vehicle (NLEV) Program for the 1999 model-year. The phase-in schedule for states opting into the NLEV program assumes a certain percentage of Tier 1 vehicles (Federally certified vehicles), Transitional Low Emitting Vehicles (TLEV) and LEVs for each model-year.

MDE provided fuel parameters for the MOBILE6 model. The fuel Reid Vapor Pressure, a measure of fuel volatility, was assumed to be 12.0 pounds per square inch (psi) and the fuel sulfur content is 300 parts per million (ppm). Oxygenated fuels and reformulated gasolines were not modeled. No refueling emission factors were calculated.

MOBILE6 cannot calculate idle emission factors. Therefore, the methodology outlined in EPA MOBILE5A Information Sheet #2 was used to obtain the idle emission factors. This method uses MOBILE6 to calculate emissions (grams/mile) for a speed of 2.5 mph for arterial roadways and multiplying the resulting emissions factor by 2.5 mph to obtain idle emission factors in grams/hour.

c. Meteorological Factors

For direct comparison to the S/NAAQS, CO concentrations were estimated for worst-case one-hour and eight-hour periods. The meteorological conditions that would result in the maximum one-hour concentrations are conditions of very light wind speeds (1.0 meter/sec) and very stable atmospheric conditions (Stability F). The wind direction that results in the maximum receptor

concentration is dependent upon roadway/receptor geometry. In general, for receptors near free flow links, wind angles nearly parallel to the roadway yield the highest CO concentrations.
The worst case one-hour average analyses conducted for this study were performed using the highest one-hour traffic volumes, Stability Class F and a 1.0 meter/sec. wind speed. Both a.m. and p.m. peaks were analyzed. The maximum one-hour CO impact was obtained for each air quality sensitive receptor by adding the background concentration to the one-hour CO receptor specific concentration.

To estimate the maximum eight-hour average CO concentration, daily traffic distributions (diurnal curves) were used to breakdown the ADTs into hourly traffic volumes. Hourly time segments were analyzed to determine the receptor-specific CO concentrations. The worst consecutive eight hours were averaged and added to the background CO concentration to obtain the eight-hour average CO concentration.

d. CAL3QHC Analysis

The mathematical model used to estimate future CO concentrations is the current version of the EPA's CAL3QHC dispersion model, released in October 1995. The CAL3QHC dispersion model is a microcomputer-based modeling methodology developed to predict the level of CO or other inert pollutant concentrations for motor vehicles traveling near roadway intersections. CAL3QHC is a consolidation of EPA's CALINE3 line source dispersion model and an algorithm that internally estimates the length of the queues formed by idling vehicles at signalized intersections. Based on the assumption that vehicles at an intersection are either in motion or in an idling state, the program is designed to predict air pollution concentrations by combining the emissions from both moving and idling vehicles. By including emissions from idling vehicles, CAL3QHC represents a more reliable tool then CALINE3 alone for predicting CO concentrations near signalized intersections where idling vehicles interact with moving vehicles in complex configurations. Predictions of free-flow traffic conditions, using either CALINE3 or CAL3QHC would yield equivalent results.

The CAL3QHC program requires that roadways be modeled as segments known as links. Links can be either free-flow links (for vehicles moving at a constant velocity) or queue links (for idling vehicles). Each can be one of four types of links based on the roadway geometry (at-grade, fill, bridge, or depressed). The free flow links used in this study are at-grade links and bridge links.

A free-flow link is defined as a straight segment of roadway having a constant width, height, traffic volume, speed, and vehicle emission factor. If any of these factors changes, a new link must be coded. The width of a free-flow link is the traveled roadway width plus ten feet on each side of the roadway to account for the dispersion of the plume generated by the wake of moving vehicles. The required inputs for free-flow links are the endpoints, traffic volume (vehicles/hour), the emission factor (grams/vehicle-mile), source height (feet), and mixing zone width (feet). A source height of zero feet was assumed for both at-grade and bridge links.

A queue link is defined as a straight segment of roadway with a constant width and emission source strength, where vehicles are idling for a specified period of time. The width of a queue

link is determined by the width of the traveled roadway only. Ten feet are not added on each side because vehicles are not moving and wake is not generated. Required inputs for queue links are the endpoints, approach traffic volume (vehicles/hour), emission factor (g/vehicle-hr), average cycle length (seconds), average red time length (seconds), number of travel lanes, clearance lost time (seconds), source height (feet), signal type (pre-timed actuated, or semi-actuated), saturation flow rate (vehicles/hour/lane) and arrival rate (worst progression, below average progression, average progression, above average progression, or best progression). A source height of zero feet is recommended for at-grade roadways.

CAL3QHC also requires the input of meteorological factors. These factors are averaging time (minutes), surface roughness coefficient (cm), settling velocity (cm/s), deposition velocity (cm/s), wind speed (m/s), and mixing height (m). The values used for these factors were held constant throughout the analysis and are presented in **Table IV-12**.

Table IV-12: Air Quality Constants

VARIABLE	VALUE
Averaging Time	60 minutes
Surface Roughness Coefficient	108 cm (Suburban Area)
Settling Velocity	0.0 cm/second
Deposition Velocity	0.0 cm/second
Mixing Height	1,000 meters
Scale Factor	0.3048 meters/foot
Source Height	0.0 feet

CAL3QHC calculates the CO concentration at each receptor for a given wind direction. The wind direction was varied through a full 360 degrees in five-degree increments in this study. The results for all wind directions for each receptor are placed in a matrix, and CAL3QHC determines the wind direction that caused the worst CO concentration at each receptor.

The worst-case one-hour average analyses conducted for this study were performed using the AM and PM peak one-hour traffic volumes, Stability Class F and a 1.0 m/s wind speed. The maximum one-hour CO impact was obtained for each air quality receptor by adding the background concentration to the one-hour CO receptor-specific concentration.

To estimate the maximum eight-hour average CO concentration, daily traffic distributions (diurnal curves) were used to break down the ADT's into hourly traffic volumes. These hourly traffic volumes were analyzed to determine the receptor-specific CO concentrations. Stability Class D and a 2.0 meter/second wind speed were used before 5 p.m. and Stability Class F and a 1.0 meter/second wind speed were used after 5 p.m. for these analyses. The hourly runs that produce the highest CO concentrations during an eight consecutive hour period were averaged and added to the background CO concentration to obtain the eight-hour average CO concentration.

e. Background Levels

In order to calculate the total concentration of CO that occurs at a particular receptor site during worst cast meteorological conditions, the background levels are considered in addition to the levels directly attributable to the facility under consideration.

Future background CO concentrations were determined by using a rollback methodology based upon the measured CO levels in 2003 at the Virginia Department of Environmental Quality monitoring station along Telegraph Road in Lee District Park in Franconia, Fairfax County, as presented on the EPA AIRS Data Website. Data from this site was used because it most closely represents the suburban and residential character of the study site. The rollback methodology assumes that the number of stationary sources of CO and vehicle miles traveled (VMT) increase at the same rate as the CO emission factors from these sources decrease. This results in the background levels remaining constant in 2003, 2015, and 2025 at 2.4 parts per million for one hour and 1.5 parts per million for eight hours.

J. Noise Quality

1. Introduction

Fifty eight noise receptor locations are located within the study area as indicated in **Table III-24** and on **Figure III-12**. The sites are located in 15 Noise Sensitive Areas (NSAs). Receptors were selected to represent the overall noise environment and to determine locations where residences may be impacted by traffic noise. A summary of impacts and mitigation measures is presented in this section. Additionally, a detailed Noise Analysis Technical Report has been prepared to determine the impact of the project on noise levels. The Technical Report is available at the Maryland State Highway Administration, 707 North Calvert Street, Baltimore, Maryland 21202.

2. Predicted Noise Levels

The method used to model and predict noise levels in this study was developed by the Federal Highway Administration (FHWA) under the U.S. Department of Transportation. The computer model, called the FHWA Traffic Noise Model® (TNM), computes highway traffic noise levels at user defined receivers, and aids in design of highway noise barriers. TNM® includes a database of speed related noise emission levels for five (5) vehicles types (automobiles, medium trucks, heavy trucks, buses and motorcycles) under cruise (constant speed) conditions. An adjustment is first applied to account for the numbers of each vehicle type and their speed as defined by the user. In addition, TNM® contains a database that accounts for the effects of accelerating vehicles such as those affected by traffic control devices (stop signs, signals, toll booths) or on-ramps, and as well as the effects of roadway grades. Sound propagation is computed taking into account the effects of atmospheric absorption, divergence (i.e. geometric spreading of sound energy over distance), intervening ground types and their acoustical characteristics, topography, man-made barriers, vegetation and rows of buildings. To improve accuracy, all TNM® databases and calculations are based on 1/3 octave band data (i.e. data broken down into individual frequency

bands), and then all results are recombined to give noise levels in the standard formats used in highway noise analysis.

In this study, noise levels are presented in terms of the A weighted equivalent sound level, abbreviated here as Leq. Leq is a single number representation of the actual fluctuating sound level that accounts for all the sound energy during a given period of time. The units of Leq are A weighted decibels or dBA. The A weighting means that the sound level is measured by a method that approximates the response of the human ear, with deemphasis of the low and very high frequencies and emphasis on the mid-frequency noise level range. In order to give a sense of perspective to the noise levels discussed, a quiet rural night would register about 46 dBA, a quiet suburban night about 60 dBA, a noisy day about 80 dBA, a gas lawn mower at 100 feet about 70 dBA and a diesel truck at 50 feet about 85 dBA. Under typical conditions, noise level changes of 2-3 dBA are barely perceptible, while a change of 5 dBA is readily noticeable. A 10 dBA increase in noise level is judged by most people as a doubling of sound loudness.

The noise levels presented in this section are for the noisiest hour of the day. This hour usually coincides with the peak traffic hour. However, in some cases where the peak hour traffic volume moves at a speed significantly less than the free-flow speed, a combination of reduced off-peak traffic volume and increase travel speed may generate peak noise levels. In this case, LOS analysis was performed and the worst case combination of traffic volume and speed was used. For this analysis, the combination of 2025 peak hour traffic and associated travel speed resulted in the worst case noise levels.

3. Impact Assessment and Abatement Consideration

a. Impact Assessment and Feasibility of Noise Control

The determination of traffic noise impacts is based on the relationship between the ambient noise levels, the predicted peak hour traffic noise levels, and the established noise abatement criteria in the study area. For this study, the applicable criteria are defined in 23 CFR, Part 772 and subsequent memoranda (see **Table IV-13**). Mitigation measures were investigated at impacted receptors. An impacted receptor is a site where the peak hour noise levels approached or exceeded the 67 dBA Federal Noise Abatement Criterion for residential areas. Based on current SHA Sound Barrier Policy, 66 dBA is considered as approaching the criteria. Additionally, the criteria call for mitigation measures to be considered where build levels exceed the existing ambient levels by 10 dBA or more.

When mitigation is investigated, certain feasibility and reasonableness criteria established by federal guidelines and SHA Sound Barrier Policy must be met in order for a barrier to be considered eligible for construction. These criteria are summarized below.

Feasibility Criteria

- Noise levels can be reduced by more than 7 dBA at impacted receptors.
- Placement of barrier cannot restrict vehicular or pedestrian access.
- Barrier cannot cause any safety or maintenance problems.
- Barrier can be constructed given topography, drainage, utilities, etc.

- There should not be non-highway noise sources that would reduce barrier effectiveness.
- Barrier should not have significant impact upon a Section 4(f) resource (i.e. publicly owned parks, recreation areas, historic sites or wildlife refuges)

Reasonableness Criteria

- The majority of impacted receptors should receive a 7 dBA or greater noise reduction.
- At least 75 percent of the impacted residents approve the proposed noise abatement.
- A 3 dBA or greater change in design year noise levels over design year no-build noise levels is expected to result from the proposed action, OR the cumulative effect of highway improvements on the design year noise levels at receptors that existed when prior improvements were made is equal to or greater than 3 dBA.
- Build levels are greater than or equal to 72 dBA and there is an increase in noise levels provided that other reasonable and feasible criteria are met.
- The barrier cannot have significant negative visual impact.
- The cost of noise abatement is equal to or less than $50,000 per residence benefited. (However, barriers with a cost per residence of $50,000 to $100,000 will be considered reasonable if the combined cost per residence of mitigation on the entire project does not exceed $50,000.)
- There are special circumstances (e.g., historical or cultural significance).

For each NSA, the results of whether criteria were met are included herein. Feasibility/Reasonableness Checklists are included in the Noise Analysis Technical Report.

b. Noise Abatement Criteria

The study of noise abatement measures considers the size of the impacted areas, the number and distribution of noise sensitive sites within that area; the predominant activities being performed and their vulnerability to noise disturbances; and the visual impact and economic feasibility of the noise attenuation methods.

An assessment of reasonable cost for sound barriers is based on the following assumptions: an effective barrier should, in general, extend in both directions for four times the distance between receiver and roadway (source) and provide a 7 to 10 dBA reduction in the noise level at first row receptors. The effective barrier height was considered to be the height at which this reduction was achieved. If a 7 dBA reduction could not be obtained with a maximum 26-foot barrier, the height was reduced to obtain the most cost effective barrier while retaining the noise abatement characteristics of the 26 foot barrier to within 1 dBA. A second consideration was that the barrier blocks the line of sight to all vehicles from every location.

The cost per residence is determined by dividing an assumed barrier cost by the number of benefited residences. A current unit cost of $18.50 per square foot is used to determine the cost of the barrier when evaluating economic feasibility. An impacted residence is considered benefited when the existing peak noise level equals or exceeds criteria and it experiences a minimum 3 dBA reduction in noise with mitigation. A residence that is not impacted is also considered benefited if it receives a 5 dBA reduction from the mitigation. When determining the cost per residence, SHA

Sound Barrier Policy has assumed that churches and schools each have a value considered equal to ten residences.

The effects of noise from each build alternative are judged in accordance with the FHWA's activity/criteria relationship published in 23 CFR, Part 772 and subsequent memorandum. The FHWA criteria, shown in **Table IV-13**, are based on specific land uses and are used in determining the need for studying noise attenuation measures. All locations within this study area are of land use Category B, which has a design noise level of 67 dBA (Leq).

This evaluation was also completed in accordance with the SHA's Sound Barrier Policy, in a report dated May 11, 1998. This is a Type I noise project as defined in 23 CFR, Part 772. A Type I project provides evaluation of noise mitigation for projects that propose construction of a highway on a new location or the expansion or reconstruction of an existing highway that substantially changes the highway's horizontal or vertical alignment or increases the number of through traffic lanes.

c. Mitigation Measures

The effects of noise from each build alternative were evaluated in accordance with the Federal Highway Administration's activity/criteria relationship published in 23 CFR, Part 772 and subsequent memorandum. Upon review of the results, it was determined that noise barriers do not meet all the feasibility and reasonableness criteria as set forth in SHA's Sound Barrier Policy (1998). It was determined that NSA's A, B, C, D, E, F, J, K, K-1, L, and M did not meet the reasonableness cost criterion of $50,000 per benefited residence. For NSA's G, H, and I the investigation of sound barriers was not warranted because the 2025 build noise levels would not exceed 66 dBA and were not equal to or more that 10 dBA above ambient noise levels. In addition, the public expressed concerns regarding the negative visual affect that noise barriers would have on the rural character of the roadway.

According to SHA Sound Barrier Policy (1998), SHA would consider installation of non-sound barrier options such as vegetative screening for areas that meet the criteria including the eligibility date criterion for a barrier but do not qualify for noise barriers. To address public concerns, screening (i.e. dense landscape plantings or other measures) would be strategically placed in the SHA right-of-way to screen residential areas in close proximity to MD 32. The exact location, type, and amount of screening will be determined in final design. Any landscaping used for screening purposes would be a densely planted mix of evergreen species such as pine, spruce, and holly.

Table IV-13: Noise Abatement Criteria (Specified in 23CFR.772)

Land Use Category	Design Noise Level (Leq)	Description of Land Use Category
A	57 dBA (exterior)	Tracts of land in which serenity and quiet are of extraordinary significance and preservation of those qualities is essential if the area is to continue its intended purpose. Such areas could include amphitheaters, particular parks, or open spaces which are dedicated or recognized by appropriate local officials for activities requiring special qualities of serenity and quiet.
B	67 dBA (exterior)	Residences, motels, hotels, public meeting (exterior) rooms, schools, churches, libraries, hospitals, picnic areas, playgrounds, active sports areas, and parks.
C	72 dBA (exterior)	Developed lands, properties or activities not included in categories A or B above.
D	None Prescribed	Land which is undeveloped on the date of public knowledge of the project, and on which no known future development is planned.
E	52 dBA (interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

4. Findings

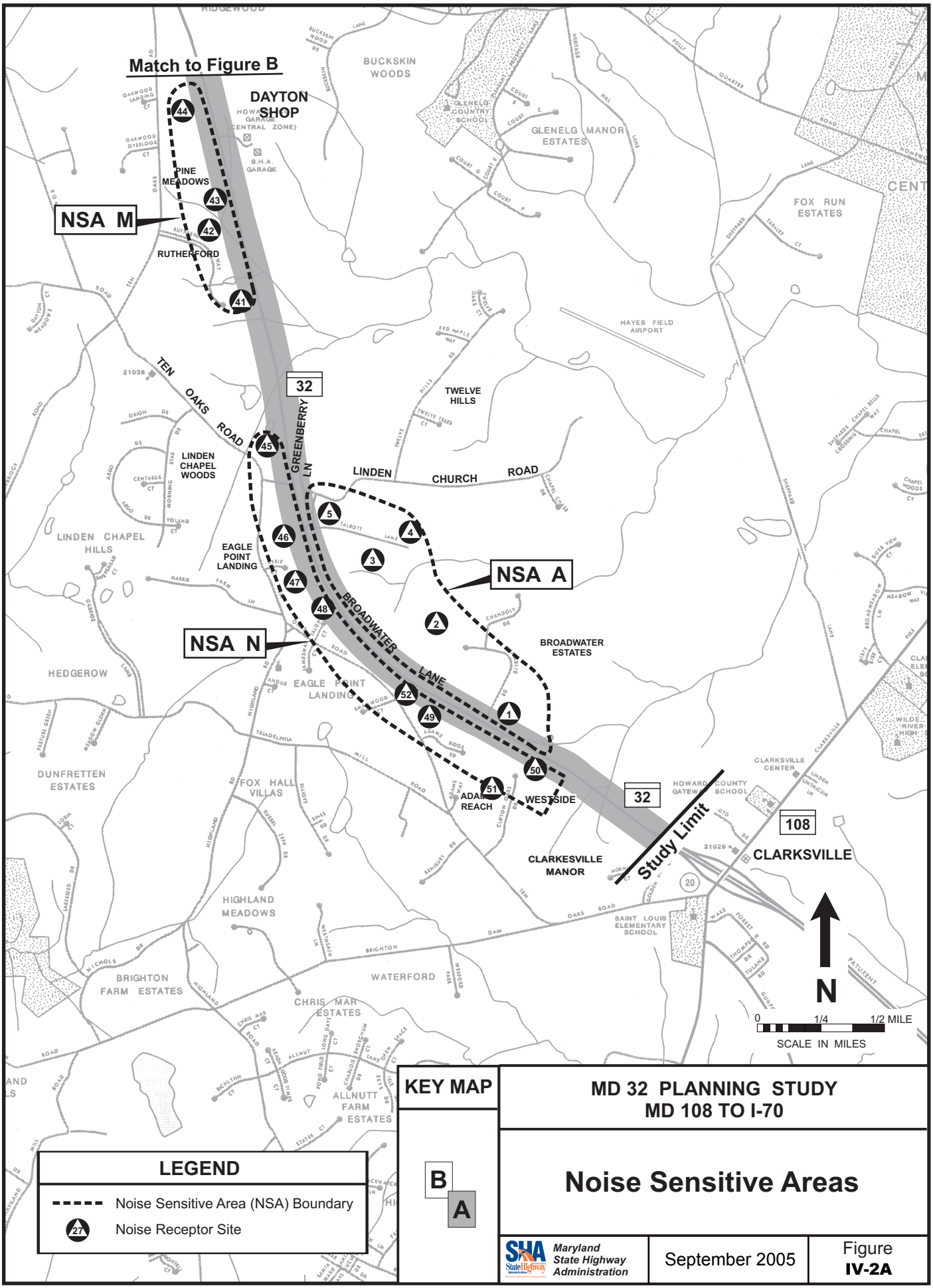
The following is a discussion of noise mitigation for each NSA. The locations of the noise sensitive areas and noise receptors are shown on **Figure IV-2A** and **2B**.

