US 1 Bel Air Bypass

Environmental Assessment (EA)

Prepared for:

Maryland Department of Transportation
State Highway Administration

Prepared by:

Parsons Brinckerhoff, Inc.

November, 1998

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FEDERAL HIGHWAY ADMINISTRATION
REGION III

US 1 BEL AIR BYPASS
FROM MD 147 TO NORTH OF MD 24/924
HARFORD COUNTY, MARYLAND

ADMINISTRATIVE ACTION

ENVIRONMENTAL ASSESSMENT

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
AND
STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

SUBMITTED PURSUANT TO: 42 U.S.C. 4332(2) (C); 49 U.S.C. 303
23 U.S.C. 128 (A) AND CEQ REGULATIONS (40 CFR 1500 ET SEQ)

PARKER F. WILLIAMS
ADMINISTRATOR

DATE

NEIL J. PEDERSEN, DIRECTOR
OFFICE OF PLANNING AND
PRELIMINARY ENGINEERING

DATE

GEORGE FRICK, JR.
FEDERAL HIGHWAY ADMINISTRATION
ASSISTANT DIVISION ADMINISTRATOR

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( ) Environmental Impact Statement
(X) Environmental Assessment
( ) Finding of No Significant Impact
( ) Section 4(f) Evaluation

S.2 Additional Information:

Mr. Louis H. Ege, Jr.
Deputy Director
Office of Planning and Preliminary Engineering
State Highway Administration
707 N. Calvert Street
Baltimore, Maryland 21202
Hours: 7:30 a.m. to 4:30 p.m.
Phone: (410) 545-8500

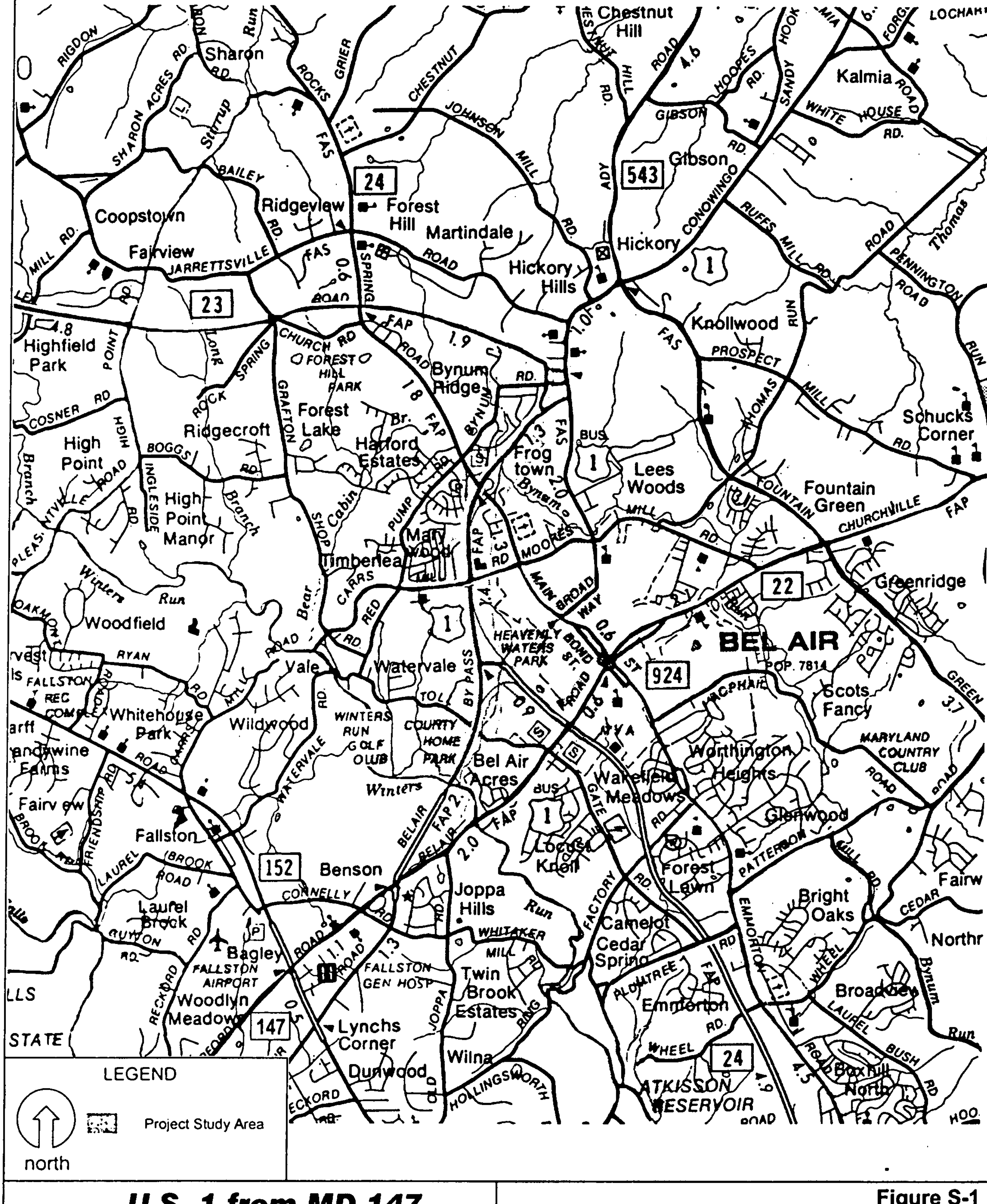
Mr. George K. Frick, Jr.
Assistant Division Administrator
Federal Highway Administration
The Rotunda – Suite 220
711 West 40th Street
Baltimore, MD 21211
Hours: 7:30 a.m. to 4:30 p.m.
Phone: (410) 962-4440

S.3 Description of Proposed Action

The purpose of this study is to develop and evaluate Alternates which will improve safety and accommodate projected increases in traffic along the US 1 Bel Air Bypass from north of MD 147 to north of the MD 24/924 intersection. US 1 is a commuter link between greater Baltimore employment centers and residential areas in and around Bel Air. This highway also provides access to adjoining commercial development and has a minor role in carrying interstate traffic between the Baltimore area and southeastern Pennsylvania. The project proposes the dualization of US 1 between MD 147 and Conowingo Road with a new interchange at MD 24 and modifications to an existing interchange at MD 24/924 (see Figure S-1).

Improvements are needed to reduce accident rates which are significantly higher than statewide averages for similar state highways and to accommodate projected increases in traffic volumes. As currently planned, the US 1 Bel Air Bypass project will link an improved highway south of the study area with a new highway north of the study area with improved access to I-95 and to the retail/business district of Bel Air via MD 24.

Traffic volumes in the study area are projected to increase as a result of planned growth in Harford County, with the average daily traffic practically doubling between 1993 and 2020. Morning and afternoon peak hour traffic volumes will also experience a significant increase. Levels-of service are expected to worsen along most portions of the study area.



U.S. 1 from MD 147 to North of MD 24/924

STATE HIGHWAY ADMINISTRATION

Figure S-1

Project Area

There were 83 police-reported accidents on US 1 in the study area during the three-year period of 1991 through 1993. These accidents resulted in a rate of 92 accidents per 100 million vehicles miles of travel (acc./100 mvm) over the study period. (This rate of 92 acc./100 mvm is statistically significantly higher than the statewide average accident rates of 49 acc./100 mvm for this type of facility.

Improvements to existing US 1 are consistent with the Governor's Smart Growth initiative in that they will serve an area with existing development and is contained within Harford County's Development Envelope. Capacity and safety improvements on The US 1 Bel Air Bypass are also listed as priorities in *Transportation Plan: An Element of the Harford County Master Plan*, January, 1994.