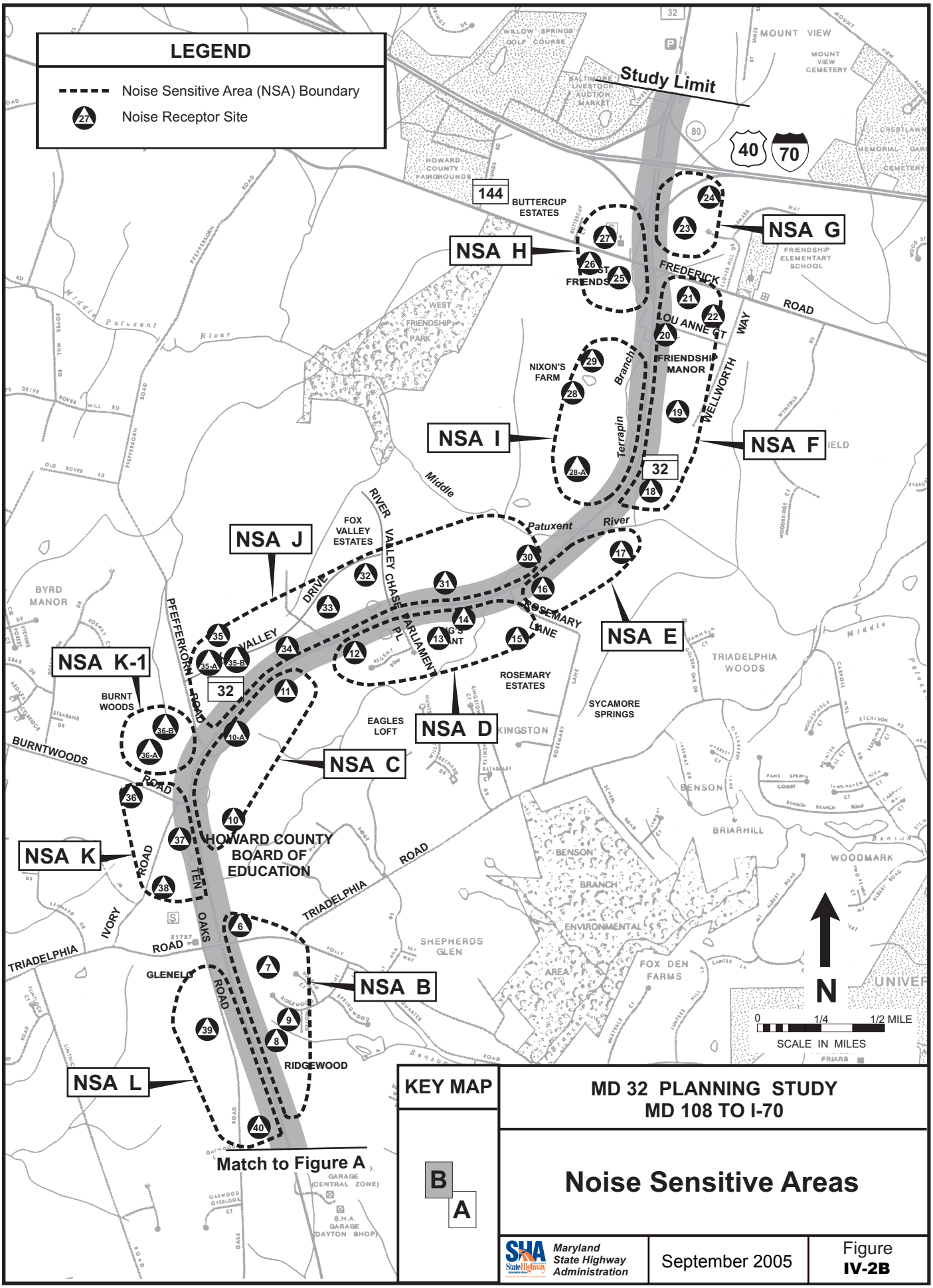
a. Noise Sensitive Area A (Receptors 1 through 5)

NSA A consists of single family residences adjacent to Broadwater Lane, on the east side of MD 32 from Station 135+ to Station 200+ shown on **Sheets 1 and 2** of **Appendix A**.

Impacts: Investigation of a sound barrier is warranted because the 2025 Build noise levels equal or exceed 66 dBA. No receptors were impacted at the substantial increase of 10 dBA or more, nor were the build noise levels greater than or equal to 72 dBA.

Mitigation: To protect the residences, a wall 7,732 feet long with an average height of 19.3 feet, constructed at a cost of $2,760,711, would reduce first row receptor noise levels by up to 10 dBA. The cost per benefited residence is $115,030 for the 24 residences benefited. (A berm, in combination with a short retaining wall adjacent to Broadwater Lane, was analyzed for this NSA. The total cost would be $4,388,640 or $151,330 per residence for the 29 residences benefited). Due to the cost per residence, this NSA does not meet the reasonable cost criterion for further consideration of a barrier.


Match to Figure B
DAYTON SHOP
BUCKSKIN WOODS
GLENELG COUNTRY SCHOOL
GLENELG MANOR ESTATES
FOX RUN ESTATES
PINE MEADOWS
NSA M
RUTHERFORD
HAYES FIELD AIRPORT
TEN OAKS ROAD
32
GREENBERRY LN
TWELVE HILLS
LINDEN CHAPEL WOODS
LINDEN CHURCH ROAD
LINDEN CHAPEL HILLS
EAGLE POINT LANDING
NSA A
NSA N
BROADWATER LANE
BROADWATER ESTATES
HEDGEROW
DUNFRETTEN ESTATES
FOX HALL VILLAS
ADAM REACH
WESTSIDE
CLARKSVILLE CENTER
HOWARD COUNTY GATEWAY SCHOOL
108
CLARKSVILLE
CLARKESVILLE MANOR
Study Limit
HIGHLAND MEADOWS
SAINT LOUIS ELEMENTARY SCHOOL
BRIGHTON FARM ESTATES
WATERFORD
CHRIS MAR ESTATES
ALLNUTT FARM ESTATES
N
0 1/4 1/2 MILE
SCALE IN MILES
LEGEND
Noise Sensitive Area (NSA) Boundary
Noise Receptor Site
KEY MAP
B
A
MD 32 PLANNING STUDY
MD 108 TO I-70
Noise Sensitive Areas
Maryland State Highway Administration
September 2005
Figure
IV-2A


LEGEND
Noise Sensitive Area (NSA) Boundary
Noise Receptor Site
Study Limit
NSA G
NSA H
NSA I
NSA F
NSA J
NSA K-1
NSA E
NSA D
NSA C
NSA K
NSA B
NSA L
Match to Figure A
HOWARD COUNTY BOARD OF EDUCATION
BUTTERCUP ESTATES
FRIENDSHIP ELEMENTARY SCHOOL
FRIENDSHIP MANOR
NIXON'S FARM
FOX VALLEY ESTATES
ROSEMARY ESTATES
SYCAMORE SPRINGS
EAGLES LOFT
BURNT WOODS
TRIADELPHIA WOODS
BENSON BRANCH ENVIRONMENTAL AREA
SHEPHERDS GLEN
FOX DEN FARMS
RIDGEWOOD
GLENELG
WOODMARK
BRIARHILL
MOUNT VIEW
WEST FRIENDSHIP PARK
HOWARD COUNTY FAIRGROUNDS
WILLOW SPRINGS GOLF COURSE
BALTIMORE LIVESTOCK AUCTION MARKET
MOUNT VIEW CEMETERY
CRESTLAWN MEMORIAL GARDENS CEMETERY
Middle Patuxent River
Patuxent River
Terrapin Branch
Middle Branch
FREDERICK ROAD
LOU ANNE CT
WAY
WELLWORTH
ROSEMARY LANE
VALLEY CHASE PL
PARLIAMENT
DRIVE
PFEFFERKORN ROAD
BURNTWOODS ROAD
TEN OAKS ROAD
IVORY ROAD
TRIADELPHIA ROAD
KINGSTON
BENSON
N
0 1/4 1/2 MILE
SCALE IN MILES
KEY MAP
B
A
MD 32 PLANNING STUDY
MD 108 TO I-70
Noise Sensitive Areas
Maryland State Highway Administration
September 2005
Figure
IV-2B

NSA A Noise Analysis Summary

Rec.	Peak Ambient Level	2025 Build Level	2025 No-Build Level	Change Over Ambient Level	Change Over 2025 No-Build Level	Build With Barrier	Insertion Loss
1	61	68	66	7	2	58	10
2	54	59	58	5	1	52	7
3	60	66	64	6	2	58	8
4	51	58	53	7	5	57	1
5	55	64	62	9	2	62	2

b. Noise Sensitive Area B (Receptors 6 through 9)

NSA B consists of single family residences and a church adjacent to Triadelphia Road and Ridgewood Drive, on the east side of MD 32 from Station 310+ to Station 340+ shown on **Sheet 3 of Appendix A**.

Impacts: Investigation of a sound barrier is warranted because the 2025 build noise levels equal or exceed 66 dBA. No receptors were impacted at the substantial increase of 10 dBA or more, nor were the build noise levels greater than or equal to 72 dBA.

Mitigation: To protect the residences, a wall 4,558 feet long with a height of 24 feet, constructed at a cost of $2,023,752, would reduce first row receptor noise levels by up to 10 dBA. The cost per benefited residence is $183,977 for the 11 residences benefited (the former Westwood M.E. church, currently a historic site used for retail, counts as two residences). A berm was analyzed for this NSA as an alternative to a reflective wall. The total cost of the berm would be $825,510 or $77,500 per residence for the 11 residences benefited. In addition, approximately 2.5 acres would be required from adjacent property owners for berm construction.) Due to the cost per residence, this NSA does not meet the reasonable cost criterion for further consideration of a barrier.

NSA B Noise Analysis Summary

Rec.	Peak Ambient Level	2025 Build Level	2025 No-Build Level	Change Over Ambient Level	Change Over 2025 No-Build Level	Build With Barrier	Insertion Loss
6	67	68	66	1	2	63	5
7	58	62	59	4	3	59	3
8	66	69	67	3	2	59	10
9	58	61	58	3	3	52	9

c. Noise Sensitive Area C (Receptors 10 through 11)

NSA C consists of single family residences adjacent to Ivory Road East, on the east side of MD 32 from Station 370+ to Station 390+ shown on **Sheet 3 of Appendix A.**

Impacts: Investigation of a sound barrier is warranted because the 2025 Build noise levels equal or exceed 66 dBA. No receptors were impacted at the substantial increase of 10 dBA or more. The build noise level was greater than or equal to 72 dBA at one receptor.

Mitigation: To protect the residences, a wall 3,084 feet long with a height of 22 feet, constructed at a cost of $1,255,188, would reduce first row receptor noise levels by up to 14 dBA. The cost per benefited residence is $179,313 for the seven residences benefited. (Construction of a berm is not feasible at this NSA.) Due to the cost per residence, this NSA does not meet the reasonable cost criterion for further consideration of a barrier.

NSA C Noise Analysis Summary

Rec.	Peak Ambient Level	2025 Build Level	2025 No-Build Level	Change Over Ambient Level	Change Over 2025 No-Build Level	Build With Barrier	Insertion Loss
10	63	67	66	4	1	58	9
10-A	57	58	58	1	0	55	3
11	70	72	72	2	0	58	14

d. Noise Sensitive Area D (Receptors 12 through 15)

NSA D consists of single family residences in the King's Grant and Rosemary Estates Communities, on the east side of MD 32 from Station 415+ to Station 455+ shown on **Sheet 4 of Appendix A**.

Impacts: Investigation of a sound barrier is warranted because the 2025 Build noise levels equal or exceed 66 dBA. No receptors were impacted at the substantial increase of 10 dBA or more, nor were the build noise levels greater than or equal to 72 dBA.

Mitigation: To protect the residences, a wall 3,944 feet long with an average height of 21.1 feet, constructed at a cost of $1,539,540, would reduce first row receptor noise levels by up to 10 dBA. The cost per benefited residence is $96,221 for the 16 residences benefited. (Construction of a berm is not feasible at this NSA.) Due to the cost per residence, this NSA does not meet the reasonable cost criterion for further consideration of a barrier.

NSA D Noise Analysis Summary

Rec.	Peak Ambient Level	2025 Build Level	2025 No-Build Level	Change Over Ambient Level	Change Over 2025 No-Build Level	Build With Barrier	Insertion Loss
12	63	65	63	2	2	55	10
13	55	58	57	3	1	52	6
14	59	67	65	8	2	60	7
14-A	63	63	63	0	0	55	8
15	57	58	55	2	4	58	1

e. Noise Sensitive Area E (Receptors 16 and 17)

NSA E consists of single family residences on the east side of MD 32 from Station 455+ to Station 475+ shown on **Sheet 4 of Appendix A**.

Impacts: Investigation of a sound barrier is warranted because the 2025 Build noise levels equal or exceed 66 dBA. No receptors were impacted at the substantial increase of 10 dBA or more. The build noise level was greater than or equal to 72 dBA at one receptor.

Mitigation: To protect the residences, a wall 1,815 feet long with a height of 22 feet, constructed at a cost of $738,705 would reduce first row receptor noise levels by up to 11 dBA. The cost per benefited residence is $738,705 for the one residence benefited. (Construction of a berm is not feasible at this NSA.) Due to the cost per residence, this NSA does not meet current criteria for further consideration of a barrier.

NSA E Noise Analysis Summary

Rec.	Peak Ambient Level	2025 Build Level	2025 No-Build Level	Change Over Ambient Level	Change Over 2025 No-Build Level	Build With Barrier	Insertion Loss
16	68	72	67	0	4	61	11
17	57	61	56	0	4	56	3

f. Noise Sensitive Area F (Receptors 18 through 22)

NSA F consists of single family residences in the Friendship Manor Community at the MD144 intersection, on the east side of MD 32 from Station 500+ to Station 530+ shown on **Sheet 5 of Appendix A**.

Impacts: Investigation of a sound barrier is warranted because the 2025 Build noise levels equal or exceed 66 dBA. No receptors were impacted at the substantial increase of 10 dBA or more. The build noise level was greater than or equal to 72 dBA at two receptors.

Mitigation: To protect the residences, a wall 4,743 feet long with an average height of 20 feet, constructed at a cost of $1,754,910 would reduce first row receptor noise levels by up to 8 dBA. The cost per benefited residence is $219,364 for the eight residences benefited. (Construction of

a berm is not feasible at this NSA.) Due to the cost per residence, this NSA does not meet the reasonable cost criterion for further consideration of a barrier.

NSA F Noise Analysis Summary

Rec.	Peak Ambient Level	2025 Build Level	2025 No-Build Level	Change Over Ambient Level	Change Over 2025 No-Build Level	Build With Barrier	Insertion Loss
18	71	76	70	5	6	64	12
19	55	57	54	2	3	53	4
20	68	74	66	6	8	61	13
21	57	64	63	7	1	64	0
22	52	58	55	6	3	54	4

g. Noise Sensitive Area G (Receptors 23 and 24)

NSA G consists of single family residences between MD144 and I-70 on the east side of MD 32, from Station 530+ to Station 550+ shown on **Sheet 5 of Appendix A**.

Impacts: Investigation of a sound barrier is not warranted at this location because the 2025 build noise levels do not exceed 66 dBA and are not equal to or more than 10 dBA above ambient noise levels.

NSA G Noise Analysis Summary

Rec.	Peak Ambient Level	2025 Build Level	2025 No-Build Level	Change Over Ambient Level	Change Over 2025 No-Build Level	Build With Barrier	Insertion Loss
23	62	64	62	2	2	N/A	N/A
24	64	65	64	1	1	N/A	N/A

h. Noise Sensitive Area H (Receptors 25 through 27)

NSA H consists of single family residences adjacent to MD144 west of MD 32, at Station 530+ shown on **Sheet 5 of Appendix A**.

Impacts: Investigation of a sound barrier is not warranted at this location because the 2025 Build noise levels do not exceed 66 dBA and are not equal to or more than 10 dBA above ambient noise levels.

NSA H Noise Analysis Summary

Rec.	Peak Ambient Level	2025 Build Level	2025 No-Build Level	Change Over Ambient Level	Change Over 2025 No-Build Level	Build With Barrier	Insertion Loss
25	60	65	63	5	2	N/A	N/A
26	60	63	62	3	1	N/A	N/A
27	60	62	60	2	2	N/A	N/A

i. Noise Sensitive Area I (Receptors 28 through 29)

NSA I consists of single family residences on the west side of MD 32, from Station 500+ to Station 510+ shown on **Sheet 3 of Appendix A**.

Impacts: Investigation of a sound barrier is not warranted at this location because the 2025 Build noise levels do not exceed 66 dBA and are not equal to or more than 10 dBA above ambient noise levels.

NSA I Noise Analysis Summary

Rec.	Peak Ambient Level	2025 Build Level	2025 No-Build Level	Change Over Ambient Level	Change Over 2025 No-Build Level	Build With Barrier	Insertion Loss
28	56	59	56	3	3	N/A	N/A
28-A	58	64	58	6	6	N/A	N/A
29	57	57	55	0	2	N/A	N/A

j. Noise Sensitive Area J (Receptors 30 through 35-B)

NSA J consists of single family residences in the Fox Valley Estates Community on the west side of MD 32, from Station 380+ to Station 460+ shown on **Sheet 3 of Appendix A**.

Impacts: Investigation of a sound barrier is warranted because the 2025 Build noise levels equal or exceed 66 dBA. No receptors were impacted at the substantial increase of 10 dBA or more, nor were the build noise levels greater than or equal to 72 dBA.

Mitigation: To protect the residences, a wall 6,664 feet long with an average height of 20 feet, constructed at a cost of $2,465,680 would reduce first row receptor noise levels by up to twelve dBA. The cost per benefited residence is $54,793 for the 45 residences benefited. (Construction of a berm is not feasible at this NSA.) Due to the cost per residence, this NSA does not meet the reasonable cost criterion for further consideration of a barrier. Because no impacted NSA has a cost per residence of $50,000 or less, project cost averaging is not applicable.

NSA J Noise Analysis Summary

Rec.	Peak Ambient Level	2025 Build Level	2025 No-Build Level	Change Over Ambient Level	Change Over 2025 No-Build Level	Build With Barrier	Insertion Loss
30	63	65	63	2	2	65	0
31	57	66	62	9	4	59	7
32	55	57	55	2	2	50	7
33	53	59	57	6	2	47	12
34	58	66	64	8	2	56	10
35	57	54	53	-3	1	48	6
35-A	62	66	62	4	4	57	9
35-A	63	64	63	1	1	56	8

k. Noise Sensitive Area K (Receptors 36 through 38)

NSA K consists of single family residences adjacent to Ten Oaks Road on the west side of MD 32, from Station 345+ to Station 365+50 shown on **Sheet 3 of Appendix A**.

Impacts: Investigation of a sound barrier is warranted at this location because the 2025 Build noise levels exceed 66 dBA. No receptors were impacted at the substantial increase of 10 dBA or more, nor were the build noise levels greater than or equal to 72 dBA.

Mitigation: To protect the residences, a wall 2,146 feet long with an average height of 20 feet, constructed at a cost of $794,020 would reduce first row receptor noise levels by up to 10 dBA. The cost per benefited residence is $794,020 for the one residence benefited. (Construction of a berm is not feasible at this NSA.) Due to the cost per residence, this NSA does not meet the reasonable cost criterion for further consideration of a barrier.

NSA K Noise Analysis Summary

Rec.	Peak Ambient Level	2025 Build Level	2025 No-Build Level	Change Over Ambient Level	Change Over 2025 No-Build Level	Build With Barrier	Insertion Loss
36	58	62	60	4	2	61	1
37	62	69	66	7	3	59	10
38	57	57	57	0	0	53	4

l. Noise Sensitive Area K-1 (Receptors 36A and 36-B)

NSA K-1 consists of single-family residences (planned but not yet constructed) adjacent to Burnt Woods Road on the west side of MD 32, from Station 365+50 to Station 375+00 shown on **Sheet 3 of Appendix A**.

Impacts: Investigation of a sound barrier is warranted at this location because the 2025 Build noise levels exceed 66 dBA. One receptor is impacted by a 10 dBA increase. No receptors had build noise levels greater than or equal to 72 dBA.

Mitigation: To protect the residences, a wall 1,456 feet long with an average height of 20 feet, constructed at a cost of $538,720 would reduce first row receptor noise levels by up to 13 dBA. The cost per benefited residence is $67,340 for the eight residence benefited. (Construction of a berm is not feasible at this NSA.) Due to the cost per residence, this NSA does not meet the reasonable cost criterion for further consideration of a barrier. Because no impacted NSA has a cost per residence of $50,000 or less, project cost averaging is not applicable.

NSA K-1 Noise Analysis Summary

Rec.	Adjusted Ambient Level	2025 Build Level	2025 No-Build Level	Change Over Ambient Level	Change Over 2025 No-Build Level	Build With Barrier	Insertion Loss
36-A	60	65	61	5	4	57	8
36-B	59	69	60	10	9	56	13

m. Noise Sensitive Area L (Receptors 39 and 40)

NSA L consists of single family residences adjacent to Ten Oaks Road, on the west side of MD 32 from Station 305+ to Station 325+ shown on **Sheet 3 of Appendix A**.

Impacts: Investigation of a sound barrier is warranted because the 2025 Build noise levels equal or exceed 66 dBA. No receptors were impacted at the substantial increase of 10 dBA or more, nor were the build noise levels greater than or equal to 72 dBA.

Mitigation: To protect the residences, a wall 2,776 feet long with a height of 22 feet, constructed at a cost of $1,129,832, would reduce first row receptor noise levels by up to 9 dBA. The cost per benefited residence is $141,229 for the eight residences benefited. (A berm was analyzed for this NSA as an alternative to a reflective wall. The total cost of the berm would be $455,000 or $56,875 per residence for the eight residences benefited. In addition, approximately 0.6 acre would be required from adjacent property owners for berm construction.) Due to the cost per residence, this NSA does not meet the reasonable cost criterion for further consideration of a barrier.

NSA L Noise Analysis Summary

Rec.	Peak Ambient Level	2025 Build Level	2025 No-Build Level	Change Over Ambient Level	Change Over 2025 No-Build Level	Build With Barrier	Insertion Loss
39	61	68	66	7	2	59	9
40	61	63	60	2	3	57	6

n. Noise Sensitive Area M (Receptors 41 through 44)

NSA M consists of single family residences adjacent to Ten Oaks Road and Rutherford Way, on the west side of MD 32 from Station 240+ to Station 290+ shown on **Sheet 2 of Appendix A**.

Impacts: Investigation of a sound barrier is warranted because the 2025 Build noise levels equal or exceed 66 dBA. No receptors were impacted at the substantial increase of 10 dBA or more, nor were the build noise levels greater than or equal to 72 dBA.

Mitigation: To protect the residences, a wall 5,646 feet long with a height of 24 feet, constructed at a cost of $2,506,824, would reduce first row receptor noise levels by up to 9 dBA. The cost per benefited residence is $192,833 for the thirteen residences benefited. (A berm was analyzed for a portion of this NSA with the remainder of the required mitigation being provided by a reflective wall. The total cost of the wall and berm would be $2,719,380 or $209,180 per residence for the 13 residences benefited.) In addition, approximately 0.6 acre would be required from adjacent property owners for berm construction.) Due to the cost per residence and the Build/No-Build noise level difference, this NSA does not meet the cost criterion for further consideration of a barrier.

NSA M Noise Analysis Summary

Rec.	Peak Ambient Level	2025 Build Level	2025 No-Build Level	Change Over Ambient Level	Change Over 2025 No-Build Level	Build With Barrier	Insertion Loss
41	59	67	63	8	4	62	5
42	54	60	58	6	2	56	4
43	65	66	64	1	2	58	8
44	64	64	62	0	2	55	9

o. Noise Sensitive Area N (Receptors 45 through 52)

NSA N consists of single family residences in the Eagle Point Landing and Adams Reach Communities, on the west side of MD 32 from Station 120+ to Station 220+ shown on **Sheet 1 of Appendix A.**

Impacts: Investigation of a sound barrier is warranted because the 2025 Build noise levels equal or exceed 66 dBA. No receptors were impacted at the substantial increase of 10 dBA or more, nor were the build noise levels greater than or equal to 72 dBA.

Mitigation: To protect the residences, a wall 11,106 feet long with a height of 24 feet, constructed at a cost of $4,931,064, would reduce first row receptor noise levels by up to 9 dBA. The cost per benefited residence is $197,243 for the 25 residences benefited. (A berm was analyzed where feasible for a portion of this NSA, with the remainder of the required mitigation being provided by a reflective wall. The total cost of the wall and berm would be $3,192,650 or $110,090 per residence for the 29 residences benefited. In addition, approximately 3.6 acres would be required from adjacent property owners for berm construction.) Due to the cost per

residence, this NSA does not meet the reasonable cost criterion for further consideration of a barrier.

NSA N Noise Analysis Summary

Rec.	Adjusted Ambient Level	2025 Build Level	2025 No-Build Level	Change Over Ambient Level	Change Over 2025 No-Build Level	Build With Barrier	Insertion Loss
45	62	62	60	0	2	56	6
46	59	64	61	5	3	55	9
47	60	63	61	3	2	57	6
48	61	67	65	7	2	61	6
49	62	62	60	0	2	56	6
50	62	69	67	7	2	60	9
51	57	60	58	3	2	55	5
52	62	66	64	4	2	58	8

5. Construction Impacts

As with any major construction project, areas around the construction site are likely to experience varied periods and degrees of noise impact. This type of project would probably employ the following pieces of equipment that would likely be sources of construction noise:

- Bulldozer and Earth Movers
- Graders
- Front End Loaders
- Dump and other Diesel Trucks
- Compressors
- Pile Drivers

Construction noise level specifications, especially relating to nighttime periods in more sensitive areas, will be coordinated with Howard County. Temporary fencing will be considered, where feasible, to screen construction activities.

K. Visual Quality

The No-Build Alternative would not have an impact on the visual quality of the study area. All of the build alternatives including SHA's Selected Alternative would alter the visual quality of the study area.

The majority of the present views from a driver's perspective along most of MD 32 from MD 108 to I-70 consist of trees along both edges of the right-of-way, which produce a narrow and often closed-in corridor. Open fields, at-grade intersections, and residential areas occasionally break this visual effect. Few expansive or distant views of the broader landscape or the horizon are available along the project route. The primary post-construction visual effect of

the build alternatives would be to produce views of a wider corridor along the main line, but not otherwise substantially different than the current view. In a few instances where trees presently form only a narrow visual buffer to adjacent open areas, project implementation would remove those trees for construction of additional lanes, such that the views of those adjacent open fields and residential areas would be available. At interchanges, the removal of much of the tree cover would open the view so drivers would see approaching exit/entrance ramps, overpasses, and associated signs similar to most other highways in the region. The access ramps and bridges would not act as visual barriers to any especially unique or picturesque viewsheds. The differences in visual effects between the build alternatives would be minimal.

Views of MD 32 from residential sites in the area would change whereby the road may in some cases be a more dominant part of the landscape, especially at intersections where grades are raised, and bridges and ramps are installed. These would be more visible to residences/viewers located at higher elevations where trees that presently buffer views of the road would be removed. To address public concerns on visual impacts, screening (i.e. dense landscape plantings or other measures) would be strategically placed in the SHA right-of-way to screen residential areas in close proximity to MD 32. The exact location, type, and amount of screening will be determined in final design. Any landscaping used for screening purposes would be a densely planted mix of evergreen species such as pine, spruce, and holly.

L. Municipal, Industrial, and Hazardous Materials Sites

Based upon completion of the field reconnaissance, review of the environmental database search, and a review of historical aerial photographs and maps, a total of 15 sites were identified within the corridor search boundaries established in the environmental database report. These 15 sites were determined to be adjacent to or within close proximity to the proposed project improvements and to be sites of environmental concern which may affect the environmental integrity of the study area. **Table IV-14** provides a summary of those sites which have been determined to present potential environmental impacts in the study area.

Table IV-14: Sites of Potential Environmental Concern

Site Number	EDR Map ID	Status	Case Description
1	**1**	Closed	LUST
2	**1**	Open	UST
3	**1**	Open w/No Violations	SQG
4	**5**	Open	LUST
5	**5**	Open	LUST
6	*****	Open	UST
7	**5**	Open	UST
8	**5**	Open w/No Violations	SQG
9	**5**	Open	UST SQG
10	**6**	Open	SQG
11	**6**	Open w/No Violations	UST SQG
12	*****	Open	UST
13	**7**	Open w/No Violations	SQG
14	**N/A**	N/A	Transformers
15	**N/A**	N/A	Transformers

Note: *Orphan Site –unmappable site

A Public Information Act (PIA) request was submitted to MDE for additional information concerning the 15 sites identified in the vicinity of the MD 32 study area that could be potential subsurface contamination sources. File information for these sites was made available for review from MDE. Based upon a review of the file information and the relation of the site locations to the proposed improvements the No-Build Alternative would not impact hazard materials sites in the study area. However, build alternatives, could have potential impact on six potential sources of subsurface contamination in the study area. These six sites were determined to be potential sites of concern due to the presence of conditions that could or have previously led to subsurface contamination. Case files for these sites include documented subsurface contamination from leaking underground storage tanks (LUST), hazardous materials spills, or releases.

1. Site 1 (LUST)

This site is identified on the MDE LUST database as having seven Underground Storage Tanks (UST) removed from service, with evidence of petroleum leakage, as shown in **Figure III-13.** During excavation of two USTs in December 1992, elevated concentrations of petroleum were encountered in the soil. A groundwater monitoring well was installed on the site and a periodic sampling program was initiated. Based upon the results of the sampling, MDE issued a Notice of Compliance for this property in November 1993. The case for this site is currently closed with no further remediation required. Recent sampling results for this site indicate that significant contamination does not remain. However, there still remains a slight potential that residual amounts of oil-contaminated soils could be encountered during excavation activities on or near the property.

2. Site 2 (UST)

This site is identified on the UST database maintained by MDE, as shown in **Figure III-13**. The site is an operating gas station and convenience mart. The site contains two, 10,000 gallon gasoline fuel tanks, which were installed in September 1995. Based upon the age of the tanks, the potential risk of a petroleum release is minimal at this time. Both Build Alternatives I and II, and SHA's Selected Alternative could result in a potential acquisition of this site. If this site is determined to be impacted by the planned improvements, the contents of the USTs should be emptied and removed from the site in accordance with MDE tank closure requirements.

3. Site 4 (LUST)

This site is identified on the LUST database by MDE, as shown in **Figure III-13**. During the removal of two, approximately 275-gallon USTs from service in June 1996, evidence of groundwater contamination by a heating oil leak was identified at this single family residence. The petroleum release was identified as contaminating the domestic well, which serviced the adjoining residential property to the east. A groundwater sampling plan was implemented for this property in addition to the installation of a new domestic well for the adjoining residence. A hydrogeologic investigation identified the extent of the shallow contamination plume in the groundwater. A remediation system to treat the contaminated groundwater was first implemented in March 1997. Subsequent remediation systems have resulted in a decrease of petroleum contamination in the groundwater. The case for this site appears to remain in an open status with MDE. Based upon the direction of groundwater flow on the site, it appears that the contamination plume is migrating to the southeast and away from the planned improvements as outlined in Build Alternatives I and II, including SHA's Selected Alternative. This site appears to present a minimal risk of contamination to the project.

4. Site 5 (LUST)

This site is also identified on the MDE LUST database, as shown in **Figure III-13**. Two USTs were removed from this site in 1981 and 1990 respectively. During excavation of the second tank, subsurface contamination was identified and three monitoring wells were installed. Soil and groundwater sampling revealed petroleum contamination of both the soil and groundwater. Periodic sampling showed a fluctuation in the levels of petroleum contamination over several years. A February 2004 sampling report identified no free product in the monitoring wells and no indication of contaminated groundwater migration onto adjoining properties. The case for this site remains in an open status with no active remediation currently in place. Both Build Alternatives I and II, including SHA's Selected Alternative appear to involve cut operations for roadway widening along the right-of-way in the vicinity of this site. Groundwater data obtained from this site has identified that the contamination plume is not migrating onto adjoining properties. It does appear that the risk of contamination to the study area from this site remains minimal.

5. Site 10 (RCRIS-SQG)

This site is identified on the EPA Resource Information System Small Quantity Generator (RCRIS-SQG) and the MDE UST, as shown in **Figure III-13**. A tank removal report from June 2004 described the removal of one, 2,000 gallon UST and one 275 gallon UST from this site. During removal of the tanks, no evidence of petroleum odors or staining was observed. MDE requested the collection of groundwater samples from two monitoring wells on site. Results of the sampling were not included in the PIA file and are not available for review. Based upon a review of Build Alternatives I and II, including SHA's Selected Alternative, it does appear that this site will be impacted through cut and fill operations as part of new access road construction under the improvement project. During these operations, there is a minimal potential that petroleum contaminated soils may be encountered.

6. Site 11 (RCRIS-SQG)

This site is also identified on the EPA RCRIS-SQG and the MDE UST database, as shown in **Figure III-13**. A review of the case file for this site identified a petroleum release in March 2003 as the result of a fuel line breakage. Soil surrounding the UST was contaminated with petroleum. The contaminated soils were excavated from the area and sent to a landfill for proper disposal. Based upon a review of Build Alternatives I and II, including SHA's Selected Alterantive, it does appear that this site would be impacted through cut and fill operations as part of new access road construction under the improvement project. During these operations, there is a minimal potential that residual amounts of petroleum contaminated soils may be encountered.

7. Results

During construction of SHA's Selected Alternative, there is a minimal potential for petroleum contaminated soils and/or groundwater to be encountered at all six sites. However, either SHA's Selected Alternative or Build Alternative I would impact Site 1LUST and Site 2UST. If these properties are to be acquired for construction of this project, then a preliminary site investigation, including subsurface soil and groundwater sampling, would be conducted to determine the potential impacts of contamination.

If oil contaminated soils or groundwater are discovered during excavation activities, the MDE Oil Control Program should be contacted immediately. The oil-contaminated soils must be managed and disposed of in accordance with MDE Requirements (COMAR 26.10.13). Oil-contaminated soils should be segregated from clean soils and the presence of petroleum contamination confirmed by laboratory analysis. Confirmed oil-contaminated soils should be disposed of at an off-site, oil-contamination treatment facility which has been approved by MDE.

As part of the design phase, the area of contact with these two sites would be thoroughly investigated and necessary site-specific measures to minimize impacts would be identified. This would most likely involve the removal and disposal of the waste at an authorized and permitted disposal facility.

M. Energy

There would be no notable difference in energy usage requirements between the build alternatives. Initially, the No-Build Alternative would require the least amount of expended energy compared to the construction of a build alternative. However, in the long term, the energy expended due to projected traffic congestion in the design year as a result of the No-Build Alternative is likely to exceed the initial energy expenditure for construction of one of the build alternatives.

N. Construction Impacts

Construction activities associated with SHA's Selected Alternative, Build Alternative I or II would have temporary impacts to resources, residences, businesses, and travelers within the immediate vicinity of the project. These would include traffic detours, potential air and fugitive dust emissions, increase noise levels, impacts to socio-economic and natural resources, and impacts to visual quality.

1. Traffic Detours

Detours and road closures during construction would create temporary inconveniences for residents, business owners, and travelers. Maintenance and protection of traffic plans would be developed during final design to mitigate access impacts and to minimize delays throughout the study area. These plans would include appropriate signs, pavement markings, and media announcements. Access to all businesses and residences would be maintained through construction scheduling.

2. Air Emissions

The operation of heavy equipment would have minor, temporary impacts on air quality during construction of a build alternative. The primary source of impact would be windblown soil and dust in active construction zones, and secondarily from increased levels of exhaust pollutants.

Measures would be taken to reduce fugitive dust and other emissions generated during construction by wetting disturbed soils, staging soil disturbing activities, and prompt re-vegetation of disturbed areas. The contractors, in accordance with state and federal regulations, would control emissions from construction equipment.

3. Construction Noise Impacts

Temporary noise impacts would occur in the study area during construction of any of the build alternatives. Sources of this noise would include earth moving equipment, vibratory rollers, pavers, trucks, jackhammers, and compressors. In most cases, the effect of increased noise levels associated with construction equipment is limited to within 300 feet of the source. These effects would typically be limited to weekday, daylight hours in accordance with local ordinances.

Several mitigation procedures can be followed to minimize temporary impacts of construction noise. Adjustments to equipment, provision of temporary noise barriers, varying construction activity areas to distribute noise events, good communication with the public, and monetary incentives to contractors could be examined during final design to minimize public impacts and annoyances during construction. Construction noise impacts are further discussed in **Section IV.J.5**.

4. Construction Impacts on Natural Resources

Temporary construction related impacts to soils, wetlands, and surface waters would be anticipated to occur as a result of this project. Temporary and permanent impacts to these resources have been addressed throughout **Section IV**.

Temporary impacts to soils include increased erosion potential from areas cleared of vegetation for construction activities. Standard sediment and erosion control measures would be implemented in accordance with state and local regulations to minimize adverse impacts.

Temporary construction related impacts to wetlands include increased sedimentation, in-stream and in-wetland work for the construction of abutments and other structures, and temporary construction crossings. The use of surface mats, clean rock fills, and other measures to be determined during final design, would be used to minimize temporary impact areas. In addition, native vegetation would be reestablished.

Temporary impacts to surface water resources would also be anticipated from construction related activities. Temporary impacts would result from temporary stream crossings, dikes and cofferdams, temporary channel relocations, and suspended solids from increased erosions and sedimentation. Runoff from disturbed areas may contain high sediment loads, which could reduce both the diversity and numbers of organisms in the aquatic environment. Physical impacts such as temporary stream crossings and cofferdams disrupt stream substrate and could affect fish migrations through these areas. This would eliminate benthic macro-invertebrate populations in this portion of the stream during the construction period, and for a short period after construction until migration and drift allow for the re-colonization of the area. Changes to the channel widths resulting from cofferdam construction may generate excessive scouring of the substrate and generate sediment impacts immediately downstream of the construction area.
Refer to **Section IV.F.3** for the restoration and mitigation measures that will be implemented with the project in compliance with the Section 404 permit.

5. Visual Quality

Construction activity and some materials stored for the project may be displeasing to residents in the immediate vicinity of the project. This visual impact would be temporary and should pose no substantial problem in the long term.

O. Secondary and Cumulative Effects Analysis

1. Introduction

A Secondary and Cumulative Effects Analysis (SCEA) was conducted in the late 1990s for the Draft Environmental Impact Statement (DEIS) for the MD 32 Planning Study. The purpose of this SCEA was to evaluate secondary and cumulative effects associated with the proposed improvements to MD 32 from MD 108 to I-70 in Howard County, Maryland. The SCEA has been revised to address agency comments and include input from the Land Use Expert Panel. It has been prepared in compliance with the Council of Environmental Quality (CEQ) regulations implementing the National Environmental Policy Act (NEPA) requirements set forth in 40 CFR 1500 – 1508.

Secondary or indirect impacts can be defined as "…*caused by the action and are later in time or farther removed from in distance, but are still reasonably foreseeable*." (40 CFR 1508.8)

A Cumulative Effect includes "…*the total effect on a natural resource, ecosystem, or human community due to past, present and future activities or actions of Federal, non-Federal, public and private entities. Cumulative impacts include the total of all impacts to a particular resource that have occurred, are occurring and will likely occur as a result of any action or influence, including the direct and reasonably foreseeable indirect impacts of a Federal activity*." (40 CFR 1508.7 and Federal Highway Administration January 2003 Memo)

2. Scoping

a. Resources

Resources impacted directly or secondarily by the project form the basis for resources that are examined in the SCEA. The SCEA analyzed the potential for secondary and cumulative effects to land use and how those effects may impact socioeconomic, cultural, and natural resources. Socioeconomic resources considered include: communities, employment, park/recreational facilities, farmland, and cultural resources (historic structures and archaeological resources). Natural resources considered include: woodlands, surface water, groundwater, wetlands, and floodplains. If a resource is impacted directly or secondarily by the project, it is included in the SCEA. The resources directly affected by the project are summarized in **Table S-1**. All resources considered for the SCEA are summarized in **Table IV-15**.

An investigation was also conducted to identify other projects and "reasonably foreseeable future actions" that could have an influence on the resources within the SCEA boundary to assess potential cumulative effects.

Table IV-15: Resources to be Studied

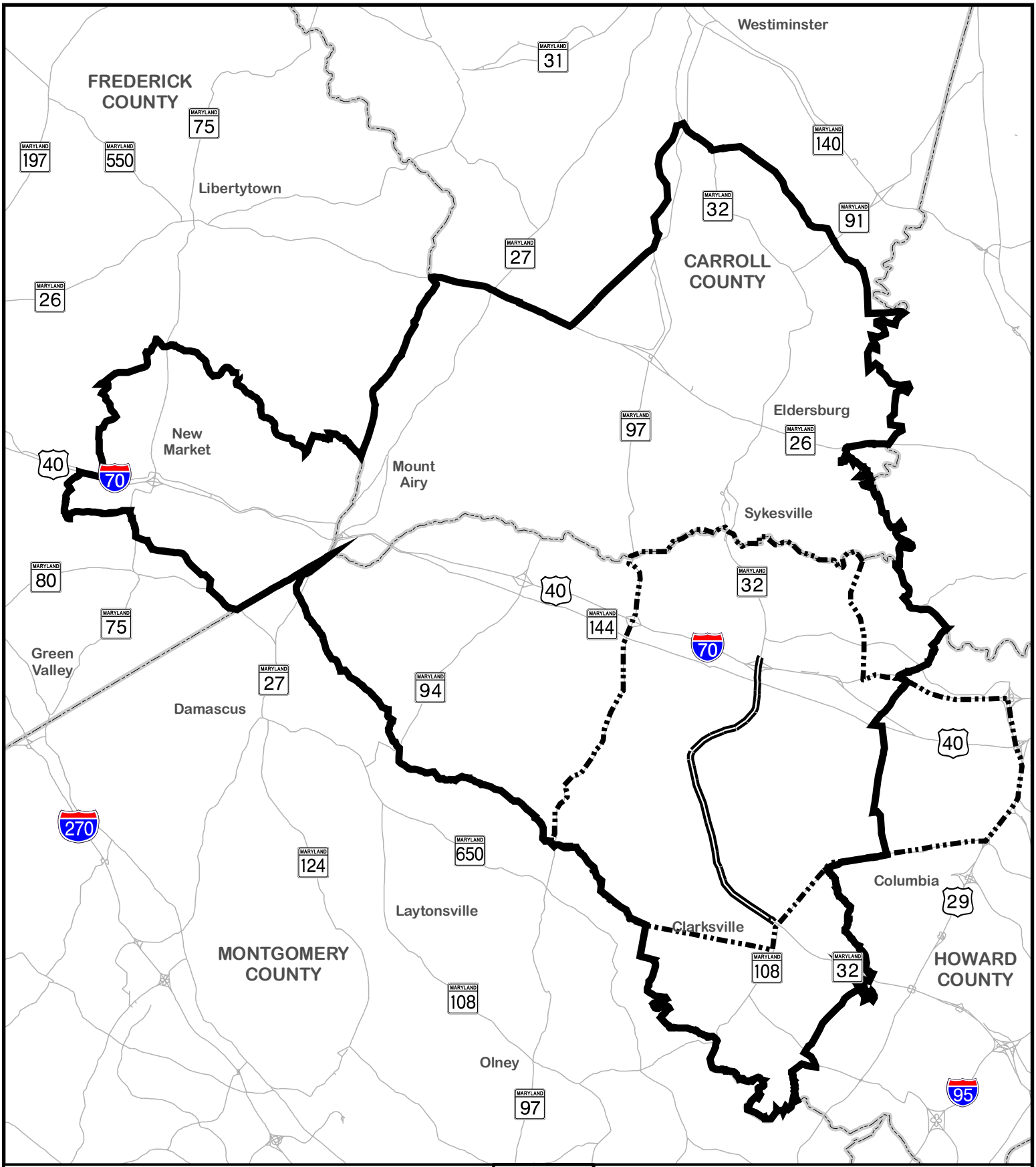
Resource/Issue	Incorporate in SCEA	Rationale	Sub-boundary
Socioeconomic Resources			
Community (cohesion, linkages, services)	**Yes**	Direct Impacts	Census Tracts, Area of Traffic Influence, LUEP Planning Areas
Parks and Recreational Facilities	No	No Direct or Secondary Impacts	N/A
Agriculture	**Yes**	Direct Impacts	Area of Traffic Influence, LUEP Planning Areas
Cultural Resources			
Historic Sites and Structures	No	No Direct or Secondary Impacts	N/A
Archaeological Resources	**Yes**	Direct Impacts	Census Tracts
Natural Environmental Resources			
Surface Water	**Yes**	Direct Impacts	Watersheds
Groundwater	**Yes**	Direct Impacts	Watersheds
Wetlands	**Yes**	Direct Impacts	Watersheds
Floodplains	**Yes**	Direct Impacts	Watersheds
RTE Species	No	No Direct or Secondary Impacts	N/A
Woodlands	**Yes**	Direct Impacts	Watersheds
Hazardous Materials	No	Not a Resource	N/A
Noise	No	Not a Resource	N/A
Air Quality	No	Addressed in regional conformity; not appropriate for SCEA	N/A

b. Geographic Boundary

The SCEA geographic boundary shown in the FEIS was revised from the SCEA geographic boundary of the DEIS. The FEIS SCEA boundary, shown in **Figure IV-3,** is based on an overlay of the 2002 Land Use Expert Panel planning areas, 2000 Census tract boundaries, watersheds and sub-watersheds, and the Area of Traffic Influence. Public water and sewer service is not available within the study area, therefore, sewer and water service boundaries were not used to develop the SCEA boundary.

Land Use Expert Panel Planning Areas

Following the approval of the DEIS by the Federal Highway Administration (FHWA) on January 21, 1999, a Public Hearing was held on March 18, 1999. Many of the comments received at the hearing were related to the potential land use development impacts of the proposed MD 32 alternatives and the SCEA, stating that the SCEA boundary did not cover enough area. In response to these concerns, an independent and objective Land Use Expert Panel (LUEP) was established. The LUEP included nine members having local, regional, and national land use expertise. This group was charged with estimating potential land use changes that may result from the proposed MD 32 improvements, taking into account the local market and planning environment. The results from the Land Use Expert Panel were mixed; however, the data was considered in the update of the SCEA for the FEIS.