S.4 Alternates Considered

The section of US 1 known as the Bel Air Bypass was constructed in the early 1960's. The existing two-lane section was constructed with the intention that it would ultimately serve as the southbound lanes of a future four-lane freeway with a 78-foot median. Sufficient right-of-way was acquired to accommodate the ultimate design prior to original construction.

The section of MD 24 (Relocated) between US 1 and I-95 received Location Approval in 1979. The approved alternate included a fully directional interchange with five bridges at US 1. This interchange concept was changed to a fully directional interchange with two stacked bridges during final design of MD 24 to avoid impacts to the Tollgate Landfill west of US 1. MD 24 opened to traffic in 1988 with a temporary at-grade intersection at US 1.

A four-lane freeway with a 78-foot median, as envisioned in the original design, was initially considered early in the current project planning study. The 78-foot Median Alternate was quickly dropped because design guidelines had been changed to include safety grading adjacent to the outer shoulders. Inclusion of safety grading with a 78-foot median would have required right-of-way acquisition beyond that which was already purchased.

An Alternates Public Meeting was held on June 22, 1989. No new alternates were proposed as a result of comments from the meeting. The alternates presented were:

Alternate 1 - The no-build alternate included maintenance and minor rehabilitation on the existing road and interchanges, but would not increase the capacity of the existing road network.

Alternate 2 (A and B) - Alternate 2 proposed the dualization of US 1 with construction of a two-lane roadway to serve northbound traffic, with the existing roadway converted to serve southbound traffic only. Alternate 2A proposed a 58-foot grass median between the roadways while Alternate 2B proposed a 34-foot median.

Interchange Options - There were eight options proposed for the MD 24 interchange named Options 1 through 8. Two options were also proposed for the MD 24/924 interchange. These were Options 9 and 10.

Since the Alternates Public Meeting, some alternate eliminations, modifications, and renaming has taken place. Assumed to be in place as part of the No-Build Alternate is a completed project which widened the existing roadway to add one auxiliary lane in each direction between MD 24 and MD 24/924 and auxiliary lanes on MD 24 at the Red Pump/Bynum Road intersection and on the ramp from southbound MD 24 to southbound US 1. These improvements have been constructed as a separate project prior to selection of any alternate under consideration for this project planning study.

The elimination of Alternate 2A because the 58-foot median had greater environmental impacts than the 34-foot median, left only one choice for median width and, therefore, the 34-foot median was incorporated into all of the remaining options. Interchange options 2 and 4 were eliminated because, like Option 5, they identified trumpet interchanges and both options had greater environmental impacts than Option 5 while providing the same operational benefit. The remaining MD 24 interchange options (1, 3, 5, 6, 7, and 8) were renamed as Alternates 2 through 7, respectively, and the MD 24/924 interchange options were renamed as Options A and B and are described below:

All build alternates include dualization of US 1 from south of Winter's Run to north of MD 24/924. The existing roadway section would become the southbound lanes of the dual highway. Four lanes are proposed from south of Winters Run to MD 24 and north of the MD 24/924 interchange (two lanes in each direction). The proposed nominal median width is 34 feet. Between MD 24 and MD 24/924 six lanes are proposed (three lanes in each direction). Within this section, the proposed median width is 38 feet due to constraints imposed by the Vale Road bridge over US 1. (The Vale Road bridge was designed to cross a four-lane divided highway with a 78-foot median.) The median width varies with each alternate through the MD 24 interchange to accommodate differing ramp configurations.

Alternate 2 (Directional Interchange) - The existing at-grade intersection at MD 24 would be eliminated. Access for the southbound US 1 to southbound MD 24 movement is provided by directional ramp D. Ramp D would pass over northbound US 1 and then pass over directional ramp C, which would be provided for the northbound MD 24 to southbound US 1 movement, passing under Ramp D and then northbound US 1.

Alternate 3 (Grade-Separated Tee Interchange) - Northbound and southbound US 1 traffic would be free flowing but the movements to and from southbound US 1 would utilize an at-grade intersection at MD 24. The design would require a left exit and left entrance along southbound US 1. This option requires the construction of one bridge to carry northbound US 1 over MD 24.

Alternate 4 (Trumpet Interchange) - The existing at-grade intersection at MD 24 would be eliminated. The existing southbound US 1 lanes would be relocated to the east. Semi-directional ramp D would provide for the southbound US 1 to southbound MD 24 movement. Loop ramp C is proposed to provide for the northbound MD 24 to southbound US 1 movement.

Alternate 5 (Three-Level Directional Interchange) - The existing at-grade intersection at MD 24 would be eliminated. Directional ramp D is proposed to provide for the southbound US 1 to southbound MD 24 movement. A bridge is required that would pass over the northbound US 1 mainline bridge and directional ramp C (northbound MD 24 to southbound US 1). Ramp C would be constructed at grade.

Alternate 6 (Grade-Separated Roundabout Interchange) - Northbound and southbound US 1 traffic would be free flowing but the movements to and from southbound US 1 would utilize a roundabout. The design would require a left exit and left entrance along southbound US 1. This option requires the construction of one bridge to carry northbound US 1 over MD 24.

Alternate 7 (At-Grade Semi-Directional Interchange) - The northbound and southbound lanes of US 1 would have continuous traffic flow. Directional ramp D would provide the southbound US 1 to southbound MD 24 movement. Connector ramp C would provide for northbound MD 24 to southbound US 1 traffic, crossing ramp D at grade with either a signal or stop sign control.

MD 24/924 Interchange

Two options are proposed for this interchange. Either option could be combined with any of the above alternates.

Option A - MD 24/924 would be widened by adding one through-lane in each direction plus turning lanes from north of Red Pump and Bynum Roads to approximately 800 feet south of the interchange and a 4-foot monolithic concrete median. Turn lanes would also be added on the Bynum Road approach to MD 24. The northbound US 1 to northbound MD 24 movement is proposed to be a double-lane loop ramp. The loop ramp could accommodate traffic destined for MD 24 and Bynum Road. The park and ride lot would be replaced near its present location.

Option B - MD 24/924 would be widened to a four-lane divided highway from north of Red Pump and Bynum roads to approximately 800 feet south of the interchange. Turn lanes would be added on the Bynum Road approach to MD 24. Loop ramp C , from northbound US 1 to northbound MD 24 would be widened to two lanes. Spur ramp B is proposed to provide access from northbound MD 924 to southbound US 1. The park-and-ride lot (with a single access point) would be replaced near its present location.

As a result of the Interagency Review meeting held in late 1996, Alternates 2, 6, and 7 were dropped because of minimal operational benefits or high costs. Alternate 1 (No-Build), the remaining Alternates (3,4, and 5) and Options (A and B) were retained for further study.

Two additional options were also introduced in order to minimize impacts to wetlands. Both of these options proposed the dualized highway to have a 22-foot median width along a portion of US 1 south of MD 24. One of these options also proposed that this same section of the highway be bifurcated to further reduce wetland impacts.

S.5 Summary of Impacts

A summary comparison of impacts associated with the alternates under consideration is presented in Table S-1, and briefly described below. The data for each of the build alternates was combined with the data for both Option A and B. The total impacts are shown by Alternate/Option combinations listed in the table as Alternates 3A, 3B, 4A, 4B, 5A, and 5B.