LEGEND

- SCEA Boundary
- DEIS SCEA Boundary
- MD 32 Study Area

N

1 inch = 3.5 miles

MD 32 PLANNING STUDY
MD 108 TO I-70

SCEA Boundary

Maryland State Highway Administration

September 2005

Figure IV-3

The study area for the LUEP included 16 sub-areas or clusters of transportation analysis zones and covered all of Howard County, central and southern Carroll County, eastern Frederick County, and a portion of northeastern Montgomery County, as shown in **Figure IV-4**. The boundaries of the 16 sub-areas were overlaid with the DEIS SCEA boundary to help establish the extent of the revised SCEA boundary.

Based on LUEP comments on the potential extent of development impacts, six of the 16 LUEP sub-areas are included in their entirety within the SCEA boundary. Two additional sub-areas, Frederick-Mid and Carroll-Mid Eastern, were only partially included in the SCEA boundary. Mount Airy and New Market, which are the population centers within the Frederick-Mid sub-area that are most likely to have land use changes or development impacts due to the MD 32 project as determined by the LUEP, are included in the SCEA.

The far northern and western portions of Frederick-Mid were excluded from the SCEA boundary based on their rural characteristics, location outside of designated Priority Funding Areas, and proximity to sub-areas that LUEP members indicated are not expected to result in development changes. The southern two-thirds of Carroll Mid-Eastern are included due to their proximity to the Sykesville/Eldersburg area. The northern third was excluded based on its current rural characteristics and expectation that any potential development impacts would be related to projects in the City of Westminster and/or MD 140 corridor, not the MD 32 project.

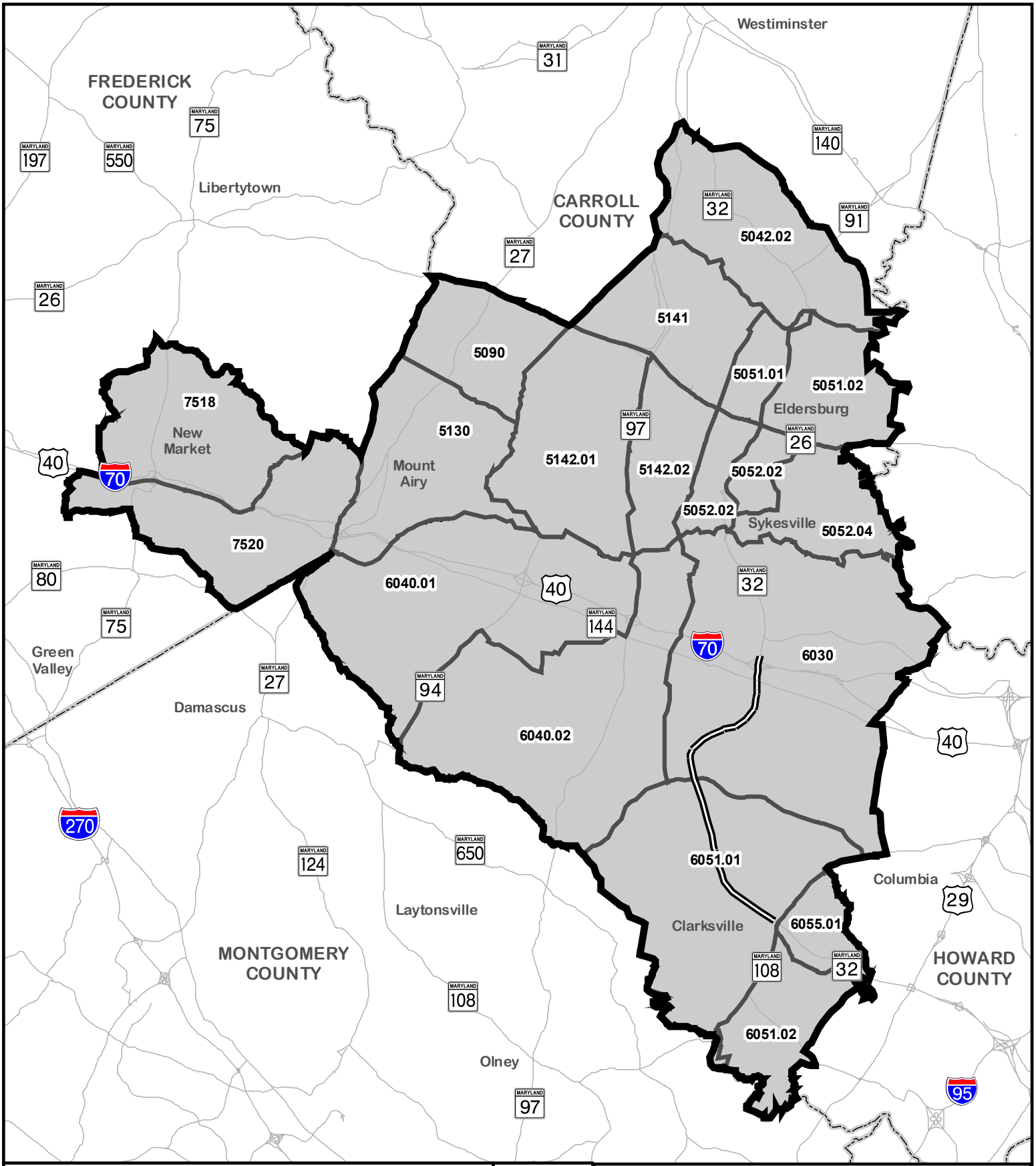
The remaining eight sub-areas were totally eliminated from inclusion of the SCEA. Seven were dismissed based on LUEP members deeming that those areas would have only slight development changes. The eighth was eliminated because the majority of LUEP members agreed that there would be no changes as the result of the MD 32 improvements.

Census Tracts

Subsequent to the DEIS, the US Census Bureau published the results of the 2000 Census. The demographic and socioeconomic data in this SCEA is based on these 2000 Census data. The 2000 Census tracts were used as an overlay with the LUEP sub-area boundaries to aid in defining the revised SCEA boundary, as shown in **Figure IV-5**. The majority of the revised SCEA boundary follows Census tract boundaries, which most closely match the LUEP planning area boundaries. The 17 Census tracts within the revised SCEA boundary represent the extent of the socioeconomic and cultural resources potentially affected by the MD 32 project.

Watersheds

The revised SCEA boundary encompasses portions of eight watersheds. They are the Middle Patuxent River (which includes the project study area), Rocky Gorge Dam, Brighton Dam, Lower Monocacy River, Liberty Reservoir, Little Patuxent, South Branch Patapsco, and Patapsco River watersheds. These watershed boundaries represent the natural environmental resources potentially affected by the project. The watershed boundaries are shown on **Figure IV-6**. Watershed and sub-watershed boundaries defined the SCEA boundary north of New Market and Mount Airy, as well as the northern SCEA boundary.



LEGEND

- SCEA Boundary
- MD 32 Study Area
- 7209 Census Tracts

1 inch = 3.5 miles

MD 32 PLANNING STUDY
MD 108 TO I-70

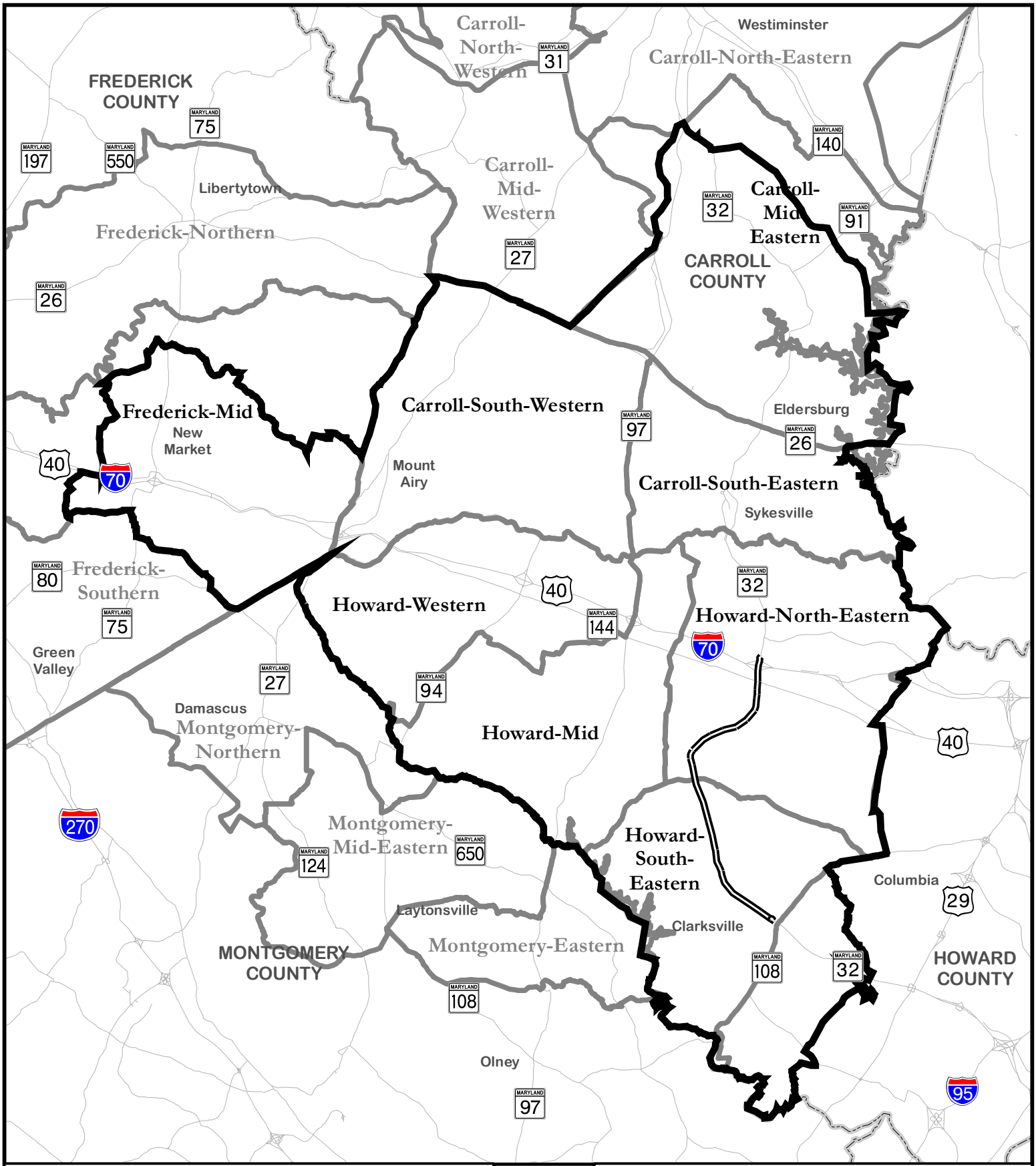
2000 U.S. Census Tracts

Source: U.S. Census Bureau, 2000

Maryland State Highway Administration

September 2005

Figure IV-5



LEGEND

- SCEA Boundary
- MD 32 Study Area
- Sub-Areas from LUEP

1 inch = 3.5 miles

MD 32 PLANNING STUDY
MD 108 TO I-70

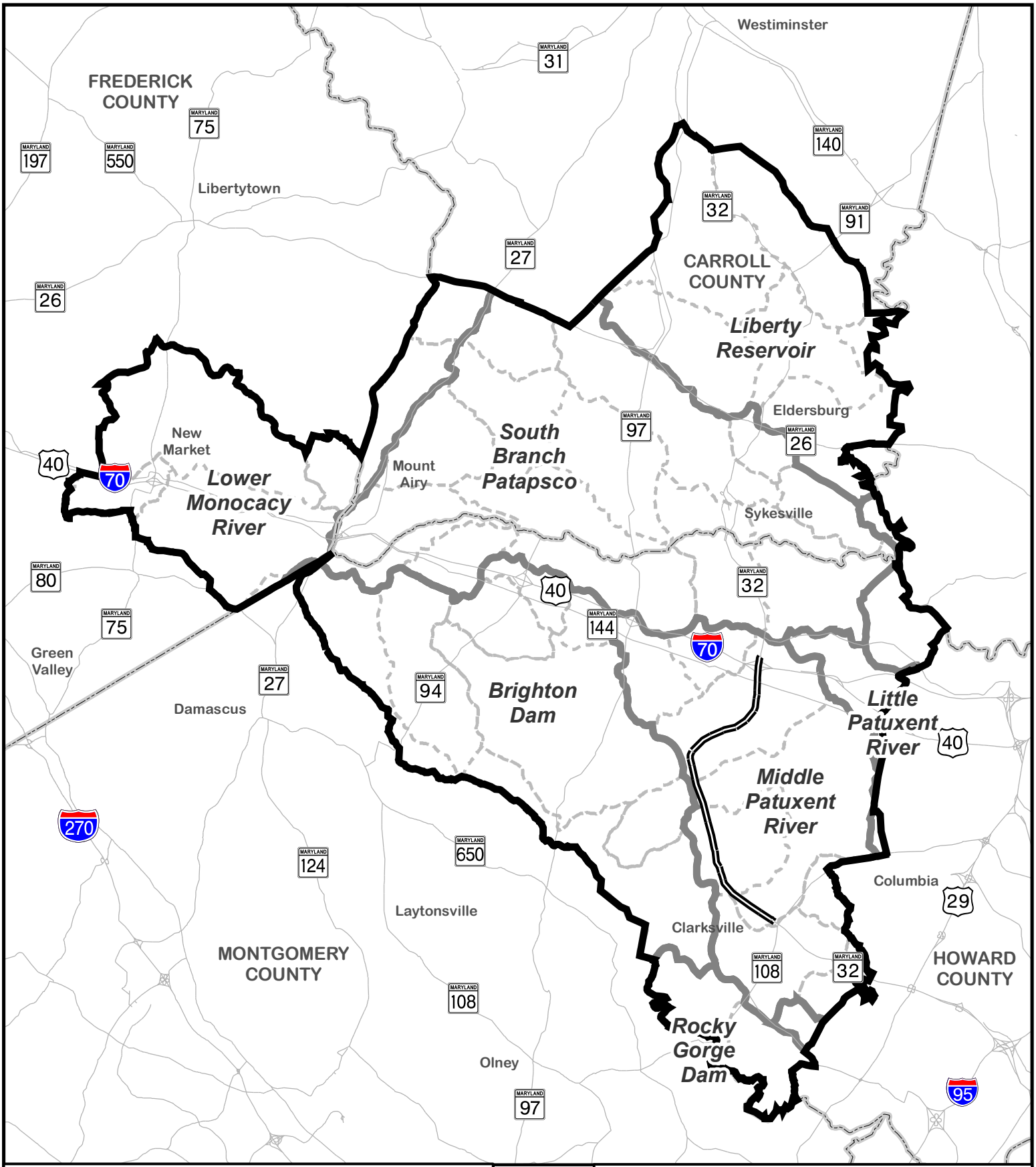
Land Use Expert Panel Sub-Areas within SCEA Vicinity

Source: State Highway Administration, 2004

Maryland State Highway Administration

September 2005

Figure IV-4



LEGEND

- SCEA Boundary
- MD 32 Study Area
- Watersheds
- Sub-Watersheds

1 inch = 3.5 miles

MD 32 PLANNING STUDY
MD 108 TO I-70

Watersheds

Source: Maryland Department of Natural Resources

Maryland State Highway Administration

September 2005

Figure IV-6

Area of Traffic Influence

The Area of Traffic Influence (ATI) is based on changes in traffic volumes by Traffic Analysis Zones (TAZs). The traffic information was updated since the DEIS with the existing traffic year as 2003 and the build year 2025. The Baltimore Metropolitan Council Round 6 Land Use Model was used to determine the projected traffic volumes for the project under No-Build and build alternatives. A select link analysis was performed on the roads surrounding the study area. A difference plot was prepared to show those roadways which would experience a 10 percent or greater increase or decrease in traffic volumes. The result is the area in which vehicular traffic will likely be affected by the build alternatives. The ATI includes 13 TAZs. To address comments on the DEIS and public concerns about the impacts south of MD 108, three additional TAZs were incorporated into the SCEA boundary. The TAZ boundaries were used to define the SCEA boundary to the south and east, as shown in **Figure IV-7**.

Overall SCEA Boundary

The SCEA boundary is a synthesis of the 2000 Census tracts, sub-watershed boundaries, LUEP planning boundaries, and ATI, as shown in **Figure IV-8**. The revised SCEA boundary addresses those comments received on the DEIS regarding the coverage area and considers the LUEP study area. The scale of the proposed SCEA boundary is appropriate for the analysis of cumulative effects and possible secondary effects.

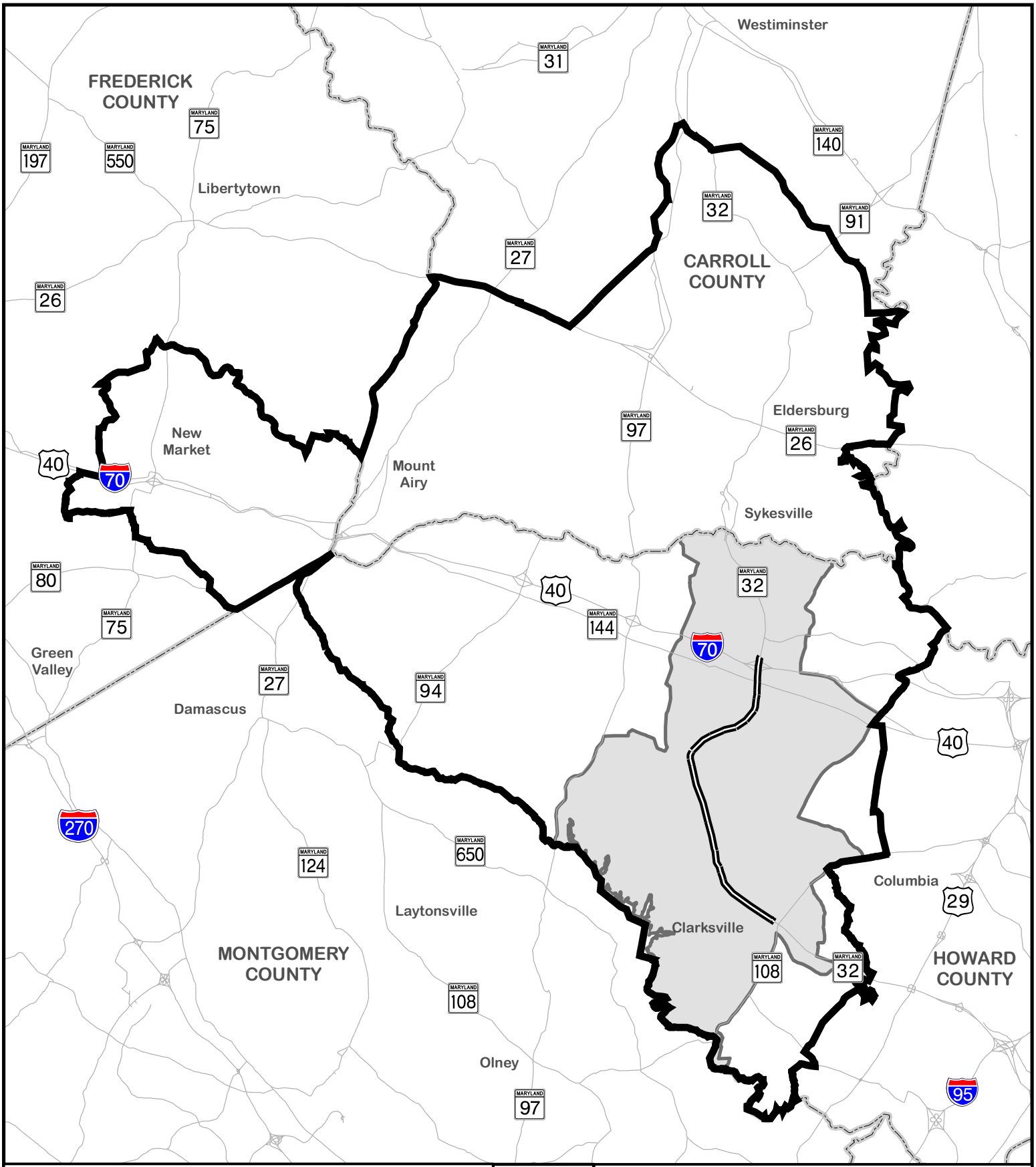
c. Time Frame (Temporal Boundary)

The time frame for the SCEA considers the past, present, and reasonably foreseeable future actions (40 CFR 1508.7). The time frame was established in accordance with SHA's SCEA Guidelines (2000). The time frame for the SCEA analysis is from the 1970 to 2025, a period of 55 years.

The past time frame was established based on historic data that were readily available. The Maryland Department of Planning (MDP) has historic Census data from 1970 to 2000. MDP land use data and mapping was readily available for 1973, 1997, and 2002.

Based on the purpose of this analysis and the data that are readily available, the present time frame covers between 2000 and 2005. Census data for the entire SCEA area is from 2000. The MDP land use data is from 2002. County development permit data bases and community Master Plans (all developed post 2001) were accessed to obtain planned development occurring with the SCEA boundary.

The future time frame of 2025 was determined based on the project's design year. Population projections are available through 2030. Population trends from the MDP and the Baltimore Metropolitan Council (BMC) were compared to show past population and projected growth between 1970 and 2025.



LEGEND

- SCEA Boundary
- MD 32 Study Area
- Area of Traffic Influence

1 inch = 3.5 miles

MD 32 PLANNING STUDY
MD 108 TO I-70

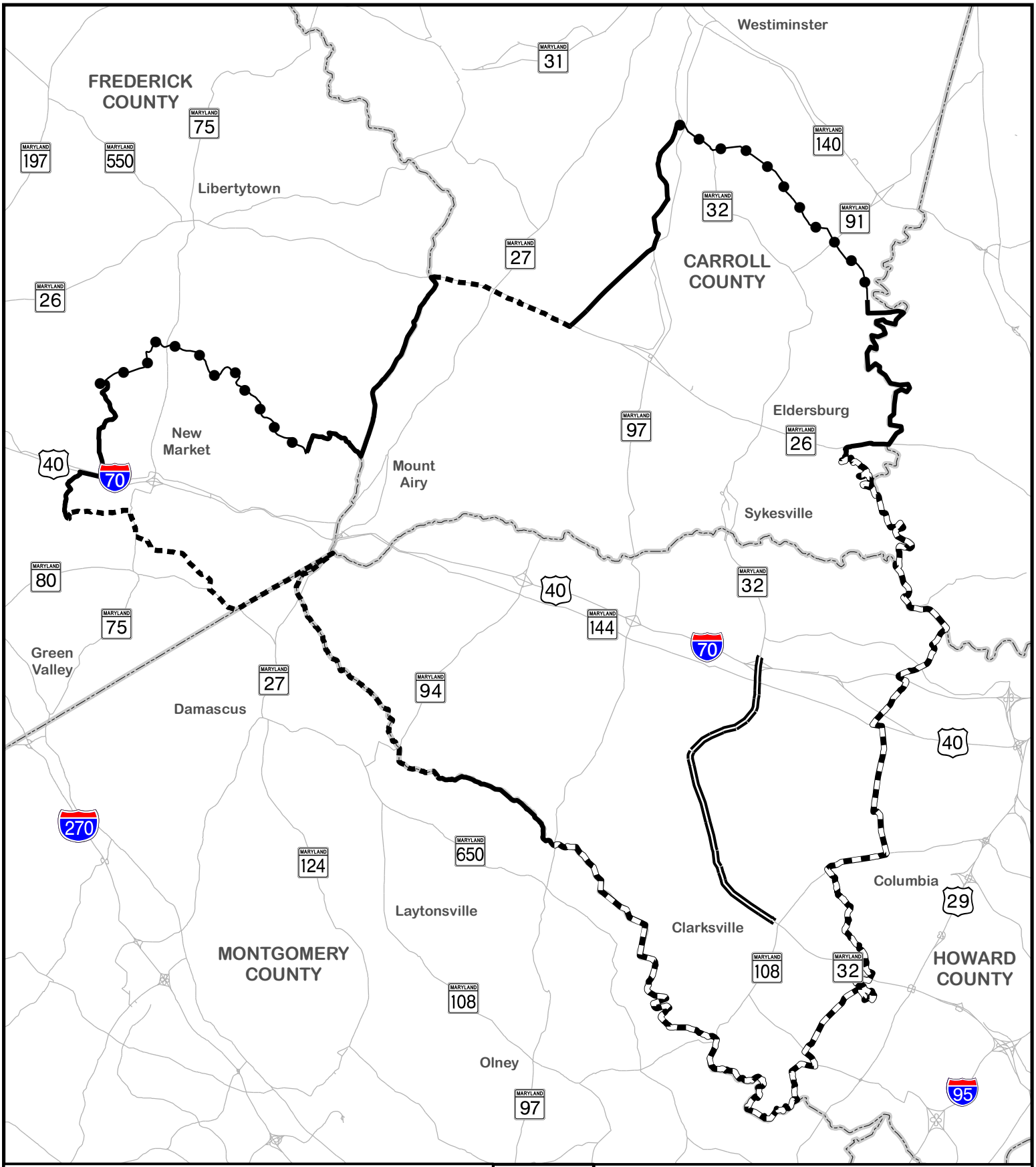
Area of Traffic Influence

Source: BMC, MWCOG 2004, Round 6 TAZ

SHA State Highway Administration — *Maryland State Highway Administration*

September 2005

Figure IV-7



LEGEND

- Census Tracts
- Planning Area
- TAZ
- Watershed
- MD 32 Study Area

1 inch = 3.5 miles

MD 32 PLANNING STUDY
MD 108 TO I-70

SCEA Boundary Composition

Maryland State Highway Administration

September 2005

Figure IV-8

d. Methodology

The methodology for the SCEA included a combination of analysis methodologies. The secondary and cumulative effects analysis used the most recent and readily available data. The two primary methodologies used for the SCEA were trends analysis and map overlays. Trends analysis was used to identify effects over time and to forecast future cumulative effects. Overlays were created using a Geographic Information System to compare land use, zoning and natural environmental constraints. The sources of data and the methodology used to analyze the secondary and cumulative effects are summarized in **Table IV-16**.

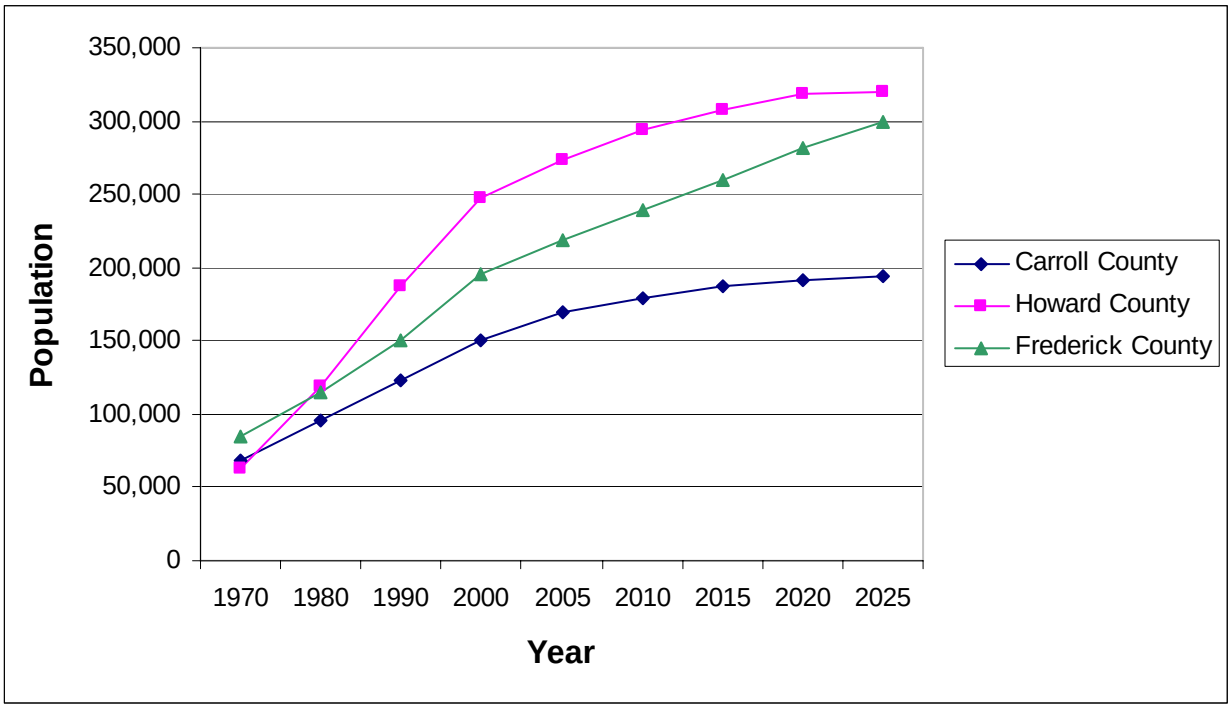
Table IV-16: Summary of SCEA Data Resources and Analysis Methodologies

Resource	Available Data/ Sources	Analysis Methodology
Communities (cohesion, linkages)	Master Plans, Maryland Department of Planning Projections, Census 2000, Baltimore Metropolitan Council Projections	Trends analysis of residential growth and development
Economic Conditions	Master Plans, Maryland Department of Planning Projections	Trends analysis
Cultural Resources, Archaeological Sites	Maryland Historical Trust, National Register of Historic Places	Trends analysis
Woodlands	Land Use Mapping, Maryland Department of Planning Trends Analysis, Maryland Department of Natural Resources	Overlays of past, present and future land use mapping. Trends analysis
Farmland / Agricultural Easements / Protected Land	Master Plans, Land Use Mapping, MDP, County Soil Conservation Services, US Department of Agriculture	Overlays of land use mapping and trends analysis from the county agriculture profiles
Surface Water and Floodplains	Watershed and stream mapping, NPDES permit data, Federal Emergency Management Agency, Maryland Department of Environment	Trends analysis
Groundwater Resources	Maryland Department of Environment, Land Use Plans	Trends analysis
Wetlands	National Wetland Inventory, Maryland Department of Environment, MDP	Trends analysis of wetland acreage

3. Land Use and Development Trends

Howard, Carroll, and Frederick Counties experienced substantial population growth between 1970 and 2000. Howard County experienced the most substantial growth among the three counties with a 90 percent change between 1970 and 1980, a 58 percent change between 1980 and 1990, and a 32 percent change between 1990 and 2000. The MDP projections show that population growth will continue at a slower rate in these three counties, with the projected trend for Howard and Carroll Counties expected to level out by 2025 at approximately one percent per year. The population in Frederick County is projected to continue growing at an average of about 16 percent per decade through 2025. **Figure IV-9** shows the past, present, and projected population trends between 1970 and 2025.

Figure IV-9: Population Trends in Howard, Carroll, and Frederick Counties between 1970 and 2025

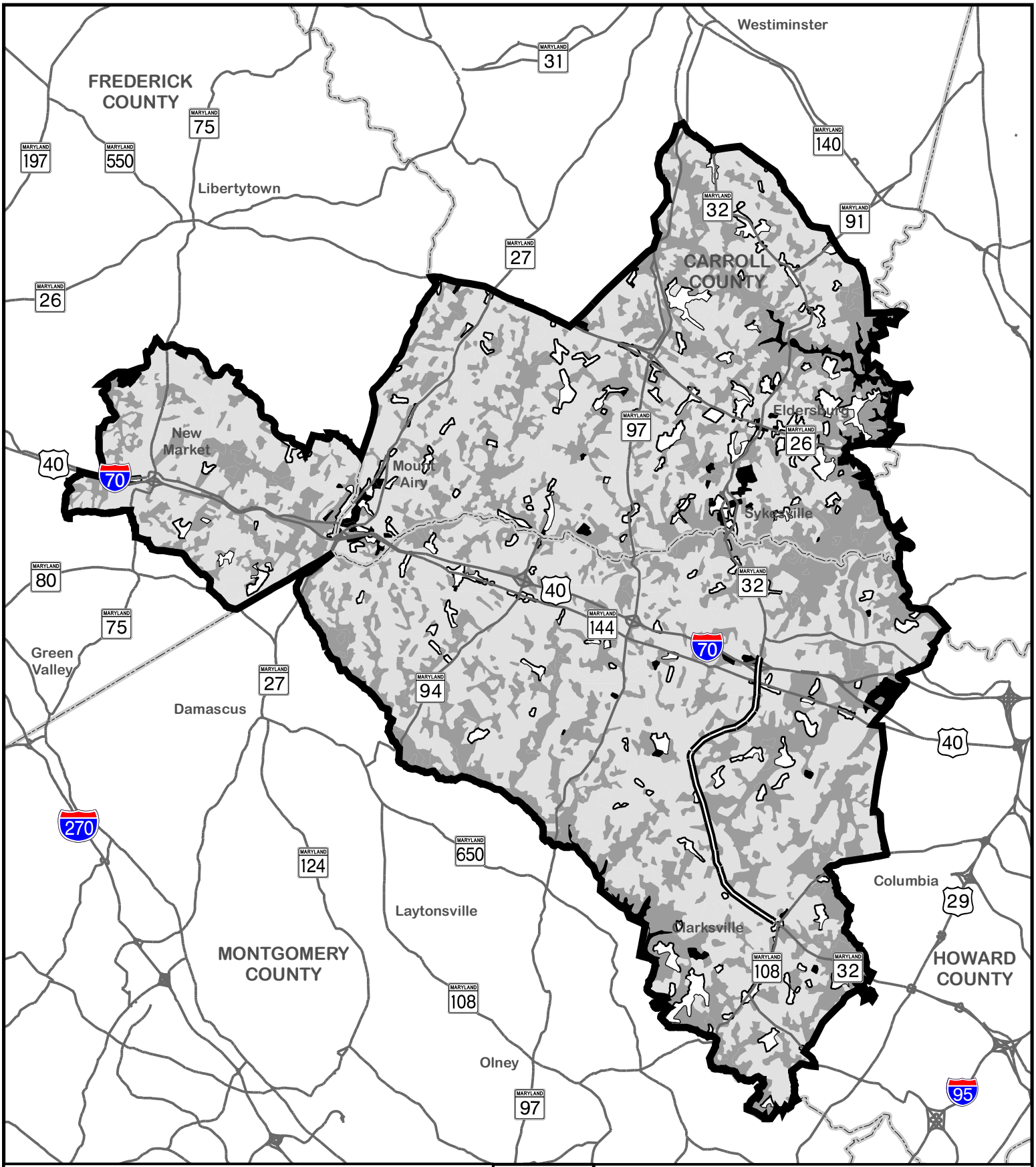


Source: Maryland Department of Planning, 2004

Three land use scenarios, past, present, and future, were used to identify land use trends within the SCEA boundary. Past and present land use mapping was prepared using land use information from the MDP, and is summarized in **Table IV-17**. The 1973 land use is shown on **Figure IV-10** and the 2002 land use is shown on **Figure IV-11**. Future land use information was collected from the individual counties.

a. Past Land Use Trends

The past land use data were obtained from MDP for 1973 and 1997, as summarized in **Table IV-17** and shown in **Figure IV-10**. In 1973, the land within the SCEA boundary was mostly agricultural land, representing 58.3 percent of the total land acres. Woodlands comprised the next largest land use within the SCEA boundary, representing 34.2 percent. In 1973, residential land made up only 5.4 percent of the land use within in the SCEA boundary. The majority of the residential land was comprised of scattered parcels of low density residences with higher densities in the communities of Clarksville, Glenelg, West Friendship, Gary, Florence, Sykesville, Eldersburg, and Mount Airy. Commercial properties within the SCEA area were concentrated along I-70 and the Maryland State Routes.



LEGEND

- SCEA Boundary
- MD 32 Study Area
- Residential
- Agriculture
- Forest
- Other Urban Development

1 inch = 3.5 miles

MD 32 PLANNING STUDY
MD 108 TO I-70

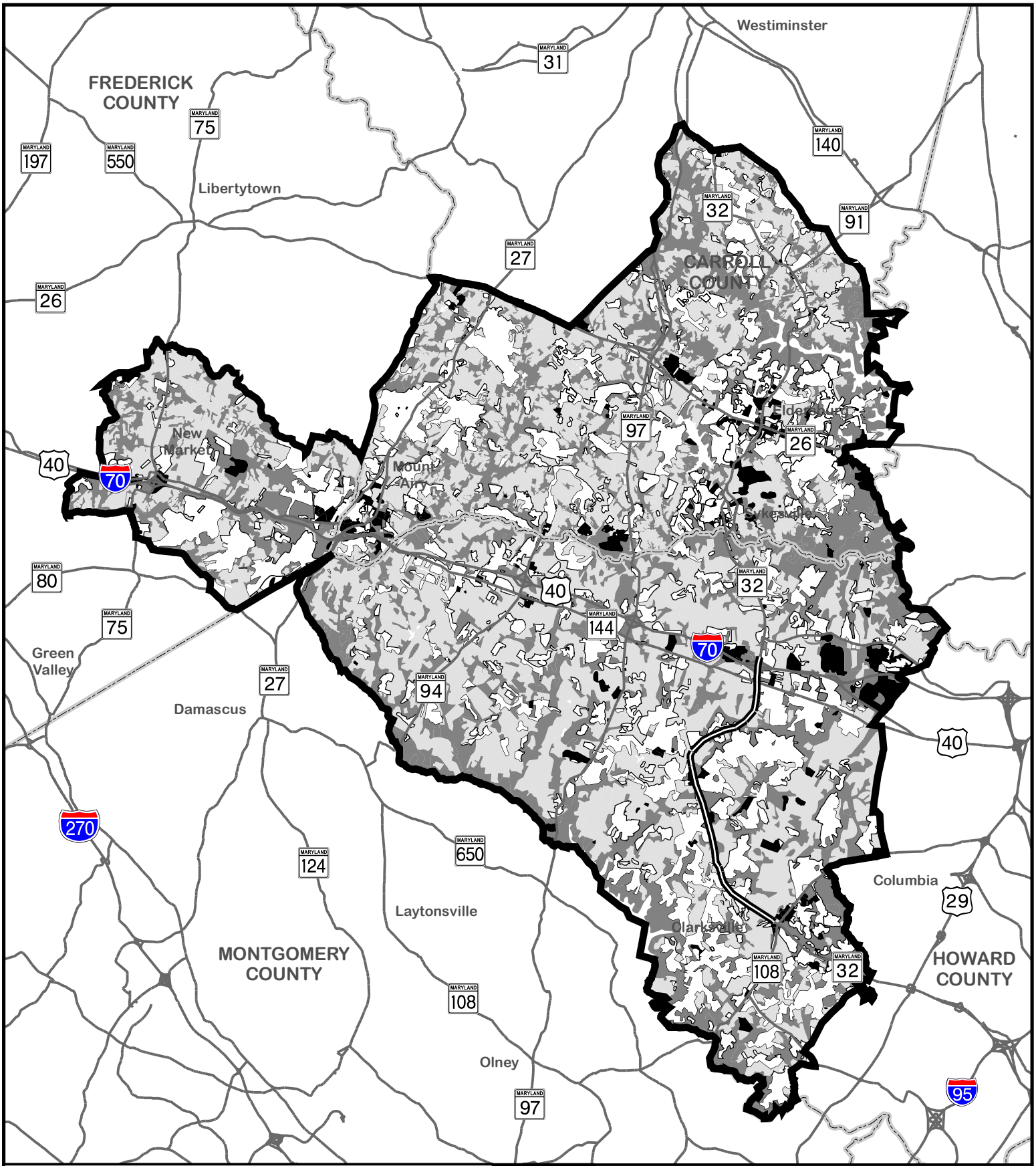
1973 Land Use

Source: Maryland Department of Planning, 1973

Maryland State Highway Administration

September 2005

Figure IV-10



LEGEND

- SCEA Boundary
- MD 32 Study Area
- Residential
- Agriculture
- Forest
- Other Urban Development

1 inch = 3.5 miles

MD 32 PLANNING STUDY
MD 108 TO I-70

2002 Land Use

Source: Maryland Department of Planning, 2002

Maryland State Highway Administration

September 2005

Figure IV-11

Table IV-17: Land Use within SCEA Boundary, 1973 - 2002

Land Use	1973 Land Use acres	1973 percent total	1997 Land Use acres	1997 percent total	2002 Land Use acres	2002 percent total	percent change between 1973 - 1997	percent change between 1997 - 2002
Agriculture	108,999	58.3%	83,169	44.4%	72,682	38.9%	-23.7%	-12.6%
Bare Ground	31	0.0%	174	0.1%	410	0.2%	4.6%	135.6%
Woodland	63,927	34.2%	56,530	30.2%	55,231	29.5%	-11.6%	-2.3%
Waters/Wetlands	1,863	1.0%	2,233	1.2%	2,395	1.3%	19.9%	7.3%
Subtotal Resources	**174,820**	**93.4%**	**142,106**	**75.9%**	**130,718**	**69.9%**	**-18.7%**	**-8.0%**
Industrial	168	0.1%	343	0.2%	381	0.2%	104.2%	11.1%
Commercial	793	0.4%	1,554	0.8%	1,945	1.0%	96.0%	25.2%
Institutional	455	0.2%	1,752	0.9%	1,846	1.0%	285.1%	5.4%
Open Urban Land	719	0.4%	961	0.5%	1,602	0.9%	33.7%	66.7%
Residential	10,128	5.4%	40,414	21.6%	50,475	27.0%	299.0%	24.9%
Subtotal Development	**12,263**	**6.6%**	**45,024**	**24.1%**	**56,249**	**30.1%**	**267.2%**	**24.9%**
TOTAL (acres)	**187,083**	**-**	**187,130**	**-**	**186,967**	**-**	**0.0%**	**0.0%**

Between 1973 and 1997, the land within the SCEA boundary became more urbanized with development trends resulting in the conversion of woodlands and farmland to residential, institutional, commercial, and industrial uses. The acreage of residential land nearly quadrupled from 10,128 acres to 40,414 acres. This suburban growth resulted in a 23.7 percent decrease in farmland between 1973 and 1997. Woodland was also converted to residential, commercial, and institutional uses between 1973 and 1997 resulting in a decrease in woodland by 11.6 percent.

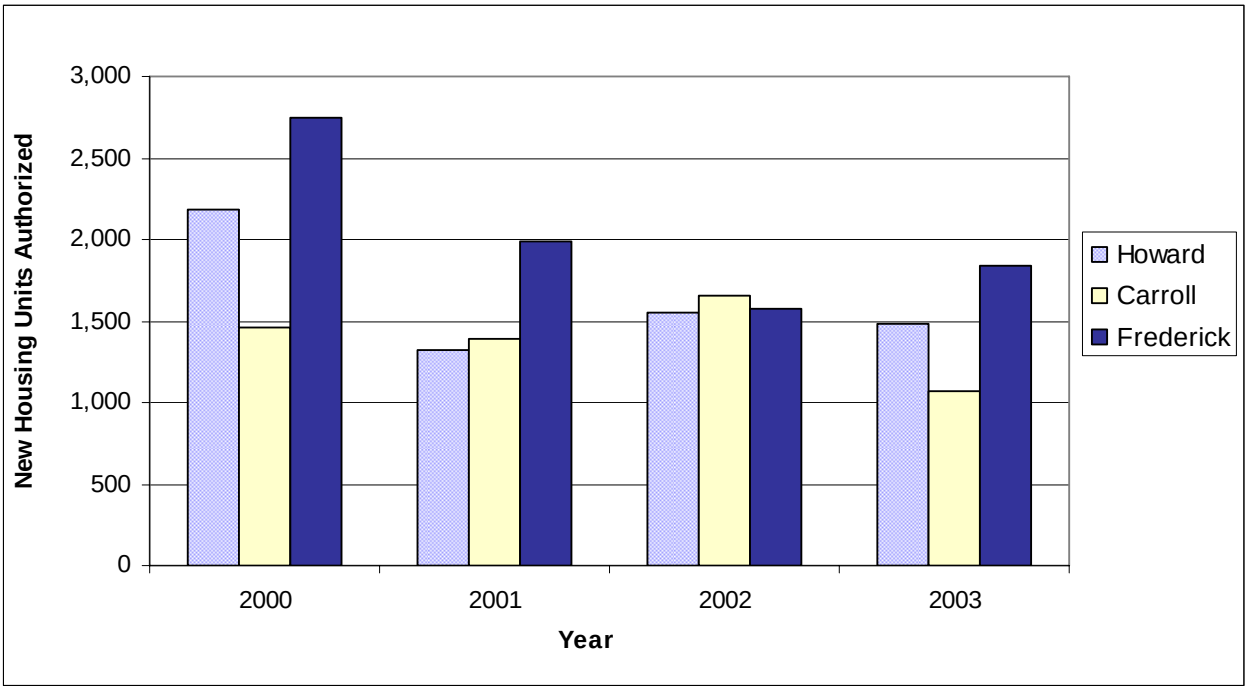
b. Present Land Use

The present time frame covers the 5 year period between 2000 and 2005. The most recent MDP land use data are from 2002 and serves as the basis for the present land use conditions analysis. However, additional data from 2000 were obtained from MDP to illustrate the current development trends in the area.