TABLE S-1
SUMMARY COMPARISON OF IMPACTS

	Alt. 1 No-Build	Alt. 3A	Alt. 3B	Alt. 4A	Alt. 4B	Alt. 5A	Alt. 5B
Residential/Commercial	0	0	0	0	0	0	0
Affected Properties	0	9	9	9	9	9	9
Right-of-Way required - acs.	0	0.8	0.8	0.8	0.8	0.8	0.8
Historic Sites	0	0	0	0	0	0	0
Archaeological Sites	0	0	0	0	0	0	0
Wetlands - acs.	0	1.67	1.67	1.90	1.90	1.90	1.90
Wetlands (with 22-foot median) - acs.	0	0.97	0.97	1.14	1.14	1.04	1.04
Wetlands (with 22-foot median-bifurcated) - acs.	0	0.80	0.80	0.83	0.83	0.85	0.85
Waters of the U.S. – acs.	0	.07	.07	.12	.12	.10	.10
Stream Crossings	0	3	3	4	4	4	4
Stream Channelization/ Relocation (linear feet)	0	0	0	0	0	0	0
100-year Floodplain - acs.	0	2.6	2.6	2.6	2.6	2.6	2.6
Parklands - acs.	0	0	0	0	0	0	0
Woodland - acs.	0	14.65	14.83	14.36	14.52	11.68	11.86
Farmland (active) - acs.	0	0	0	0	0	0	0
Threatened & Endangered Species	0	*	*	*	*	*	*
Noise**	7	10	10	10	10	10	10
Air Quality (violations)	0	0	0	0	0	0	0
Consistent with Comprehensive Plan	no	yes	yes	yes	yes	yes	yes
Cost(millions)	N/A	$35.4	$36.3	$44.2	$45.2	$40.7	$41.1

** There is the potential for one threatened species, the Bog Turtle, to be impacted by this project. Due to the limited time period for which surveying for Bog Turtles can be conducted, a final determination has not yet been made. Surveying will be conducted in the Spring of 1999 and a final determination of the impacts will then be made.

** Expressed as the number of Noise Sensitive Areas for which either the Federal Noise Abatement Criteria were approached (66 dBA) or exceeded or there was a 10 dBA or more increase over ambient noise levels.

Socio-economic Environment

No significant impacts to the social and economic environments are anticipated with any of the build alternates or options. Mobility and safety will generally be improved as a result of build alternates being considered. There may be some minor changes in access in localized areas. No displacements (residential or commercial) would occur as a result of this project. The new roadway will be built almost entirely within existing right-of-way with the exception of a few narrow strips of land (totaling 0.8 ac.) near the MD 24/924 interchange.

The project would not require the use of land from any potential Section 4(f) properties, including public parks, recreation areas, or significant historic sites or archaeological sites

Natural Resources

Non-tidal wetlands in the study area would be impacted by each build alternate/option combination. These impacts would range from 0.80 acres to 1.90 acres depending on which alternate is chosen.

Each alternate/option combination would also have floodplain impacts in the amount of 2.6 acres These impacts would occur at Winters Run in the southern portion of the study area and would be considered transverse crossings.

There would be no impacts to active farmlands or Prime Farmland Soils. There would be 3-4 stream crossings but no channelization or relocation of streams would be necessary. Between 11.68 and 14.83 acres of woodland would also be impacted. There are also potential impacts to one threatened species.

Noise and Air Quality

At 10 of the 15 noise receptor sites for this project, noise levels for the design year were predicted to approach or exceed the Federal Highway Administration Noise Abatement Criteria of 67 dB(A) for the design year, 2020. For Alternates 4 and 5, one receptor site projected an increase of 10 dB(A) or more. Under the No-Build Alternate, 7 of the 15 noise receptors recorded noise levels which would approach or exceed FHWA Noise Abatement Criteria.

The State and National Ambient Air Quality Standards would not be exceeded under the No-Build or build alternates for the US 1 Bel Air Bypass project.

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US 1 BEL AIR BYPASS

ENVIRONMENTAL ASSESSMENT FORM

The following Environmental Assessment Form is a requirement of the Maryland Environmental Policy Act and Maryland Department of Transportation Order 11.01.06.02. It's use is in keeping with the provisions of 1500.4(k) and 1506.2 and .6 of the Council of Environmental Quality Regulations, effective July 31, 1979, which recommend that duplication of Federal, State and Local procedures be integrated into a single process.

The checklist identifies specific areas of the natural and social-economic environment which have been considered while preparing this environmental assessment. The reviewer can refer to the appropriate section of the document, as indicated in the "Comment" column of the form, for a description of specific characteristics of the natural or social-economic environment within the proposed project area. It will also highlight any potential impacts, beneficial or adverse, that the action may incur. The "No" column indicates that during the scoping and early coordination processes, that specific area of the environment was not identified to be within the project area or would not be impacted by the proposed action.

US 1 BEL AIR BYPASS

Environmental Assessment Form

			YES	NO	COMMENTS
A.	Land Use Considerations				
	1.	Will the action be within the 100 year floodplain?	x		see Section 5.5.3
	2.	Will the action require a permit for construction or alteration within the 50 year floodplain?	x		see Section 5.5.3
	3.	Will the action require a permit for dredging, filling, draining or alteration of a wetland?	x		see Section 5.6.1
	4.	Will the action require a permit for the construction or operation of facilities for solid waste disposal including dredging and excavation spoil?		x	
	5.	Will the action occur on slopes exceeding 15%?		x	
	6.	Will the action require a grading plan or a sediment control permit?	x		see Section 5.5.1
	7.	Will the action require a mining permit for deep or surface mining?		x	
	8.	Will the action require a permit for drilling a gas or oil well?		x	
	9.	Will the action require a permit for airport construction?		x	
	10.	Will the action require a permit for the crossing of		x	

		YES	NO	COMMENTS
	the Potomac River by conduits, cables or other like devices?			
11.	Will the action affect the use of a public recreation area, park, forest, wildlife management area, scenic river or wildland?	___	x	_____
12.	Will the action affect the use of any natural or manmade features that are unique to the county, state or nation?	___	x	_____
13.	Will the action affect the use of an archeological or historical site or structure?	___	x	_____
B.	Water Use Considerations			
14.	Will the action require a permit for the change of the course, current, or cross-section of a stream or other body of water?	___	x	see Section 5.5.2
15.	Will the action require the construction, alteration, or removal of a dam, reservoir, or waterway obstruction?	___	x	_____
16.	Will the action change the overland flow of stormwater or reduce the absorption capacity of the ground?	x	___	see Section 5.5.2
17.	Will the action require a permit for the drilling of a water well?	___	x	_____
18.	Will the action require a permit for water appropriation?	___	x	_____
19.	Will the action require a permit for the construction and operation of facilities for treatment or distribution of water?	___	x	_____

		YES	NO	COMMENTS
20.	Will the project require a permit for the construction and operation of facilities for sewage treatment and/or land disposal of liquid waste derivatives?	___	x	_____
21.	Will the action result in any discharge into surface or sub-surface water?	x	___	see Section 5.5.2
22.	If so, will the discharge affect ambient water quality parameters and/or require a discharge permit?	___	x	see Section 5.5.2
C.	Air Use Considerations			
23.	Will the action result in any discharge into the air?	___	x	see Section 5.8
24.	If so, will the discharge affect ambient air quality parameters or produce a disagreeable odor?	___	x	_____
25.	Will the action generate additional noise which differs in character or level from present conditions?	___	x	_____
26.	Will the action preclude future use of related air space?	___	x	_____
27.	Will the action generate any radiological, electrical, magnetic, or light influences?	___	x	_____
D.	Plant and Animal Considerations			
28.	Will the action cause the disturbance, reduction or loss of any rare, unique or valuable plant or animal?	___	x	_____
29.	Will the action result in the significant reduction or loss	___	x	_____

			YES	NO	COMMENTS
		of any fish or wildlife habitats?			
E.	Socio-Economic Considerations				
	31.	Will the action result in a preemption or division of properties or impair their economic use?	___	x	_____
	32.	Will the action cause relocation of activities, structures, or result in a change in the population density or distribution?	___	x	_____
	33.	Will the action alter land values?	___	x	_____
	34.	Will the action affect traffic flow and volume?	x	___	see Section 5.1.7
	35.	Will the action affect the production, extraction, harvest or potential use of a scarce or economically important resource?	___	x	_____
	36.	Will the action require a license to construct a sawmill or other plant for the manufacture of forest products?	___	x	_____
	37.	Is the action in accord with federal, state, regional and local comprehensive or functional plans - including zoning?	x	___	see Section 2.5
	38.	Will the action affect the employment opportunities for persons in the area?	___	x	_____
	39.	Will the action affect the ability of the area to attract new sources of tax revenue?	___	x	_____
	40.	Will the action discourage present sources of tax revenue from remaining in the area, or affirmatively	___	x	_____

		YES	NO	COMMENTS
	encourage them to relocate elsewhere?			
41.	Will the action affect the ability of the area to attract tourism?	—	x	
F.	Other Considerations			
42.	Could the action endanger the public health, safety or welfare?	—	x	
43.	Could the action be eliminated without deleterious affects to the public health, safety, welfare or the natural environment?	x	—	
44.	Will the action be of statewide significance?	—	x	
45.	Are there any other plans or actions (federal, state, county or private) that, in conjunction with the subject action could result in a cumulative or synergistic impacts on the public health, safety, welfare, or environment?	—	x	
46.	Will the action require additional power generations or transmission capacity?	—	x	
47.	This agency will develop a complete environmental effects report on the proposed action.	x	—	

1.0 DESCRIPTION OF PROPOSED ACTION

1.1 Project Location

Located in Harford County, Maryland, northeast of Baltimore (Figure 1-1), the section of US 1 through and approaching the Bel Air area is a major transportation connector to and from the Baltimore area. It is a commuter link between greater Baltimore employment centers and residential areas in and around Bel Air. US 1 also provides access to adjoining commercial development and has a minor role in carrying interstate traffic between the Baltimore area and southeastern Pennsylvania.

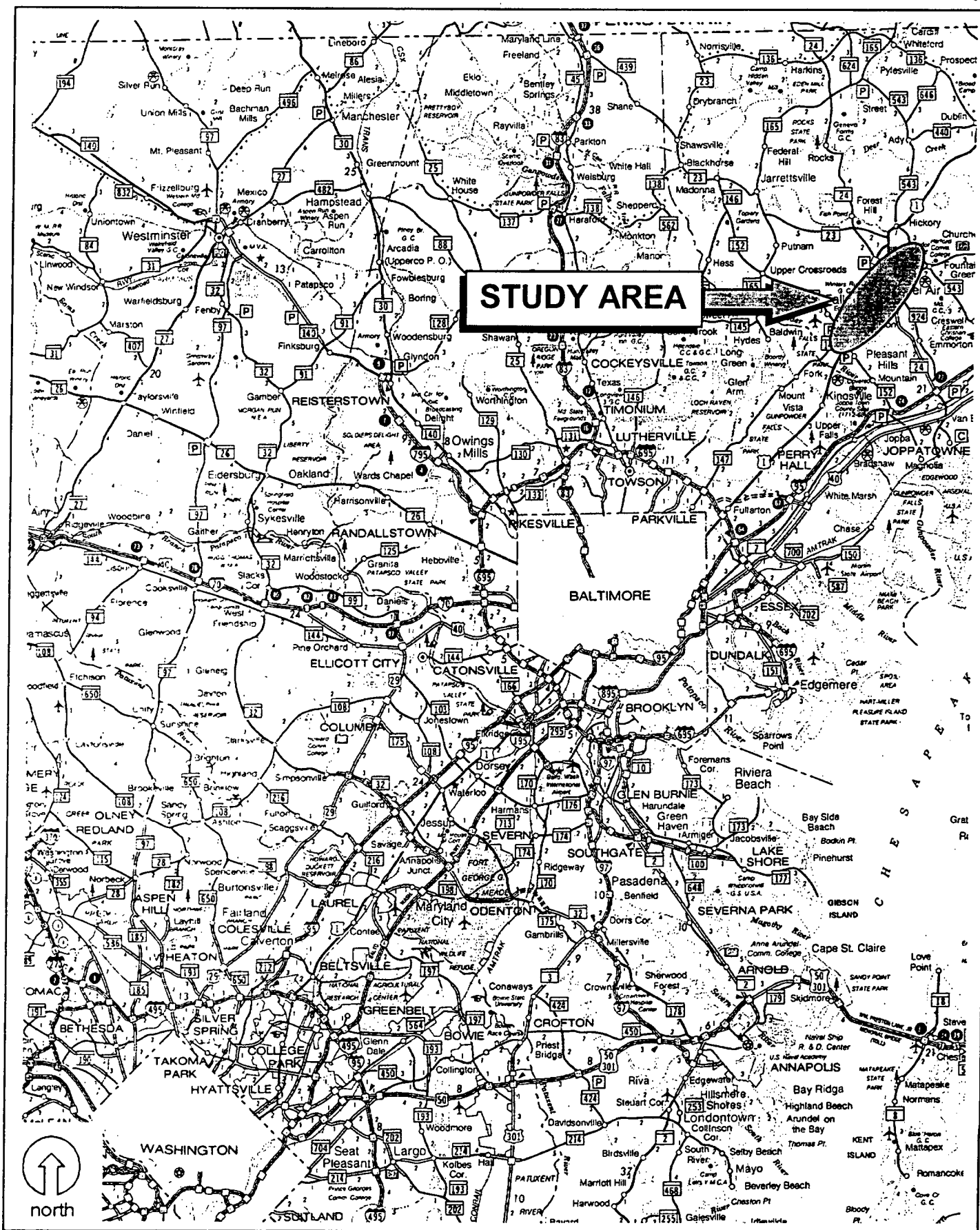
1.2 Project Description

Capacity and safety improvements are proposed to dualize a 4.5-mile section of US 1 (known as the Bel Air Bypass) from north of MD 147 to the MD 24/924 intersection (see Figure 1-2). Also included are new access controlled interchanges at existing intersections with MD 24 and MD 24/924. The study portion of the US 1 Bel Air Bypass varies greatly with regard to roadway typical sections.

- From the intersection of US 1 and MD 147 northward for 0.9 miles, the existing roadway is a four-lane divided highway with paved shoulders.
- From 0.9 miles north of the MD 147 intersection to the MD 24 interchange, the existing roadway is two lanes, undivided with paved shoulders.
- From MD 24 to the MD 24/924 interchange, the existing roadway is four lanes, undivided, with paved shoulders of varying widths.
- From MD 24/924 to the intersection with US 1 Business, the existing roadway is two lanes with paved shoulders.

For most of its length within the study area, the existing right-of-way is between 250 and 300 feet wide. There are three signalized intersections in the study area: MD 147, MD 24 and US 1 Business. At the intersection of US 1 and MD 24/924, there is a partial cloverleaf interchange.

The project proposes, through a series of build alternates and options, the dualization of the two-lane sections of US 1 by constructing a new northbound parallel roadway. The existing roadway will be converted to serve southbound traffic only. The improved roadway can be described in three separate sections:



U.S. 1 from MD 147 to North of MD 24/924

STATE HIGHWAY ADMINISTRATION

Figure 1-1

Project Location Map

U.S. 1 from MD 147 to North of MD 24/924

STATE HIGHWAY ADMINISTRATION

Figure 1-2

Project Study Area

- From north of MD 147 to MD 24, the proposed roadway would be four lanes, divided with shoulders.

- From MD 24 to the MD 24/924 interchange, the proposed roadway would be six lanes, divided with shoulders.

- From MD 24/924 to US Business 1, the proposed roadway would be four lanes, divided, with shoulders.