The present land use conditions are summarized in **Table IV-17** and **Figure IV-11**. Agricultural land (38.9 percent) and woodlands (29.5 percent) make up the majority of the land use within the SCEA area. Large contiguous parcels of agricultural land within the SCEA boundary are located in southwestern Howard County and western Carroll County.

Residential land is the third most prominent land use type within the SCEA boundary representing 27.0 percent of the current land use; this was an increase of 24.9 percent since 1997. **Figure IV-12** illustrates the residential growth that has occurred regionally between 2000 and 2003 by County.

Figure IV-12: New Housing Units Authorized in Howard, Carroll, and Frederick Counties between 2000 and 2003



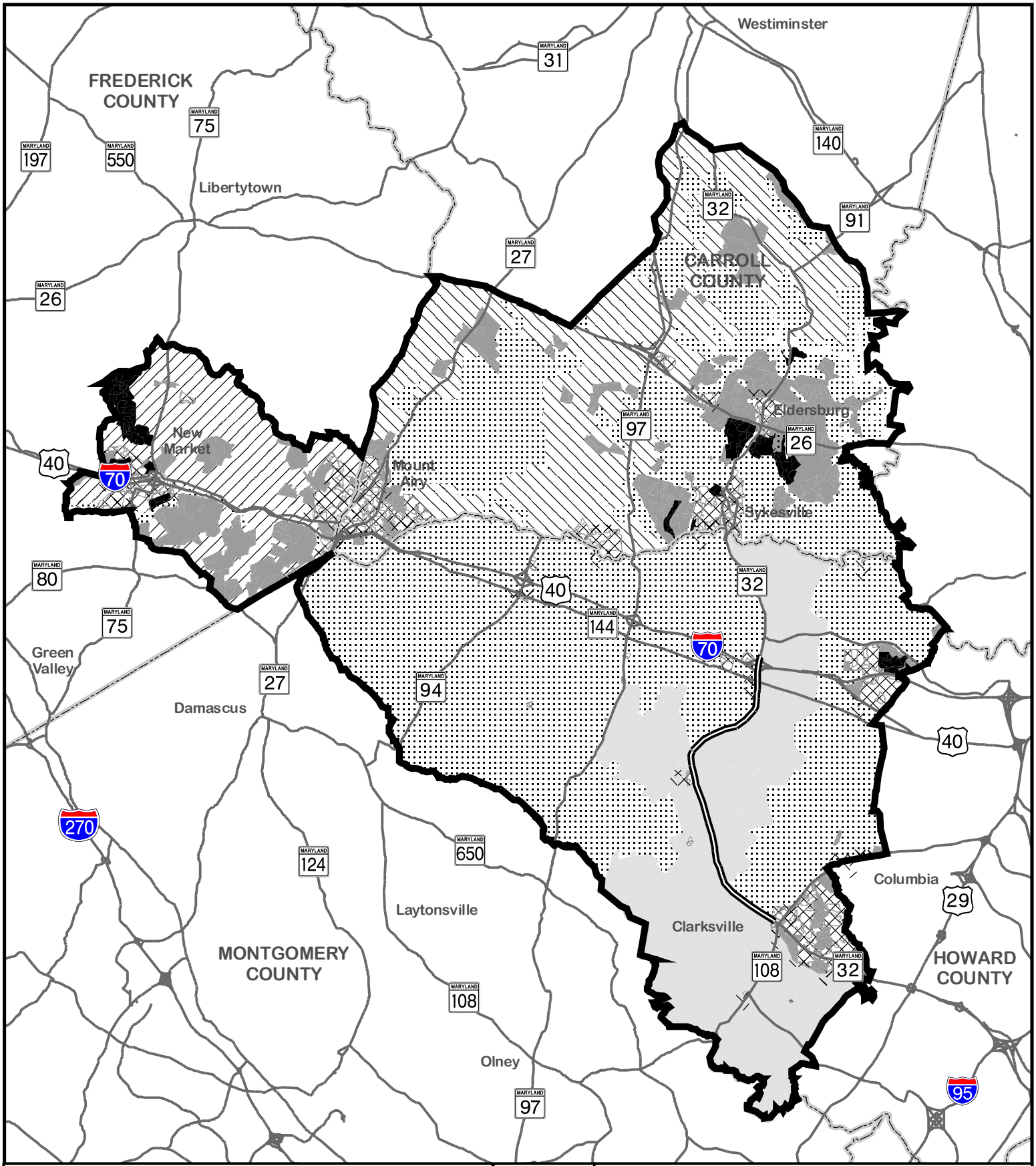
Source: Maryland Department of Planning

The residential land within the SCEA boundary is concentrated along major roadways, with the greatest concentrations along MD 108, MD 32, and MD 97 in Howard County; along MD 32, MD 26, MD 97, MD 27, and MD 94 in Carroll County; and along county roads in Frederick County.

Commercial, institutional, and industrial uses each represent less than or 1 percent of the land use within the SCEA boundary. These uses are concentrated in the relatively urban areas of Clarksville, Mount Airy, Sykesville, and Eldersburg.

c. Future Land Use Trends

The future time frame was established as between 2005 and 2025. Future land use information was gathered from existing land use and community plans. Howard, Carroll, and Frederick Counties' Departments of Planning were contacted to get a listing of the planned development projects occurring within the SCEA boundary, as summarized in **Table IV-19**. In order to identify additional areas where development could occur within the SCEA boundary, the GIS layer for generalized zoning was obtained from the MDP, as shown in **Figure IV-13**. The areas with the potential to develop are identified as residential or urban (commercial, industrial, municipality, mixed use, or other) uses. Areas not zoned residential or urban have build-out potential. Land not zoned for development is divided into three categories by the MDP in the GIS layer: least protected, moderate protected, and most protected. Land that is designated as least protective was considered to have build-out potential in this analysis. The MDP zoning classifications are defined in **Table IV-18**.



LEGEND

- SCEA Boundary
- MD 32 Study Area
- High/Moderate Density Residential
- Low Density Residential
- Very Low Density Residential
- Urban Build Up
- Most Protective
- Moderately Protective
- Least Protective

1 inch = 3.5 miles

MD 32 PLANNING STUDY
MD 108 TO I-70

Future Land Use

Source: Maryland Department of Planning, 2001

Maryland State Highway Administration

September 2005

Figure IV-13

Table IV-18: Maryland Department of Planning Zoning Classifications

Resource Protection		
Most Protected	The most restrictive rural zoning districts with an intent to protect natural resources	max density ≤ .05 du/acre[1]
Moderately protected	Moderately restrictive rural zoning districts that have an intent to protect natural resources	max density >.05 du/acre and < 0.1 du/acre
Least Protected	Least restrictive rural zoning districts that have an intent to protect natural resources	max density ≥ 0.1 du/acre and < 1.0 du/acre
Residential Zoning		
Very Low Density Residential	The lowest density zones with a residential intent	max density > 0.2 du/acre and <1.0 du/acre
Low Density Residential	Low density zoning with a residential intent	max density ≥ 1and < 3.5 du/acre
Moderate Density Residential	Moderately density zoning with a residential intent	max density ≥ 3.5 du/acre < 10du/acre
High Density Residential	Highest density residential zones	max density ≥ 10du/acre
Urban Build-Up		
Commercial	Zoning districts that allow various commercial land uses such as business, offices, and retail use	n/a
industrial	Zoning districts that allow various industrial land uses such as manufacturing, light industrial, and heavy industrial	n/a
Municipality	Any zoning district within a municipality	n/a
Other	Other specialized zones that do not fall into any of the above categories (i.e. military zones)	n/a
Mixed Use	Zoning districts that allow a mix of any of the above zoning categories	n/a

Note: 1 du/acre - dwelling units per acre
Source: Maryland Department of Planning, 2002 Land Use

Results of the Land Use Expert Panel

In response to comments on the DEIS relating to land use development impacts and the SCEA, an independent and objective MD 32 Land Use Expert Panel (LUEP) was established. The LUEP included local, regional, and national land use experts. The LUEP's charge was to estimate potential land use changes that may result from different proposed highway improvements, taking into account the local market and planning environment.

The LUEP overall study area included sixteen sub-areas in parts of Montgomery, Frederick, Carroll, and Howard counties, as shown in **Figure IV-4**. The panelists individually estimated how the household and employment projections through 2020 would change in response to the two-lane or four-lane highway improvement options. The LUEP also considered effects of the highway improvement options on key factors influencing development and identified incentives and disincentives to encourage development in Priority Funding Areas and discourage development outside those areas.

The nine members of the LUEP reflected a range of expertise and knowledge about specific characteristics of different parts of the study area. Given these variations and the complexity of the charge, the LUEP decided that the results of its work should be more qualitative (order-of-magnitude) than quantitative and limitations, if any, regarding the potential use of the results of its work should be stated. The results of the LUEP's work was expressed in two principal ways: 1) estimated increases or reductions to current households and employment projections (2000-2020) that may result, depending on which highway improvement option – no-build, two-lane or four-lane – was selected; and 2) their opinions about the potential effects of highway alternatives on key factors influencing development and land use. When the LUEP member's individual responses were shared, the results revealed areas of agreement and differences rather than overall consensus. The LUEP's conclusions are summarized below. For more information refer to the *Analysis of the Work of the MD 32 Land Use Expert Panel* dated September 2002.

- In some instances, the LUEP members were in agreement and in others they were divided, to different degrees, regarding the potential land use impacts that may be experienced in the sub-areas:
    - In seven of the sixteen sub-areas, the LUEP members agreed there would be no or little impact if MD 32 were widened. The seven sub areas were Carroll-North-Eastern, Carroll-North-Western, Frederick-Northern, Frederick-Southern, Montgomery-Northern, Montgomery-Mid-Eastern, and Montgomery-Eastern.
    - In two of the sub-areas, Carroll-Mid-Eastern and Carroll-South-Eastern, the panelists were in agreement that there would be development impacts if the road were widened.
    - In the Carroll Mid-Western and all four Howard County sub-areas, the members were divided. For both two and four-lane build alternatives, three to five members estimated impacts and the remaining members indicated there would be no impact. For the four-lane option, two to three members estimated moderate or significant impact.
    - In two sub-areas, Carroll South-Western and Frederick Mid, the panelists were sharply divided as four to five panel members estimated that there would be no impact from the four-lane alternative, whereas four members indicated significant impact would result.

- For the overall Study Area:
    - Eight panelists estimated that household growth for the no-build scenario would be the same as, or less than the counties' projected increase.
    - When comparing their estimates for the two-lane build option to their estimates for the no-build option, three panelists indicated that there would be no change in

the number or projected households and six indicated that there would be a slight increase.
    - When comparing the panelists' estimates for the four-lane build option to their estimates for the no-build option, two panelists estimated no change, three members estimated a slight impact (1-9 percent), three a moderate impact (10-19 percent), and one a significant (20 percent or more) impact.

- Seven of the nine LUEP members provided estimates of the impact of the road options on the number of jobs projected in the study area:
    - The no-build option would result in 2,190 fewer jobs than the projected growth of the estimated 29,200 jobs.
    - The two-lane option would result in between 600 and 1,400 more jobs than projected.
    - The four-lane option would result in 1,369 more jobs than the projected 29,200 jobs.

- The LUEP agreed unanimously that care must be taken regarding where future growth and development takes place and presented a series of potential incentives and disincentives for directing growth to Priority Funding Areas and away from areas not designated for development.

- Some LUEP members expressed concern that, in the absence of increased capacity on MD 32, increased traffic would gravitate to parallel, side, or minor county roads. Also, some members raised safety issues related to considering the three options.

- The LUEP agreed that the rate of growth would be influenced by the improvement options: more capacity- more rapid the growth, less capacity- slower the rate of development.

- The LUEP, though in some cases hearing differing views, offered insights on potential effects the three highway options may have on development and growth, including demand for development, zoning changes, property values, and pace of development.

- The LUEP agreed unanimously that land use change is a result of many factors and available road capacity is only one of these variables.

The findings and conclusions from the LUEP were considered in the development of the SCEA boundary (**Section IV.O.2.b**), as well as for determining potential secondary and cumulative effects of the MD 32 project.

Current Land Use Plans and Zoning

Future land use within the SCEA boundary will be primarily influenced by the recommendations of the current land use plans and zoning. There are five land use plans that cover areas within the SCEA boundary: the *Howard County General Plan 2000; 2000 Carroll County Challenges and Choices: A Master Plan for the Future; 2001 Freedom Community Plan* (Carroll County)*;*

Draft 2005 Mount Airy Environs Community Comprehensive Plan (Carroll County), and *the 2005 New Market Planning Region* (Frederick County). All of the land use plans identify these regions within the SCEA boundary as areas for large projected growth.

The *Howard County General Plan 2000* identifies the area of western Howard County outside of the planned service area for water and sewer as the Rural West. The Rural West area is zoned all residential, in either Rural Conservation[1] district or Rural Residential district[2] (Refer to **Figure III-3** for a zoning map of Howard County.) This area is not served by public sewer and is approximately 94,900 acres of land. According to the *Howard County General Plan 2000*, 75 percent (71,600 acres) of the land in the Rural West is committed to development or preservation. The land uses in the Rural West are 48 percent residential, 44 percent preservation easements, and 8 percent commercial, institutional, industrial, infrastructure etc.

Development in Carroll County has been guided by a master plan since the mid 1960s. Development is directed to nine designated Community Planning Areas (CPA). Two CPAs are located in the SCEA area: Mount Airy and the Freedom Community, which includes Sykesville and Eldersburg. A development goal in the *2000 Carroll County Challenges and Choices: A Master Plan for the Future* is to direct growth within the CPAs, in order to protect and conserve agricultural and environmental resources.

The Freedom Community Planning Area includes Sykesville and Eldersburg in southeastern Carroll County. According to the *2001 Freedom Community Comprehensive Plan,* the majority of the land in this area is single-family residential. The plan states, "that while over 60 percent of the land is designated conservation or agriculture, privately-held land is developing as low-density residential areas. When these areas are combined, residential accounts for over 85 percent of the land in the Freedom CPA." Commercial development in the Freedom CPA is primarily concentrated at the MD 32/ MD 26 intersection. In order to control growth and adequately supply public facilities to residents the plan proposes phasing new development.

Mount Airy is in the northwestern corner of the SCEA area and is geographically located in both Carroll and Frederick Counties. The Carroll County portion of the Mount Airy is covered under the *Mount Airy Environs Community Comprehensive Plan*. The Frederick County portion of Mount Airy is covered under the *New Market Region Plan* and described later in this section.

According to *Mount Airy Environs Community Comprehensive Plan*, 1.3 percent of the existing land within the growth area boundary around Mount Airy is undeveloped. Current large-lot residential development patterns in Mount Airy are similar growth patterns experienced in other communities within the SCEA area. Single-family residential land makes up the largest land use in Mount Airy, 41.1 percent. Agriculture makes up 38.1 percent of the land and is concentrated in the eastern and northwestern limits of Mount Airy. Residential growth in Mount Airy is permitted as long the Town of Mount Airy can adequately supply public facilities to the residences.

[1] Rural Conservation district established requirements for cluster residential development on large acre parcels.
[2] Rural Residential district permit cluster and non-cluster subdivisions but require lot sizes to be three acres for non-cluster development and 1.2 acre lot sizes for cluster development or 4.25 acre gross subdivision.

There are eight Planning Regions in Frederick County. The New Market Planning Region is in eastern Frederick County and is the only Frederick County Planning Region within the SCEA boundary. Within the New Market Planning Region are the municipalities of Mount Airy and New Market. The New Market Region is expected to have the second largest proportion of projected growth in Frederick County after the City of Frederick Region. According to the *New Market Region Plan*, 58 percent of the land zoned residential is developed. Like other communities in the SCEA area, residential development is occurring rapidly in New Market and Mount Airy. In order to accommodate new growth, these communities are annexing land to develop for residential uses. In Mount Airy, plans include the annexation of 480 acres to the west. In New Market, 225 single-family houses and 16 townhouse lots are proposed within the town limits and 105 single-family lots are proposed for a recent annexation of 44 acres.

Residential and Commercial Development

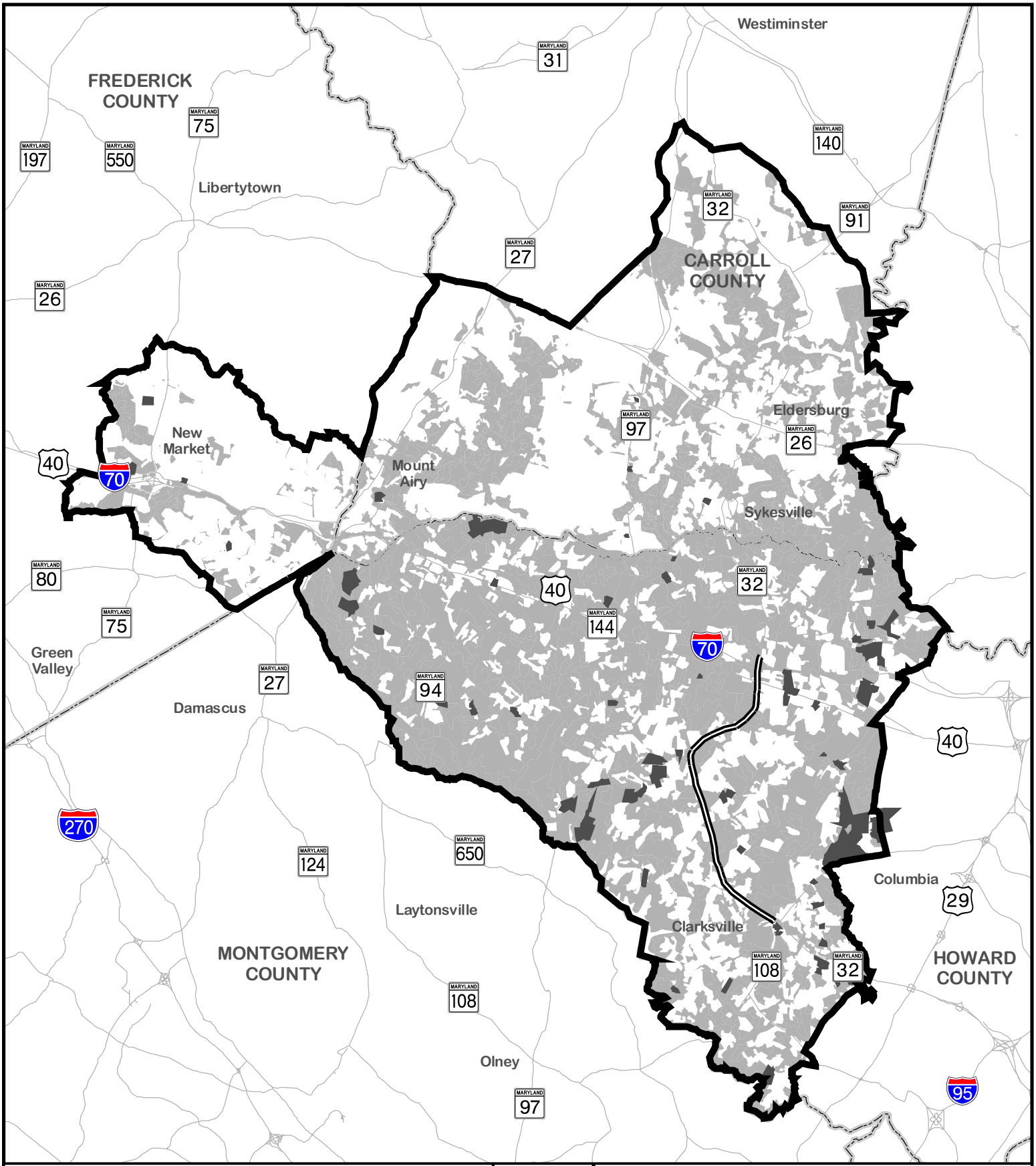
As stated above, the planning areas within the SCEA boundary are experiencing much growth. The majority of the development projects within the SCEA boundary are residential projects. In Howard County, the residential development is primarily occurring between MD 32 and MD 97. In Carroll County, the residential development is primarily occurring along MD 97 and in the Sykesville-Eldersburg area. The residential development in Frederick County is occurring between Mount Airy and New Market. A list of current development projects (as of January 2005) occurring within the SCEA area was complied from the Howard and Carroll counties is provided in **Table IV-19**. Residential developments were only listed if more than ten single-family lots are proposed. **Figure IV-14** shows the planned development within the SCEA boundary.

The projects listed in **Table IV-19** were analyzed for potential secondary and cumulative effects in conjunction with the improvements from the MD 32 Planning Study. There are currently no developments proposed or in any stage of review by Howard, Carroll, or Frederick Counties that require the upgrade of MD 32 to allow the development to occur.