The build alternates will be constructed within the existing 250 to 300 feet of right-of-way with the exception of improvements proposed at MD 24/924 where narrow strips of right-of-way will be required along MD 24 and MD 924 to accommodate sidewalks and intersection modifications.

This study evaluates alternative methods to improve safety and to accommodate projected increases in traffic resulting from planned growth in the area. The proposed improvements are in accordance with the Harford County master plan.

2.0 PURPOSE AND NEED

Improvements to the existing US 1 Bel Air Bypass are proposed to reduce accident rates which are statistically significantly higher than the statewide average for similar state highways, and to accommodate projected increases in traffic volumes resulting from planned growth. An increasing number of single and multi-family residential developments are being constructed adjacent to the Bel Air Bypass, particularly north of Vale Road, in response to the demand for housing in this area and in accordance with approved local plans. As a result of this growth, 1993 average daily traffic volumes (ADTs) are projected to double by the year 2020.

2.1 System Linkage

US 1 lies within Corridor #17 of the Maryland Department of Transportation's Congestion Management System (CMS). The CMS program resulted from a mandate of the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991. The program entails a high level of analysis of causes and solutions to traffic congestion and mobility needs for 28 transportation corridors across the State of Maryland. Corridor #17 stretches from Cecil County to downtown Baltimore. Although the primary facility in Corridor #17 is I-95, US 1 in the project area is one of the main roadways in the CMS Corridor.

The intersection at MD 147 was chosen as the southern terminus of the subject study for several reasons:

1. US 1 from MD 152 to MD 147 is a four-lane undivided facility that is currently undergoing project planning activity.

2. The four-lane section of the Bel Air Bypass from MD 147 to south of Winters Run will accommodate projected traffic volumes through the year 2020 and therefore is not proposed for improvement.

The northern terminus for the project was chosen as north of MD 24/924 because this is also the southern terminus of the proposed US 1 bypass of Hickory. The Hickory Bypass project has received location approval from the Federal Highway Administration (FHWA) and is currently in final design; construction is expected to begin August 1999.

Dualization of the US 1 Bel Air Bypass will link an improved highway south of the study area with a new highway north of the study area. Interchange improvements will improve access to I-95 and the retail/business district of Bel Air via MD 24 and MD 924.

2.2 Traffic Volumes

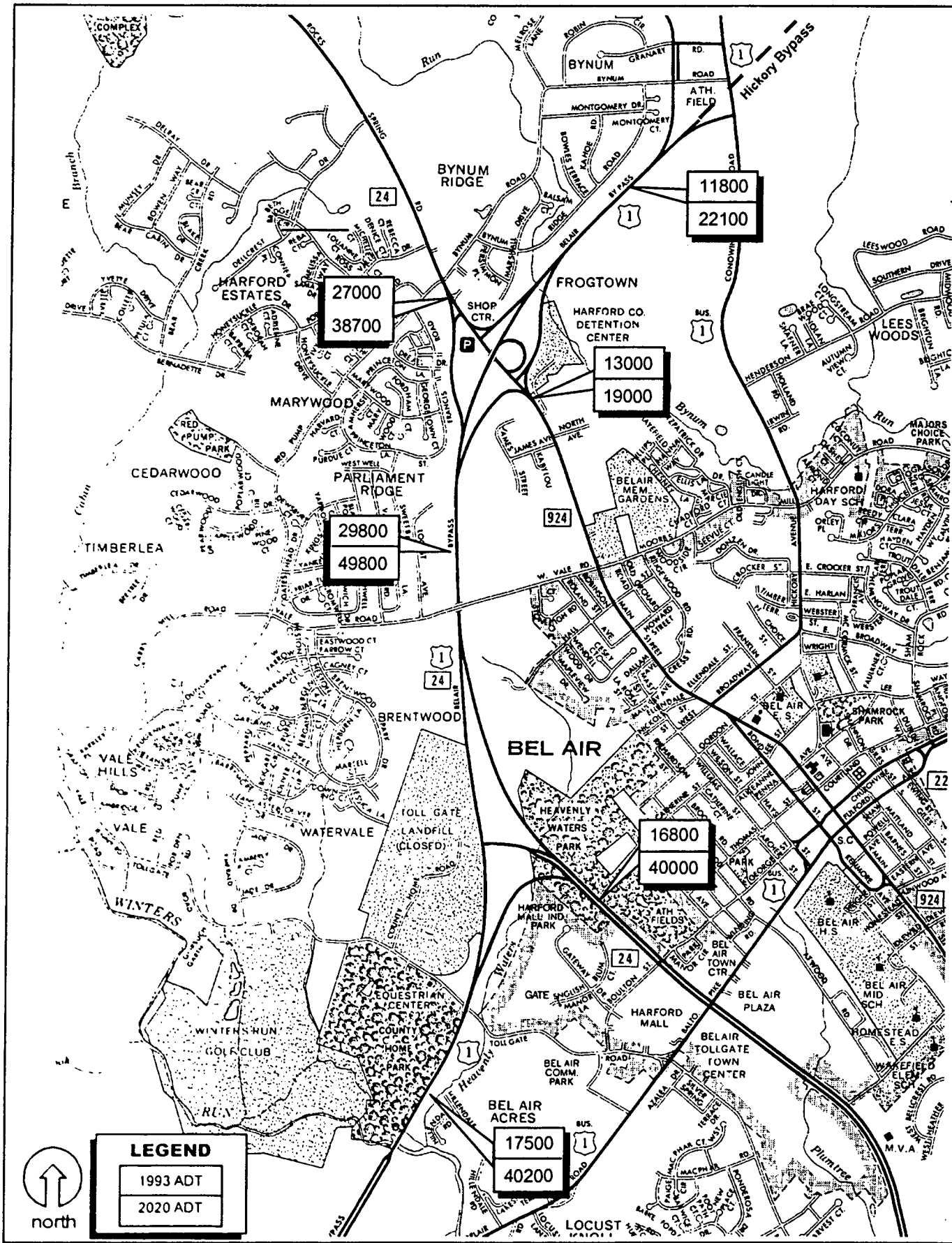
Average Daily Traffic (ADT) volumes as measured in 1993 and projected for 2020 are shown in Table 2-1. In 1993, ADT at the southern end of the project area was 17,500; 29,800 in the middle of the project, and 11,800 at the northern end (see Figure 2-1). ADT's are projected to more than double from 17,500 to 40,200, south of MD 24 by 2020. For the portion of the project north of MD 24, ADT will double because no expeditious alternate route is available for traffic relief.

TABLE 2-1
AVERAGE DAILY TRAFFIC

	1993	2020
Between MD 147 and MD 24	17,500	40,200
Between MD 24 and MD 24/924	29,800	49,800
North of MD 24/924	11,800	22,100

Source: State Highway Administration, 1993

AM and PM peak hour traffic volumes are also expected to experience a considerable increase by the year 2020. The most significant changes occur on the southbound side of US 1 during the AM peak and on the northbound side during the PM peak. As shown on Figures 2-2A and 2-2B, the traffic volumes for US 1 at the northern end of the study area are expected to rise from 668 vehicles per hour (vph) to 1,600 vph southbound in the AM; and from 686 vph to 1,071 vehicles per hour northbound in the PM. In the middle of the study area, the vph will increase from 1,699 to 3,125 for southbound traffic in the morning; and from 1,706 to 2,884 vph northbound in the evening. At the southern end of US 1 in the study area, the southbound AM peak vph will increase from 1,371 to 2,900 and the northbound PM peak vph will grow from 1,094 to 2,519.

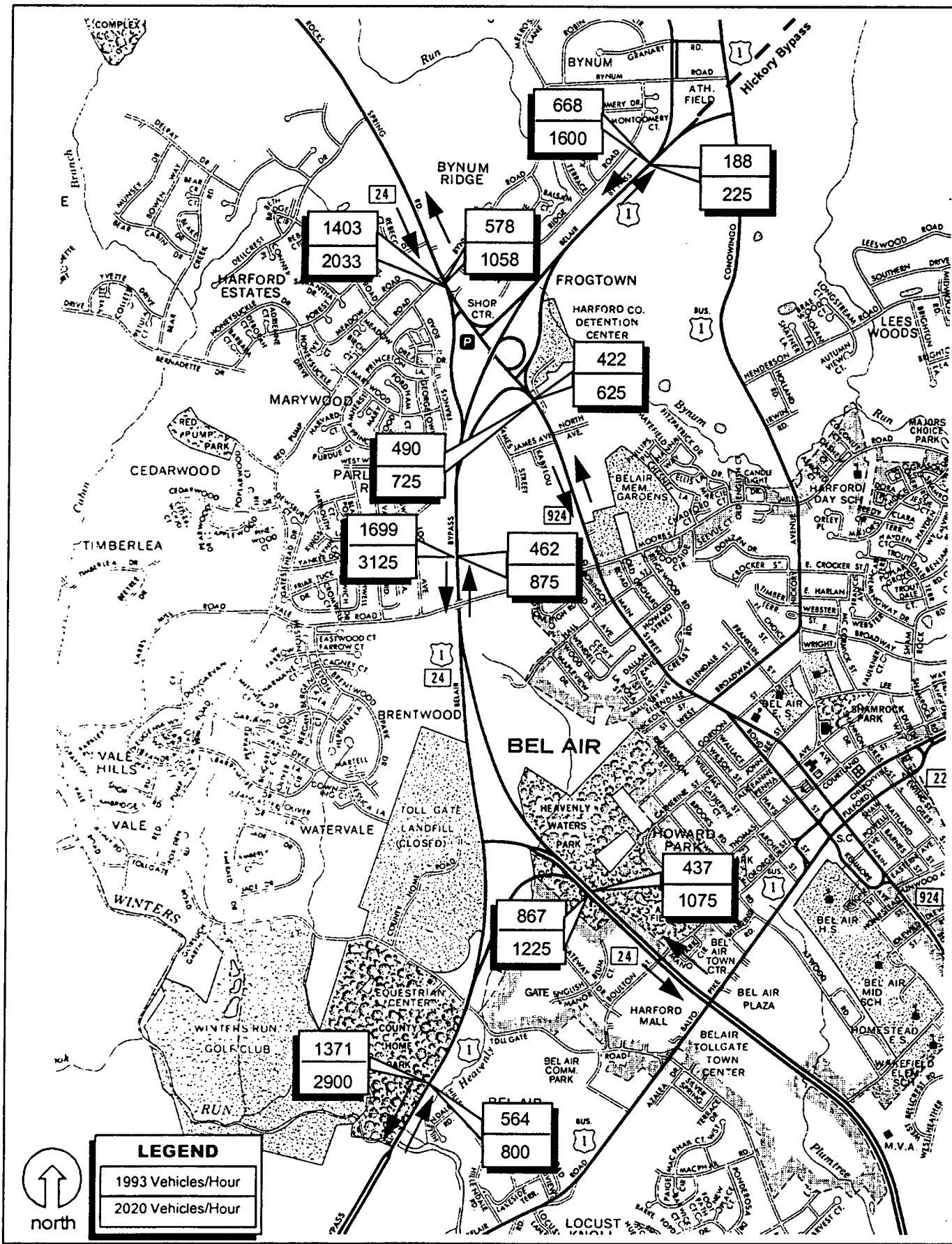


U.S. 1 from MD 147 to North of MD 24/924

STATE HIGHWAY ADMINISTRATION

Figure 2-1

Average Daily Traffic (ADT)

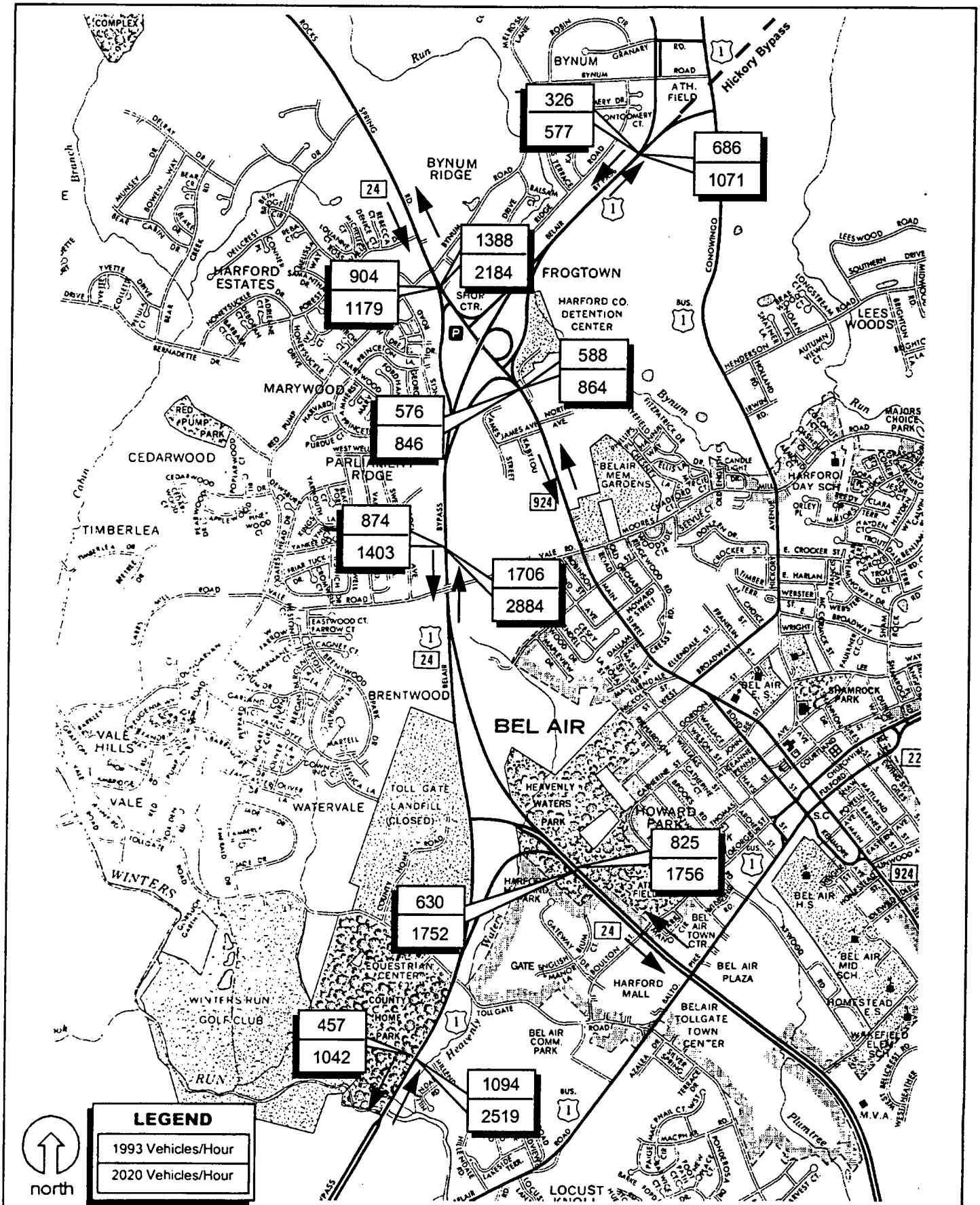


U.S. 1 from MD 147 to North of MD 24/924

STATE HIGHWAY ADMINISTRATION

Figure 2-2a

AM Peak Hour Traffic Volumes



U.S. 1 from MD 147 to North of MD 24/924

STATE HIGHWAY ADMINISTRATION

Figure 2-2b

PM Peak Hour Traffic Volumes

2.3 Capacity

Level-of-service (LOS) analyses have been conducted for the US 1 mainline, major intersections, interchange ramps, and ramp merges and diverges for traffic volumes that were measured in 1993, and were forecast assuming a no-build condition for the year 2020. (Table 2-2 lists mainline levels-of-service and Table 2-3 lists notable intersection levels-of-service and volume to capacity ratios).