Table IV-19: Anticipated Residential and Commercial Development within or near the SCEA Boundary

County	Location	Description
Howard	Benedict Farm – MD 108 @ Homewood Rd	43 single family units
Howard	Riverwood Phase 1 – Homewood Rd & McGee Rd	48 single family units
Howard	Walnut Grove – Sheppard Lane & north of MD 108	89 single family units
Howard	Sheppard Rd just south of Homewood Rd	19 single family units
Howard	Castleberry at Ten Oaks	45 single family units
Howard	Windsor Forrest Knolls	18 single family unit
Howard	Shapiro Property	21 single family units
Howard	Cattail Creek Overlook- MD 94 & Brittle Branch Way	20 single family units
Howard	Pheasant Run West	11 single family units
Howard	Rivercrest	12 single family units
Howard	Bewley Property- Union Chapel Rd & Bucks Run Dr.	52 single family units
Howard	Susan Moxley Property – MD 144 East of MD 97	16 single family units
Howard	Cloverfield – Pfefferkorn Rd	21 single family units
Howard	Linthicum Oaks- Linthicum Rd S of Sharp Road	50 single family units
Howard	Warfields II- Triadelphia Rd & Howard Rd	114 single family units
Howard	Triadelphia Crossing- SW of Sharp Rd & Triadelphia Rd	21 single family units
Howard	Edgewood Farm- Roxbury Rd & Triadelphia Rd	60 single family units
Howard	Curtis Property- Triadelphia Mill Rd	22 single family units
Howard	Turnbury Grove- Ten Oaks Rd @ Golden Harvest Ct.	33 single family units
Howard	Turf Valley Professional Buildings	Commercial
Howard	Zepp Plaza	Commercial
Howard	Waverly Corporate Center	Commercial
Carroll	MD 97 at Obrecht Road	30 single family lots
Carroll	Wildwood Park in Mount Airy	63 single family lots
Carroll	Sterling Glen in Mount Airy	63 single family lots
Carroll	MD 97 at Buckhorn Road	25 lots/ 14 acres
Carroll	Watersville Road in Mount Airy	132 single family lots
Carroll	South Carroll Gateway Industrial Park	Industrial - 12 lots
Carroll	Business and technology park at former Warfield Complex	Commercial
Frederick	Turnpike Farms Industrial/Commercial Center	5 lots
Frederick	Harvest Ridge Active-Adult Residential Subdivision – Bill Moxley Road	103 single family lots
Frederick	Adventure Park – Baldwin Road	Commercial
Frederick	Orchard at New Market - within the Town of New Market	104 single family lots
Frederick	Royal Oaks/Brinkley Manor - within the Town of New Market	225 single family lots

Source: Howard, Carroll, and Frederick Counties' Department of Planning



LEGEND

- SCEA Boundary
- MD 32 Study Area
- Planned Development
- Potential Build-Out

1 inch = 3.5 miles

MD 32 PLANNING STUDY
MD 108 TO I-70

Planned Development within SCEA Boundary

Source: Howard County 2005

Maryland State Highway Administration

September 2005

Figure IV-14

Transportation Projects

The Maryland Department of Transportation Consolidated Transportation Program (CTP) for FY 2005 to 2010 indicates there are five major SHA projects other than the MD 32 Planning Study located within the SCEA boundary. The projects are identified in **Table IV-20**. These projects may contribute to the cumulative effects upon community and natural resources within the SCEA boundary if constructed.

Table IV-20: Major Transportation Projects within the SCEA Boundary

Transportation Project	Improvements	Status
MD 144 Main Street Through the Town of New Market (Frederick County)	Streetscape	Construction to begin in FY 2006
I-70 Baltimore National Pike W of Howard Co Line to MD 97 (Howard and Carroll Counties)	Roadway resurfacing	Under construction
MD 32 Patuxent Freeway At Sykesville Road (Howard County)	Expand existing rideshare facility	Construction to begin in FY 2005
MD 26 Liberty Road Between Liberty Reservoir and MD 32 (Carroll County)	Access, operational, safety and streetscape improvements; includes bicycle and pedestrian facilities	Location approved in Spring 2001. Transitioning to final design, but no funding or schedule has been set.
MD 32 Sykesville Road From MD 851 intersection to S of Main St (Carroll County)	Reconstruct intersection	Construction to begin in FY 2005

Source: The MD SHA Consolidated Transportation Program, 2005-2010

d. Land Use Conclusions

Substantial land use changes have occurred or will occur within the SCEA boundary over the 55-year time frame considered in this analysis as land within the SCEA boundary is converted from agriculture and woodland to residential, commercial, institutional, and industrial land. The land use changes are associated with the development in the area and are a consequence of the population increases the area has experienced. The development in the area will continue into the 2025 future time frame. However, given the projected growth in population and development, the pace and extent of the future land use change will be less than that experienced during the past 35 years.

There are numerous planned developments within the SCEA boundary that are expected to occur regardless of whether improvements are made to MD 32. The Land Use Expert Panel agreed that certain areas within the region could experience varying levels of household growth depending upon the MD 32 scenario. In general, land use change could result from many factors, including available roadway capacity, zoning, population change, employment availability, and property values. While it is clear that the rate of household and job growth would be influenced by increased capacity on regional roadways, there are no indications that the pattern of development would be influenced by changes to roadway capacity.

Howard, Carroll, and Frederick Counties have current zoning plans, which regulate the location and type of development that can and will occur within the SCEA boundary as well as the rest of the counties. Changes to existing zoning could be proposed at any time, and may be granted on a case-by-case basis by county Departments of Planning. Given that much of the area within the SCEA boundary is not designated for growth and is located outside of a Priority Funding Area, zoning changes are expected to be limited.

4. Secondary and Cumulative Effects

This section discusses the potential secondary and cumulative effects to environmental resources within the SCEA boundary and associated with the MD 32 Planning Study. Secondary effects are caused by the action (construction of a build alternative for the MD 32 Planning Study), and are later in time or farther removed from the immediate study area, but still reasonable foreseeable. Secondary effects could include growth-inducing effects and changes in land use, zoning, population, or growth rate. In other words, secondary effects focus on known development proposals, or land use changes that can only occur if a build alternative is constructed, or if the project changes the rate of the development. Coordination with Howard, Carroll, and Frederick County planning agencies has determined that there are no transportation, residential or commercial development projects dependent upon any of the MD 32 Planning Study alternatives.

As previously stated, the purpose of the MD 32 Planning Study is to improve traffic operations and safety conditions, as well as to provide continuity with the remaining portion of the Patuxent Freeway System. The study addresses the needs of continued growth in Howard County, which is expected to occur regardless of the alternative chosen for this study. However, the Land Use Expert Panel (2002) found that the build alternatives would potentially increase the rate of current private development, within the framework of the existing pattern of land use. The extent, pace, and location of development within the SCEA boundary will primarily be influenced by State, County, and Local land use regulations. Therefore, improvements to MD 32 would not induce secondary development from dependent projects, land use changes, or zoning changes, but may induce secondary effects caused by changes to the rate of development.

In general, these secondary effects are expected to be minimal for several reasons:

1) As described by the LUEP, the build alternatives would only affect the rate of development within areas currently designated for growth by state and local planning authorities;
2) Improvements to MD 32 would not influence the pattern of development, and there are no known development projects dependent upon improvements to MD 32;
3) The final completion date for MD 32 would potentially occur after most of the areas currently designated for growth have been built out. Therefore, the developed area that would be present within the SCEA boundary at the design year would be similar among all alternatives; and
4) Secondary effects to natural, socioeconomic, and cultural resources would be avoided minimized and mitigated through applicable regulations.

Cumulative effects include impacts on the environmental resources which will result from incremental impacts of the construction of the MD 32 Planning Study when added with other past, present, and reasonable foreseeable actions. Cumulative impacts would result from public or private development that may or may not be associated with the MD 32 Planning Study.

The following sections describe the potential secondary and cumulative impacts associated with the project alternatives. Secondary and cumulative effects were assessed by comparing known resource locations within areas that have the potential to be development; the "least protected" areas, as shown in **Figure IV-13.**

Under the No-Build Alternative there will be no direct, secondary or cumulative impacts. All build alternatives would affect the same resources directly, secondarily, or cumulatively, even though the degree of effect may slightly differ among the alternatives. For this reason, the build alternatives are discussed collectively.

a. Communities

Residential communities are scattered throughout the SCEA boundary, but are concentrated primarily along I-70 and the Maryland state routes. (Refer to **Figure IV-3** for the location of the communities within the SCEA boundary.) The communities within the MD 32 study area include Clarksville, Dayton, Glenelg, and West Friendship. Larger communities within the SCEA boundary were identified using the 2000 Census Designated Places (CDP) classification, which is defined by the US Census as a statistical entity comprising a densely settled concentration of population that is not within an incorporated place, but locally identified by name. The CDP communities identified entirely within the SCEA boundary include:

- Sykesville (Carroll County)
- Mount Airy (Carroll County)
- Mount Airy (Frederick County)
- New Market (Frederick County)

The CDP communities partially within the SCEA boundary include:

- Columbia (Howard County)
- Eldersburg (Carroll County)
- Green Valley (Frederick County)
- Linganore-Bartonsville (Frederick County)

The secondary effects on communities would be both beneficial and adverse. Improved access and traffic conditions would stimulate the rate of development within designated growth areas, thus boosting immediate employment opportunities. Additional capacity along MD 32 would increase the rate of residential and commercial development, allowing the build out potential of designated areas to be reached quicker. Although the growth would be occurring in designated areas, the increased rate of development may result in faster conversion of land that currently exists in non-urban uses.

The potential for secondary effects to residential communities within the SCEA boundary was assessed in consideration of improved access and traffic conditions that could stimulate growth within the project corridor. Effects could include an increased housing construction rate, a faster increase in community population, and quicker conversion of forest and agricultural land that is zoned for residential use. The proposed residential development in the study area is not dependent on the MD 32 improvements, therefore secondary effects would not occur as a result of a change in land use pattern.

Secondary effects on commercial development were also assessed for areas within the SCEA boundary. Current zoning and land use plans generally support residential development and limit non-residential uses to specific areas such as crossroad villages (Glenelg and West Friendship) and the larger communities (Mt. Airy, Sykesville, and New Market). Compared to the No-Build alternative, the build alternatives could increase the rate that these designated areas are developed for commercial use. The build alternatives would not affect the future land use pattern as established in county general plans.

Cumulative effects associated with the build alternatives would also be beneficial and adverse. Beneficial effects include improved access and traffic conditions that would stimulate growth within designated growth areas, thus boosting employment opportunities. Under the build alternatives, cumulative effects on local employment will also be beneficial. Development of designated commercial areas will create jobs for project area residents; residential development will create short-term construction jobs; and proposed highway construction on other major projects will create temporary jobs as well as improve local mobility for commuters.

Additional residential and commercial developments unrelated to the MD 32 project, as well as the expected increase in population, may create adverse cumulative effects by increasing the traffic flow through local communities. However, additional transportation improvements to serve this development are foreseeable through existing community master plans. This project and other transportation projects are expected to improve local access and traffic conditions, and reduce current cut-through traffic in some neighborhoods and communities. The MD 32 build alternatives would not affect the pattern of development already affecting communities/neighborhoods.

Existing land use regulations, such as Smart Growth, limit the amount and location of development prior to the completion of any project. Zoning regulations, as well as adequate public facilities ordinances, are in place in all counties to guide development to designated areas. Thus, adverse secondary or cumulative effects to communities would be managed.

b. Woodlands

The MDP land use data from 1973 and 2002 were compared to determine the change in woodland acreage within the SCEA boundary, as shown in **Figures IV-10** and **IV-11**. Between 1973 and 2002 there was a loss in woodlands of 15.7 percent (from 63,927 acres in 1973 to 55,231 acres in 2002) within the SCEA boundary. A similar trend has occurred throughout the state of Maryland. According to the *Maryland's Strategic Forest Lands Assessment* (DNR 2003), "Inventories by the USDA Forest Service have shown that over the last 50 years

Maryland has lost an average of 7,200 acres of woodland per year, primarily because of land development for urban uses." The problem of decreased woodlands is compounded by the fragmentation of remaining woodlands. Fragmented, isolated parcels of woodlands are less effective for wildlife habitat and the protection of air, water, and soil (DNR 2003).

Present and future development projects and transportation projects were compared with the land use plans to determine the potential secondary and cumulative effects to woodlands. Most of the large, contiguous parcels of woodlands are located in state parks along rivers within the SCEA boundary and are subject to protection from development.

Secondary effects to woodlands could occur as a result of the build alternatives. Because there are no development projects dependent upon improvements to MD 32, secondary effects to woodlands would not occur as a result of a change to the land use pattern. However, compared to the no-build alternative, the rate of development for areas zoned for residential use could increase as a result of improved roadway capacity on MD 32. This could result in a faster conversion of woodlands to residential and commercial uses in areas designated for growth. A change in the rate of development would adversely affect woodland species by changing the time that habitat is available for wildlife population establishment and dispersal into other habitats. The rate of woodland conversion would not be inconsistent with historical trends of land use change.

Cumulative effects to woodlands and woodland habitat would occur with build alternatives of the MD 32 project combined with other transportation and development projects. Cumulative effects would most likely occur in existing woodland areas which are designated for development. Wildlife species would be impacted from continued loss of habitat or fragmentation of habitat.

The cumulative effects on woodland habitat would result in cumulative effects on woodland species. Some species have threshold population levels below which reproductive capacity and immigration are not able to overcome stresses from adverse environmental effects. Cumulative fragmentation of woodland habitat and increased woodland edge habitat can result in changes to animal movement patterns, predation and decreased reproductive success of woodland species.

Natural Resources Article Section 5-103, known as the Maryland Reforestation Law, regulates disturbances to woodlands during highway construction projects. Under this law, any highway project that impacts at least one acre of woodland requires a strict 1:1 mitigation ratio, if the project uses state funds. The Maryland Forest Conservation Act of 1991 (FCA) regulates woodland impacts for most other projects including public and private development projects that would be cumulative to the MD 32 project. The FCA requires preparation of a forest conservation plan for impacts to woodlands that total more than 40,000 square feet. Unlike the Maryland Reforestation Law, the FCA does not require a strict 1:1 mitigation ratio for affected woodlands. Rather the FCA protects "high priority" woodlands and sets reforestation and afforestation threshold percentages for any land undergoing development. Secondary and cumulative impacts to woodlands will be minimized and mitigated by Maryland Department of Environment (MDE) and Maryland Department of Natural Resources (DNR) under the Maryland Reforestation Law and FCA.

c. Farmland and Agricultural Easements

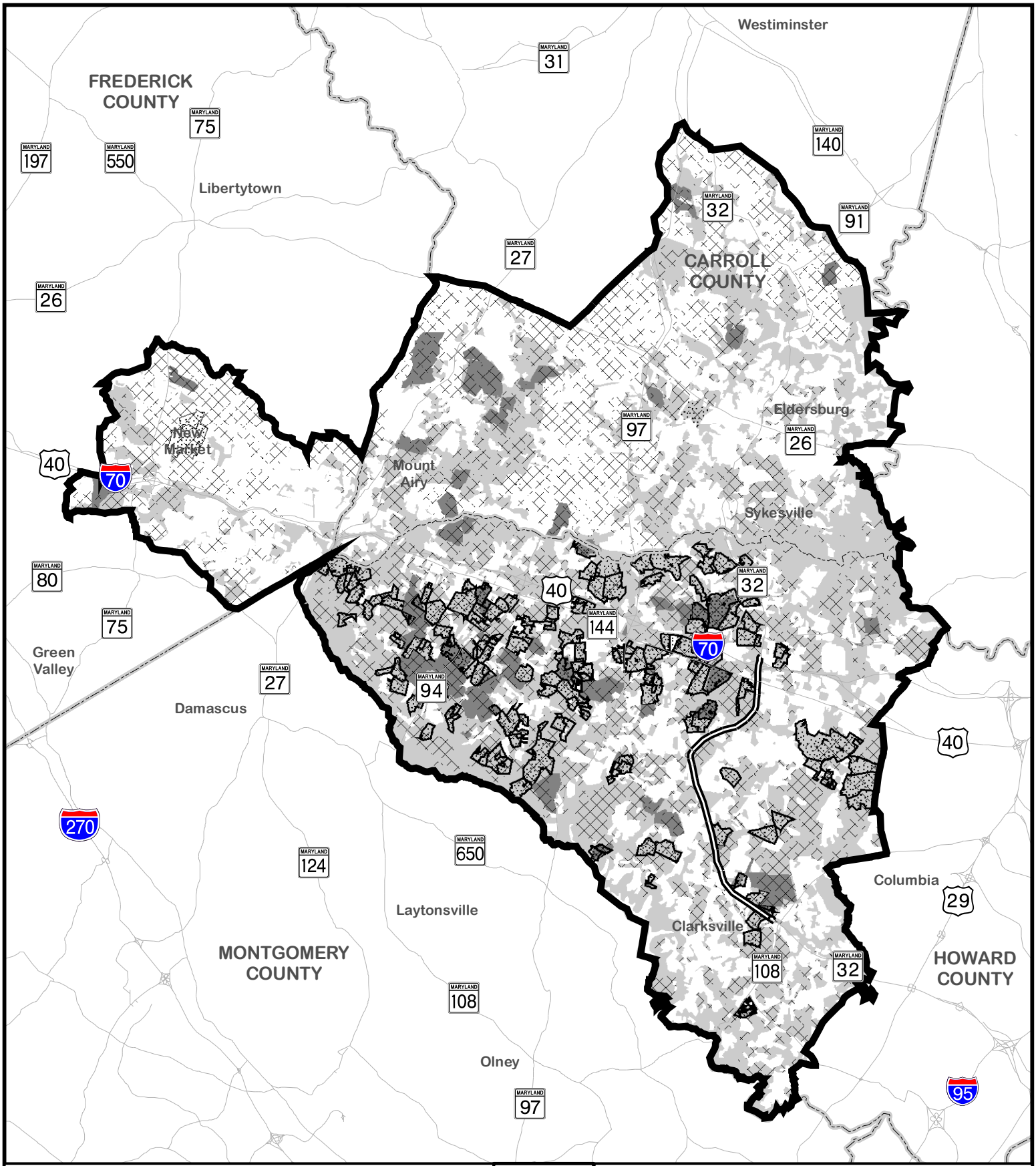
The number of farms within the SCEA boundary and the entire state of Maryland has been on the decline since prior to 1970. According to the 2002 Census of Agriculture, the state of Maryland has lost 24.3 percent of its farmland between 1974 and 2002 at an average annual rate of 0.9 percent. As presented in **Table IV-17**, agriculture land comprised 38.9 percent of the land within the SCEA boundary in 2002. According to the 1973 land use, there were 108,999 acres of agricultural land. Between 1973 and 2002 there was a loss of 50.0 percent of the farmland. The loss in farmland within the SCEA boundary is due to the increase in primarily residential and commercial growth that resulted from an increase in population and subsequent sprawl during this time frame.

A total of 17,710.6 acres of agriculture preservation parcels are within the SCEA boundary, the majority of which is located in western Howard County, as shown in **Figure IV-15**. According to the *Howard County General Plan 2000*, much of the agricultural land within the SCEA boundary is designated for various densities of residential development (3 acre lots for cluster develop and 1.2 acre lots for cluster development). Refer to **Section III.A.3.a** for more information on Howard County's zoning. Farmland in Howard County, including much of the farmland along the MD 32 corridor, is zoned into one of two categories: Rural Residential or Rural Conservation (**Figure III-3** of this FEIS). In Carroll County, large tracts of farmland west of Sykesville are zoned for conservation, residential, and agricultural uses. Within Frederick County, between New Market and Mt. Airy, the land is zoned for rural residential use. Thus, with the exception of farmland that is protected under agricultural preservation easements (**Figure IV-15**), much of the existing farmland within the SCEA boundary could be converted to development regardless of the alternative chosen for the MD 32 project.

Secondary effects to farmlands within the SCEA boundary could occur as a result of the build alternatives. The rate of development for areas zoned for residential use could increase as a result of improved access and capacity to MD 32. The result would be a faster conversion of the land already designated for residential development. Areas that are not designated for residential use or are under an agricultural preservation easement would not sustain secondary effects. The rate of farmland loss associated with secondary effects of the MD 32 build alternatives is not expected to be greater than the historic rate of farmland loss. As there are no projects dependent upon improvements to MD 32 for completion, there will be no secondary effects to farmlands as a result of a change in the pattern of farmland conversion.

Cumulative effects to farmlands would occur as a result of any public or private land development within the SCEA boundary that would convert farmland to urban land. Cumulative effects are most likely to occur in existing farmland areas that are designated for residential development. Given the current land use and pattern of land use development, the farmland areas most likely to incur cumulative effects are located along the MD 32 corridor in Howard County and along I-70 in Frederick County.

Current federal, state, and local policies and legislation, including county zoning regulations, are in place to protect farmland resources. In addition, agricultural preservation easements protect many of the farmlands located within the SCEA boundary from development. Current and



LEGEND

- Agricultural Land Use
- SCEA Boundary
- MD 32 Study Area
- County Programs
- State Districts and Easements
- Potential Build-Out

1 inch = 3.5 miles

MD 32 PLANNING STUDY
MD 108 TO I-70

Agricultural Preservation Parcels

Maryland State Highway Administration

September 2005

Figure IV-15

future development and transportation projects using federal funding that impact prime and unique farmlands are subject to the requirements of the Farmland Protection Policy Act.

d. Surface Water

The MD 32 study area lies entirely within the Middle Patuxent River watershed, near the drainage divides with South Branch Patapsco River and Little Patuxent River to the north and the drainage divide with Patuxent River (Triadelphia Reservoir) to the west. The SCEA boundary encompasses portions of eight watersheds, as shown in **Figure IV-6**. The DNR "eight-digit" watersheds of which a portion is found within the SCEA boundary are: the Middle Patuxent River (02131106), Rocky Gorge Dam (02131107), Brighton Dam (02131108), Lower Monocacy River (02140302), Little Patuxent River (2131105), Liberty Reservoir (02130907), South Branch Patapsco (02130908), and Patapsco River Lower North Branch (02130906) watersheds.

Potential secondary effects were assessed within the SCEA boundary by comparing the surface water and aquatic habitat within watersheds, streams, and floodplains. Future planned development and transportation projects would result in more impervious areas, which could possibly impact surface water in Howard, Carroll, and eastern Frederick Counties by increasing the amount of stormwater runoff entering surface waters causing excess erosion and sedimentation and affecting stream channel morphology. Historically, impervious surfaces have been steadily increasing within the SCEA boundary since 1970 as land within the project area has been converted from farmland and agriculture to transportation, residential, and business uses.

There could be secondary effects to surface waters as a result of the build alternatives. The rate of land use converted to impervious surfaces could increase. However, the MD 32 project would not result in changes to the land use pattern, therefore, the rate of land use conversion to impervious surface would not change once growth areas are developed. There are no planned development projects in the SCEA boundary that are dependent on improvements to MD 32 for completion; therefore, there would be no secondary effects to surface waters as a result of a change in land use pattern.

Build alternatives of the MD 32 project, combined with the other transportation and development projects within the SCEA boundary, would result in cumulative effects to surface water. With land use changes from agriculture and woodlands to urban uses, there would be adverse impacts to water quality and surface waters from increased stormwater runoff. Most cumulative effects to surface water would occur in potential build-out areas (**Figure IV-13**). It is expected that the MD 32 project would have a relatively minimal contribution to cumulative surface water quality trends within the SCEA boundary.