Level-of-service is a qualitative measure of a highway's operating conditions at any given time based on speed, ability to maneuver, traffic interruptions, delay, volume to capacity ratio (the number of vehicles passing a given point compared to the theoretical maximum number of vehicles that could pass that point during an interval of time), and other factors. This measure is dependent upon highway geometry and traffic characteristics, and ranges from LOS A (best) to LOS F (worst).

- LOS A is free flow, with low volumes, high speeds, and a high degree of maneuverability
- LOS B is reasonably free flow, with speed and maneuverability slightly restricted by traffic conditions.
- LOS C is stable flow, with speed and maneuverability restricted by traffic conditions.
- LOS D approaches unstable flow, speed and maneuverability are noticeably restricted and controlled by traffic conditions.
- LOS E represents volatile flow with virtually no usable gaps in the traffic stream and volumes at or near capacity.
- LOS F is forced flow operations with low speeds and volumes above capacity.

Mainline LOS for US 1 was evaluated through three segments of roadway. These were the two-lane section south of MD 24; the two-lane section from MD 24 to north of MD 924; and the four-lane divided section south of MD 24. In 1993, during the AM and PM peak hours, both sides of the two-lane segment south of MD 24 operated at LOS C for the peak direction. By 2020 this segment will operate at LOS F for southbound traffic during the AM peak and northbound traffic during the PM peak. The two-lane segment from MD 24 to north of MD 924, operated at LOS D for southbound traffic during the AM peak and at LOS E for northbound traffic during the PM peak in 1993. This section was then upgraded to a four lane highway in 1998 which is projected to operate at LOS B for all directions and times in 2020.

The intersection of US 1 with MD 24 is projected to experience the most dramatic change in LOS between 1993 and 2020. This intersection is expected to drop from LOS A in the AM and LOS B in the PM in 1993 to LOS F in both the AM and PM peaks by the year 2020 under the No-Build alternate. Volume to capacity (V/C) ratios for the intersection will increase from .47 during the AM and .70 in the PM to 1.03 in the AM and 1.04 in the PM

TABLE 2-2
MAINLINE LEVEL OF SERVICE
US 1

	AM				PM			
	SB		NB		SB		NB	
	1993	2020*	1993	2020*	1993	2020*	1993	2020*
2-Lane Roadway								
south of MD 24	C	F	B	B	A	B	C	F
MD 24 to north of MD 924[1]	D	B[1]	A	B[1]	B	B[1]	E	B[1]
4-Lane Divided								
south of MD 24	B	D	A	A	A	A	B	C

*2020 projecions are based on the no-build alternate.
[1] This segment was upgraded to four lanes in 1998 and the 2020 LOS reflects this improvement.

TABLE 2-3
INTERSECTION LEVEL-OF-SERVICE/VOLUME TO CAPACITY RATIO
US 1

	AM		PM	
	1993	2020*	1993	2020*
US 1 @ MD 24	A/.47	F/1.03	B/.70	F/1.04
US 1 @ MD 24/MD 924 Interchange				
MD 924 @ ramp onto northbound US 1	A/.28	A/.43	A/.38	A/.58
MD 24/924 @ ramp from southbound US 1	A/.30	A/.47	A/.50	C/.79
MD 24/924 @ ramp onto southbound US 1	A/.38	A/.59	A/.47	C/.72

*2020 projecions are based on the no-build alternate.

2.4 Safety

There were 83 police-reported accidents on US 1 in the study area during the three-year period of 1991 through 1993. These accidents resulted in a rate of 92 accidents per 100 million vehicles miles of travel (acc/100 mvm) over the study period. This rate of 92 acc/100 mvm is statistically significantly higher than the statewide average accident rate of 49 acc/100 mvm.

The accidents experienced in the study area are listed by severity and are shown along with the accident rates and the corresponding statewide average accidents rates for each level of severity in Table 2-4. The rate of accident for both injury (46.7 acc/100 mvm) and property damage (45.6 acc/100 mvm) accidents are higher in the study area than in the state (26.2 acc/100 mvm and 21.7 acc/100 mvm, respectively) as a whole. Study area property damage occurred at a rate nearly double the statewide average, while injury accidents occurred at a rate 76% greater than the statewide average rate.

TABLE 2-4
STUDY AREA ACCIDENTS

SEVERITY	1991	1992	1993	TOTAL	RATE (ACC/100MVM)	STATEWIDE AVG. RATE[1] (ACC/100MVM)
Fatal Accidents	0	0	0	0	0	0.8
Injury Accidents	13	11	18	42	46.7*	26.2
Property Damage	13	13	15	41	45.6*	21.7
Total Accidents	26	24	33	83	92.3*	48.7

*Significantly higher than the statewide rate
[1] Statewide Average Rate for facilities of this type.

The accident frequencies and rates by collision type are listed in Table 2-5 along with their respective statewide average rates. Of the seven types of accidents that are highlighted, the study area experienced significantly higher rates than the statewide average rate in five categories. The left-turn accident rate (11.1 acc/100 mvm) was almost eight times that of the statewide average rate (1.4 acc/100 mvm). Study area rates exceeded statewide average rates by 75% or more in three other categories.

TABLE 2-5
STUDY AREA ACCIDENT CHARACTERISTICS

COLLISION TYPE	TOTAL ACCIDENTS	STUDY RATE (ACC/100 MVM)	STATEWIDE AVG. RATE[1] (ACC/100 MVM)
Rear End	22	24.5*	14.0
Fixed Object	20	22.2*	12.3
Opposite Direction	6	6.7*	3.2
Sideswipe	15	16.7*	7.2
Left Turn	10	11.1*	1.4
Pedestrian	1	1.1	0.7
Parked Vehicle	1	1.1	0.7
Other Collision	8	8.9	9.2

*Significantly higher than the statewide rate.
[1] Statewide average rate for similarly designed highways.
Note: Data shown is from the three year period from 1991-1993.

The nighttime, wet surface, and alcohol-related accidents are compared to the statewide percentage of these accidents by environmental condition in Table 2-6. These accidents, resulting from adverse environmental conditions, fell within an acceptable range, except Alcohol-Related accidents that were significantly higher than the statewide percentage. There were no High Accident Intersections (HAI) or Sections (HAS) within the study area.

TABLE 2-6
ACCIDENT ENVIRONMENTAL CONDITIONS

COLLISION	1991-1993	% OF TOTAL ACCIDENTS	STATEWIDE %
Nighttime	28	34	32
Wet Surface	16	19	28
Alcohol-Related	13	16*	8

*Significantly higher than the statewide average rate.

Overall, the section of US 1 from MD 147 to North of MD 24/924 experienced an average accident rate of 92 acc/100 mvm during the three year study period. This accident rate is significantly higher than the statewide rate of 49 acc/100 mvm for a similarly designed highway.

2.5 Master Plan Compatibility

The portion of US 1 north of Winters Run is located within the Rock Spring study area of the plan. Although the adjacent low and medium-intensity land uses do not have direct access to this section of US 1, these land uses are serviced by US 1 via MD 23, MD 24, MD 924 and US 1 -

Business (north of Bel Air). The current development pattern in this part of the County is expected to continue.