Secondary and cumulative effects from the build alternatives would be minimized through compliance with stormwater management requirements. Sediment and erosion control requirements (for all publicly and privately funded projects) in place during construction would limit the sediment reaching the waterways and long-term stormwater management would control the runoff from new development. Federal, state, and local regulations require best management practices utilized in stormwater management facilities which would assist in improving the quality of stormwater runoff.

e. Groundwater Resources

The majority of land within the SCEA boundary is served by aquifers and groundwater. Most of western Howard County, including the MD 32 study area, is outside the Howard County's planned service area for water and sewer service, except an area east of MD 32 between MD 144 and Patapsco Valley State Park, as shown in **Figure III-3** in this FEIS. In Carroll County, except for the designated Mount Airy Environs and the Freedom Community Planning Area (Sykesville and Eldersburg) land within the SCEA boundary is served by private wells. The New Market Region in Frederick County is served by a public water supply.

Future planned development in areas with public water and sewer would have no impact on the groundwater drinking supply. In these areas, water service will be expanded as infrastructure is developed. Western Howard County outside the planned service area will experience the greatest effect on groundwater from future development.

There is the potential for secondary effects to occur to groundwater within the SCEA boundary as a result of an increased rate of public and private development and a subsequent increase in stormwater runoff due to additional impervious surfaces. The future planned development in these counties would occur regardless of the implementation of the No-Build or build alternatives and are therefore independent of the construction of MD 32 between MD 108 and I-70. However, the rate at which this development occurs could be faster with the build alternatives as compared to the No-Build Alternative. Federal, state, and local regulations require best management practices to be implemented in stormwater management facilities, which would assist in improving the quality of stormwater runoff.

There is the potential for cumulative effects to occur to groundwater resources within the SCEA boundary as a result of public and private development. Increased stormwater runoff and decreased groundwater infiltration from additional impervious surface would potentially affect the water table within the SCEA boundary. Cumulative effects to the quality and quantity of groundwater resources would be minimized through existing laws and regulations to protect against degradation. Any effects to groundwater resources will be closely monitored by the MDE under the regulation of the Safe Drinking Water Act. In addition, stormwater management facilities constructed with the build alternatives would control groundwater pollution.

f. Wetlands

Overall, the State of Maryland experienced a loss of 378 acres of wetlands between 1991 and 2003 (*An Overview of Wetlands and Water Resources in Maryland*, MDE 2000). However, through permitted mitigation, programmatic gains, and other gains, 645 acres of wetlands were created; resulting in a net increase of 267 wetland acres in the state. Wetlands within the SCEA boundary also declined between 1991 and 2000. This decline can be attributed to public and private development that has occurred in the area over this time frame. However, watersheds within the SCEA boundary have experienced a net gain of 27.22 acres of wetlands since 1991. **Table IV-21** presents the wetland gains and losses by watershed within the SCEA boundary and Maryland.

Table IV-21: Acres of Wetland Gains and Losses in Maryland and Watersheds within the SCEA Boundary

Watershed Name	Watershed Code	Estimated Total Wetland Area (1994)	Permanent Impacts (1991-2000)	Total Gains (1991-2003)	Net Gain/Loss (1991-2000)
Maryland	**N/A**	**598,422 acres**	**-378 acres**	**645 acres**	**267 acres**
Patapsco River Lower North Branch	2130906	588	-13.63	10.89	-2.74
Liberty Reservoir	2130907	50	-2.23	1.6	-0.63
Patapsco South Branch	2130908	0	-1.39	7.15	5.76
Little Patuxent River	2131105	11	-12.74	33.75	21.01
Middle Patuxent River	2131106	0	-3.76	8.39	4.63
Rocky Gorge Dam	2131107	0	-5.52	5.46	-0.06
Brighton Dam	2131108	100	-.32	.24	-0.08
Lower Monocacy River	2140302	33	-5.62	4.95	-0.67
Total of Watersheds within SCEA Boundary	**N/A**	**782**	**-45.21**	**72.43**	**27.22**

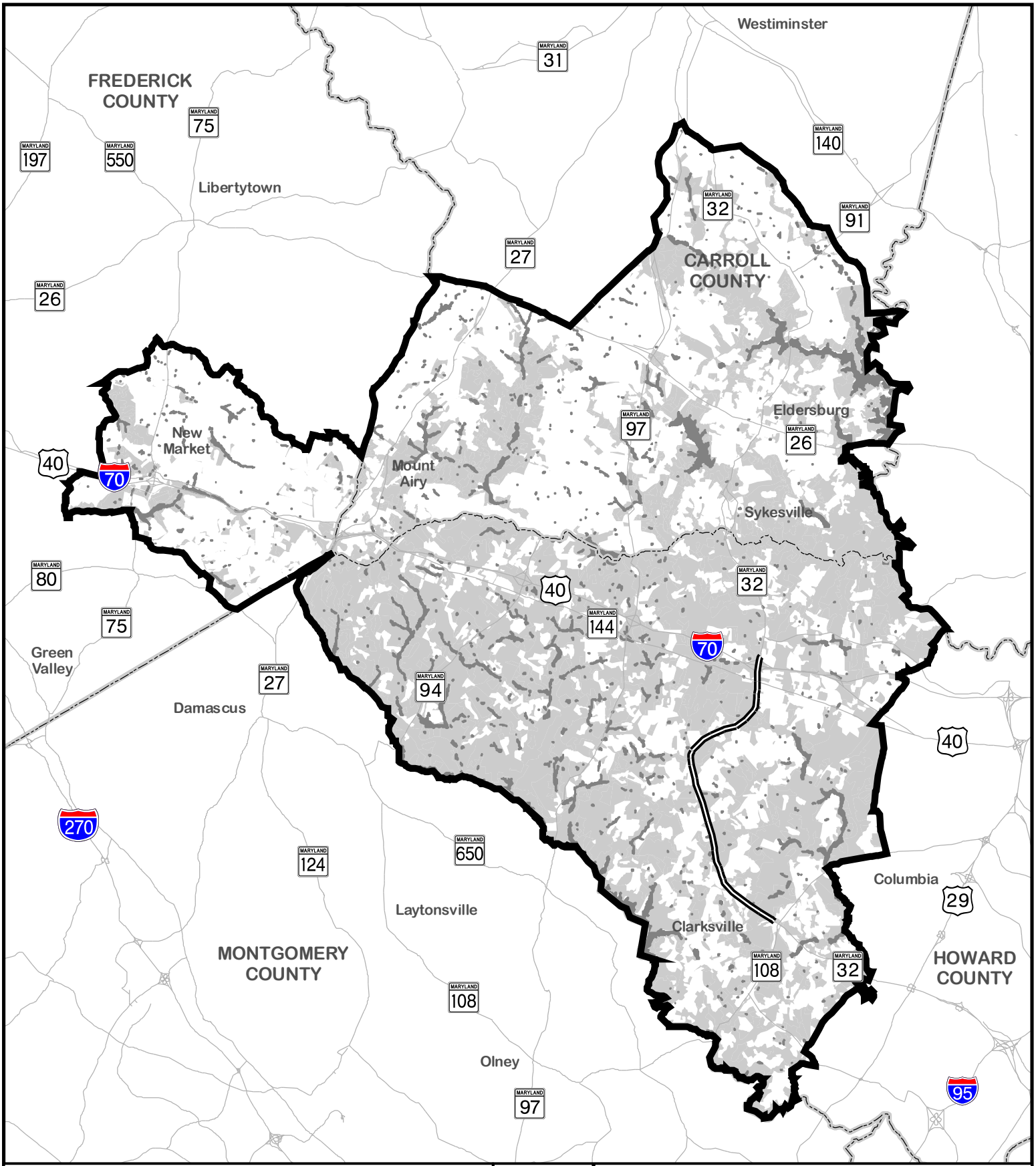
Source: MDE, Wetlands and Waterways Division 2003.

Three watersheds experienced a gain in wetlands between 1991 and 2000. The Middle Patuxent River Watershed, which the MD 32 Planning Study is in, experienced a loss of 3.76 acres, but a gain of 8.36 acres for a net gain of 4.63 acres of wetlands. The Patapsco South Branch watershed and the Little Patuxent watershed also experienced a net gain in wetlands between 1991 and 2000. In the other five watersheds, wetlands were created, but there was a net loss of wetlands between 1991 and 2000.

The wetlands identified on the National Wetland Inventory (NWI) within the SCEA boundary are shown in **Figure IV-16**. Many of the wetlands within the SCEA boundary are in areas that have experienced land use changes in the past 30 years. However, it is likely that most of these wetlands were preserved or their potential loss was compensated for given the regulations under Section 404 of the Clean Water Act. Any impacts to wetlands have been reviewed by the MDE and incorporated into the total wetland acreage changes for their respective watershed, as shown in **Table IV-20**.

Planned or future development and transportation projects within the SCEA boundary were assessed to evaluate possible secondary and cumulative impacts. This development is independent of and would occur regardless of whether the MD 32 Study was constructed; therefore secondary impacts are not anticipated. Any future projects will be subject to federal and state wetland protection legislation and programs with required review from the USACE and MDE. Permits requiring avoidance, minimization, and/or mitigation would help offset most wetland losses caused by cumulative effects. Because of the level of regulation protecting wetlands and trends illustrating overall gains in wetland acreage since 1991, it is anticipated that the proposed improvements to MD 32 would have minimal cumulative effects on wetlands.

The build alternatives could cause secondary effects to wetlands through an increased rate of development within areas already planned for development. This rate change could result in a



LEGEND

- SCEA Boundary
- MD 32 Study Area
- Wetlands: NWI
- Potential Build-Out

1 inch = 3.5 miles

MD 32 PLANNING STUDY
MD 108 TO I-70

Wetlands

Source: National Wetlands Inventory, 1981-82

Maryland State Highway Administration

September 2005

Figure IV-16

faster conversion of wetlands to uplands than would occur under the No-Build Alternative. Given current land use regulations, wetlands in areas that are not designated for growth would not incur secondary effects. Thus, the overall area of wetlands potentially affected by development would be the same regardless of the alternative. In addition, because there are no projects dependent upon improvements to MD 32 for completion, there will be no secondary effects to wetlands as a result of a change in the pattern of development.

The build alternatives would contribute to cumulative effects on wetlands. Cumulative effects would occur through planned or other future development within the SCEA boundary. In most cases, cumulative effects would occur in areas designated for growth or where there is potential for build-out **(Figure IV-16**).

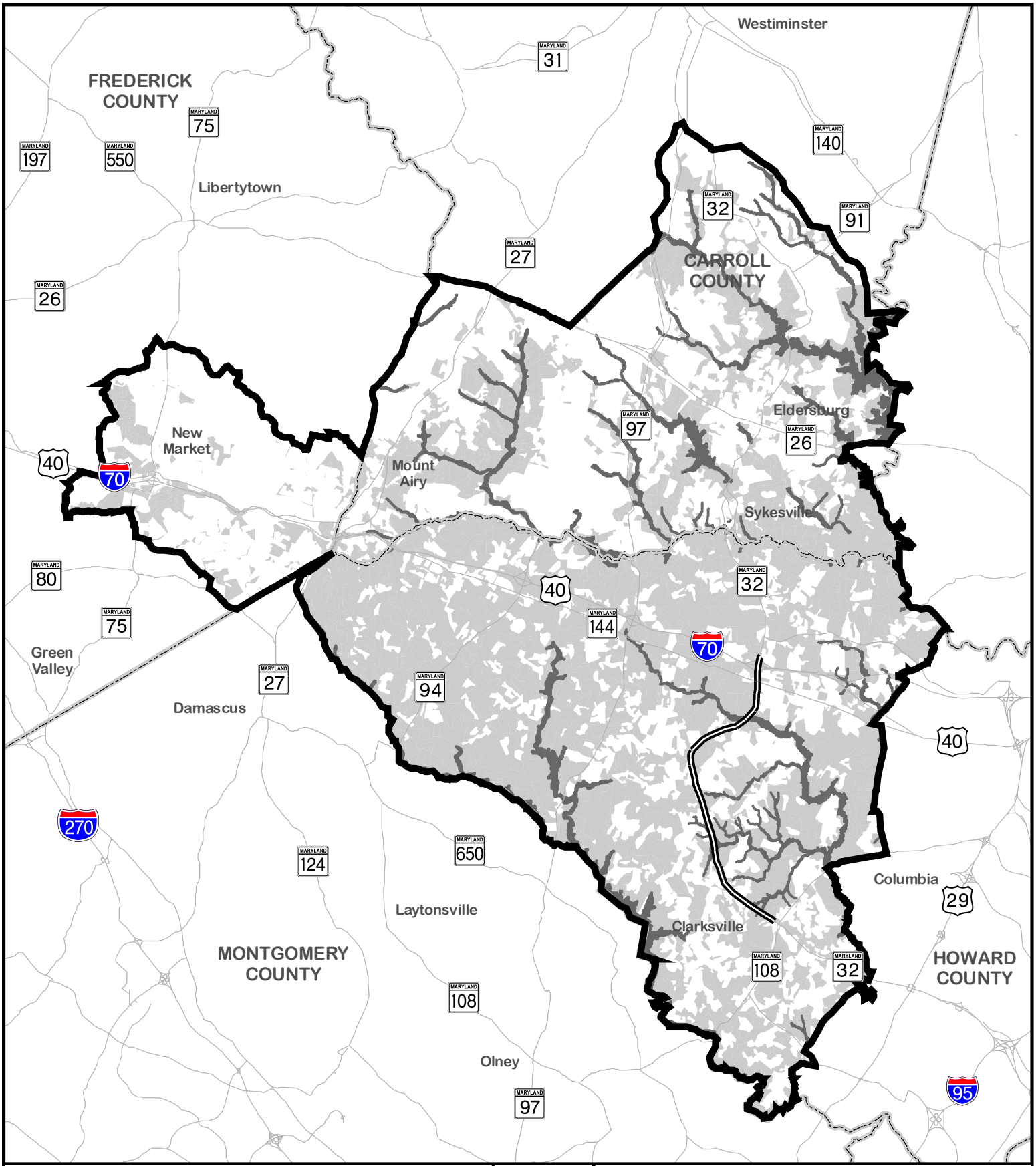
Both secondary or cumulative wetland impacts that occur as a result of public or private development would require review by the USACE and/or the MDE. As demonstrated by the trends analysis presented in **Table IV-21**, regulations requiring avoidance, minimization, and mitigation have been highly effective in maintaining wetland area. It is anticipated that these regulations would continue to help offset most wetland losses caused by cumulative effects.

g. Floodplains

Within the SCEA boundary there are 100-year floodplains associated with the Middle Patuxent River, Benson Branch, Clydes Branch, some tributaries of Clydes Branch, the Patuxent River, the Patapsco River, and Piney Run, as shown in **Figure IV-17**.

Planned development and transportation projects within the SCEA boundary were assessed by comparing planned projects with floodplain boundaries to evaluate potential secondary and cumulative impacts. The majority of the floodplains within the SCEA boundary are within areas already built-up or located within existing parklands that afford additional protection from development. There are no planned development projects in the SCEA boundary that are dependent on improvements to MD 32 for completion; therefore, there would be no secondary effects to floodplains as a result of a change in land use pattern. However, the build alternatives could induce an increased rate of development within planned growth areas, which could result in secondary effects to floodplains. Most floodplain areas are protected from development through zoning and land use regulations; however, there may be some floodplains that incur secondary effects a result of a change in development rate in adjacent planned growth areas and subsequent disturbance to hydrologic function.

Cumulative effects to floodplains are possible from the MD 32 project combined with other transportation and development projects. Disturbance to floodplain vegetation and landscapes may cause loss of hydrologic function. This loss of function can cause increased flooding, excess erosion and sedimentation, and damage to downstream channel morphology. Future development will have minimal impact to 100-year floodplains due to existing Federal and State legislation and review by USACE and MDE. Permits requiring avoidance, minimization, and/or mitigation to individual floodplains would offset most floodplain disturbances caused by cumulative effects.



LEGEND

- SCEA Boundary
- MD 32 Study Area
- 100 Year Floodplain
- Potential Build-Out

1 inch = 3.5 miles

MD 32 PLANNING STUDY
MD 108 TO I-70

100 Year Floodplain

Source: Federal management Emergency Agency, 1986-96

Maryland State Highway Administration

September 2005

Figure IV-17

h. Cultural Resources – Archaeological Sites

Although there are historic structures that are listed on or eligible for the National Register of Historic Places within the MD 32 study area, none of them will be directly, secondarily, or cumulatively affected by the project.

The MD 32 project will directly affect one archeological site that may be eligible for the National Register. Site 18HO232 is a prehistoric site with diagnostic artifacts indicative of a Late Archaic period occupation. Site 18HO261 will be impacted by construction of an access road for local traffic. The SHPO has concurred that future archeological work will be required to conclusively define National Register eligibility if site 18HO261 is affected. SHA is currently assuming eligibility of Site 18HO261 and assumes that the build alternatives will adversely affect the property.

Because the SCEA boundary has not been thoroughly surveyed for archeological resources, there may be additional resources that have not been identified. As the population within the SCEA boundary increases and commercial and residential development pressures rise, there may be effects to these unrecorded resources. Prehistoric archeological resources are often found within undisturbed areas, especially near streams, that may be affected by future development.

Because there are no development projects dependent on the MD 32 project, there will be no secondary effect caused by land use change to any archeological resources or historic structures. However, the build alternatives may cause secondary effects on archeological resources by increasing the rate at which potential build-out areas are developed. Known and unknown archeological resources in areas that are not designated for growth would not incur secondary effects. Thus, the extent of archeological resources potentially affected by development would be the same regardless of the alternative.

Cumulative effects to archeological resources caused by development within the SCEA boundary are likely under any of the build alternatives. The potential for cumulative effects to archeological resources arise from the MD 32 project effects together with additional, unrelated development within the SCEA boundary. Comprehensive information on archeological resources within the SCEA boundary is not readily available; therefore, a detailed assessment of cumulative effects to archeological resources cannot be made.

Cumulative effects that occur to any known or unknown sites would be regulated through existing laws that facilitate the protection of archeological resources. The Howard County General Plan has policies in place to preserve all significant archeological resources and historic structures and to administer the provisions of the County's historic preservation ordinances. Section 106 of the National Historic Preservation Act and the Maryland Historic Preservation Act require federal and state agencies to consider the effects of their actions on historic properties. Section 4(f) of the 1966 Department of Transportation Act prohibits the use of significant cultural resources, including archeological resources, for federal transportation projects unless there is a thorough alternatives analysis to avoid and minimize harm.

5. Secondary and Cumulative Effects Analysis Conclusions

a. Secondary Effects

Howard, Carroll, and Frederick Counties are projected to experience continued growth in populations and urban development through the design year 2025 regardless of the selected improvements from the MD 32 study. Improvements to MD 32 would not induce secondary development from dependent projects, land use changes, or zoning changes, but may induce secondary effects to environmental resources through changes to the rate of development.

b. Cumulative Effects

The No-Build Alternative would not contribute to cumulative effects within the SCEA boundary. The build alternatives would contribute to cumulative effects to resources as described in this SCEA. Development within the SCEA boundary has steadily increased since the 1970s. These development trends are projected to continue into the future with control by state and local planning agencies. Cumulative effects to resources are expected to occur within areas currently zoned residential or urban build-up and would generally avoid environmentally sensitive areas such as floodplains and agricultural easements. Also, the cumulative effects to environmental resources will be regulated by existing applicable federal, state, and local legislation through individual avoidance, minimization, and/or mitigation strategies.

c. Mitigation

The Council on Environmental Quality (CEQ) regulations, which implement NEPA, requires that Environmental Impact Statements include consideration and discussion of possible mitigation for project impacts. Specifically, FHWA's environmental regulations as outlined in 23 CFR 771 state that measures necessary to mitigate adverse impacts will be incorporated into the action and are eligible for Federal funding when the FHWA determines that: 1) the impacts for which the mitigation is proposed actually result from the FHWA action; and 2) the proposed mitigation represents a reasonable public expenditure after considering the impacts of the action and the benefits of the proposed mitigation measures.

Measures that would be appropriate to offset most secondary and cumulative effects will be beyond the control and funding authority of SHA and FHWA. The pace and extent of future development within the SCEA boundary will be influenced and controlled by state and county land development policies and plans. SHA would work with state and local planning agencies that can influence development patterns and promote the benefits of controls that incorporate environmental protection into all planned development.

Possible mitigation strategies for secondary and cumulative effects could be considered by the responsible parties, including state and local planning agencies. These strategies may include low-impact development measures, land use management through planning regulations and zoning, and public education on the benefits of environmental conservation and smart growth.

P. Relationship between Local and Short-Term Uses of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

The local-short term impacts during construction of the project would include localized noise and air pollution, and minor traffic delays. These local short-term impacts from construction would be the same for any of the build alternatives. With proper controls in place during construction, the short-term impacts would not have a lasting effect on the environment.

The long-term benefits of the build alternatives, such as increased safety, improved mobility, and decreased congestion, should offset the short-term construction impacts in the study area. The MD 32 Planning Study has been designed in accordance with the *Howard County General Plan 2000*, which has considered the need for present and future traffic requirements within the context of present and future land use development. The local short-term impacts and use of resources by the proposed action are consistent with the maintenance and enhancement of long-term productivity for the local area, region, and State.

Q. Irreversible and Irretrievable Commitments of Resources that would be involved in the Proposed Action

The construction of any of the build alternatives will involve the irreversible and irretrievable commitments of various natural, human, and fiscal resources. The build alternatives require the commitment of land for the highway construction, which is considered an irreversible commitment during the time period the land is used for a highway facility. If a greater need arises for the use of the land or if the highway facility is no longer needed, the land can be converted to another use. However, it is not anticipated that either of these situations would be necessary.

Fossil fuels, labor, highway construction materials, and natural resources will be expended during the construction of the SHA Selected Alternative. The materials used in the highway construction are irretrievable; however, they are not in short supply and their use should not have an adverse effect on continued availability of these resources. Any of the build alternatives would require an irretrievable commitment of federal and state funds for right-of-way acquisition, materials, and construction. Upon completion of the project, funds for annual maintenance will be required.

The commitment of these resources is based on the concept that local and regional residents, commuters, and businesses would benefit from the proposed highway improvements. The benefits, which outweigh the loss of these resources, would include safety, accident reduction, access management, and improvements to traffic flow.