US 1 will also be affected by high-intensity commercial and residential development in the vicinity of Hickory where a new bypass is being designed, and industrial and commercial development near the planned intersection of MD 23 and US 1 between Bel Air and Hickory.

Improvements to existing US 1 are consistent with the Governor's Smart Growth initiative in that they will serve an area with existing development and are within the development envelope. The widening that will result from the proposed project is not expected to promote secondary or cumulative growth. Traffic volumes generated by the continuing growth along US 1 and elsewhere within the development envelope will worsen the existing operational and safety problems on US 1. Capacity and safety improvements on US 1 and US 1 Business are listed as priorities in *Transportation Plan: An Element of the Harford County Master Plan*, January 1994.

2.6 Conclusion

Accident rates on US 1 in the study area already significantly exceed statewide averages for similar roadways and US 1 is predicted to experience a large increase in traffic as the areas north of Bel Air continue to develop in accordance with approved and adopted plans. Growth trends in the study area indicate a 24% increase in population by the year 2020 in accordance with approved and adopted plans. Economic development and jobs in the study area are expected to grow approximately 26% over the same time period, based on County employment projections. Additional job growth is occurring elsewhere in the County, especially in designated Enterprise Zones. Since US 1 is a major transportation route through Harford County, it is anticipated that growth in the surrounding area will affect traffic and congestion along US 1.

Peak period LOS in the study area is poor and will worsen as traffic grows. Additional mainline capacity along the entire 2-lane section of US 1 is needed, as well as additional capacity for the at-grade intersection of US 1 and MD 24, in order to maintain satisfactory LOS during AM and PM peak hours in the year 2020.

3.0 DESCRIPTION OF EXISTING ENVIRONMENT

3.1 Social Environment

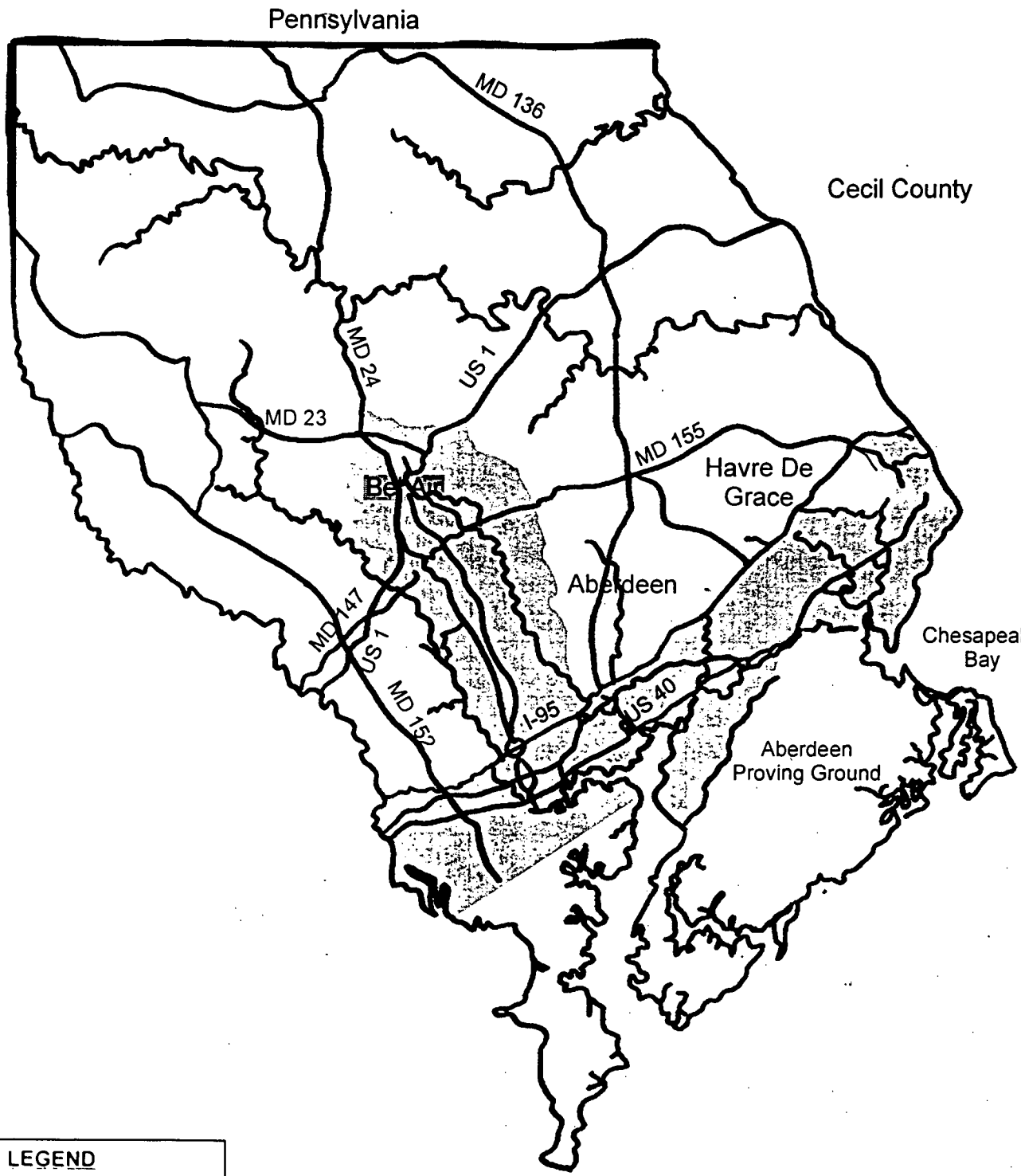
Harford County has prepared a number of Master Plans to help guide the County's expanding growth and population. Land uses, zoning, transportation, open space, public facilities, services and buildings are all guided by these comprehensive plans. The master plan dating from 1977 established a Development Envelope to attract and direct orderly growth in the County, primarily between I-95/US 40 and along MD 24 to north of Bel Air. The US 1 Bypass Improvement Project lies within this Development Envelope (see Figure 3-1).

Much of the information for this chapter was obtained from the most recent area master plans: the *Harford County 1996 Master Plan and Land Use Element Plan* and the *1995-2000 Comprehensive Plan: Town of Bel Air*. Additional information was derived from 1990 census data. Population and housing statistics are identified for Bel Air, greater Bel Air which includes the study area, and Harford County. The study area is comprised of six census tracts (see Figure 3-2) from which specific data was compiled.

3.1.1 Population and Housing

The overall population in Harford County increased from 145,930 in 1980 to 182,132 in 1990, a 25 percent increase. By 1995, the population had grown another 13 percent, to 205,367 and by 2020 it is expected that it will increase by another 29 percent to 264,810. Harford County has been transformed from a predominantly rural county supported by agriculture and forestry to a fast-growing, suburban community in the Baltimore Metropolitan Region. The County, one of the fastest growing in the state, can attribute this to its strategic location between Baltimore and Philadelphia in the intensively developed Washington D.C. to New York corridor. Several major transportation corridors including I-95, US Routes 1 and 40 and two rail lines, including Amtrak's Northeast Corridor, transverse the County.

The six census tracts (3032.02, 3035, 3036.01, 3036.02, 3038, and 3039) which contain the project study area as seen in Figure 3-3, have experienced a similar increase in population. The number of people living in these census tracts rose from 22,345 in 1980 to 33,911 in 1990. By 1995, 41,155 people were living in the study area. Population trends for the study area and Harford County from 1995 through 2010 are presented in Table 3-1 and show similar increases. Additionally, there were 63,094 households in the County in 1990. That number increased by

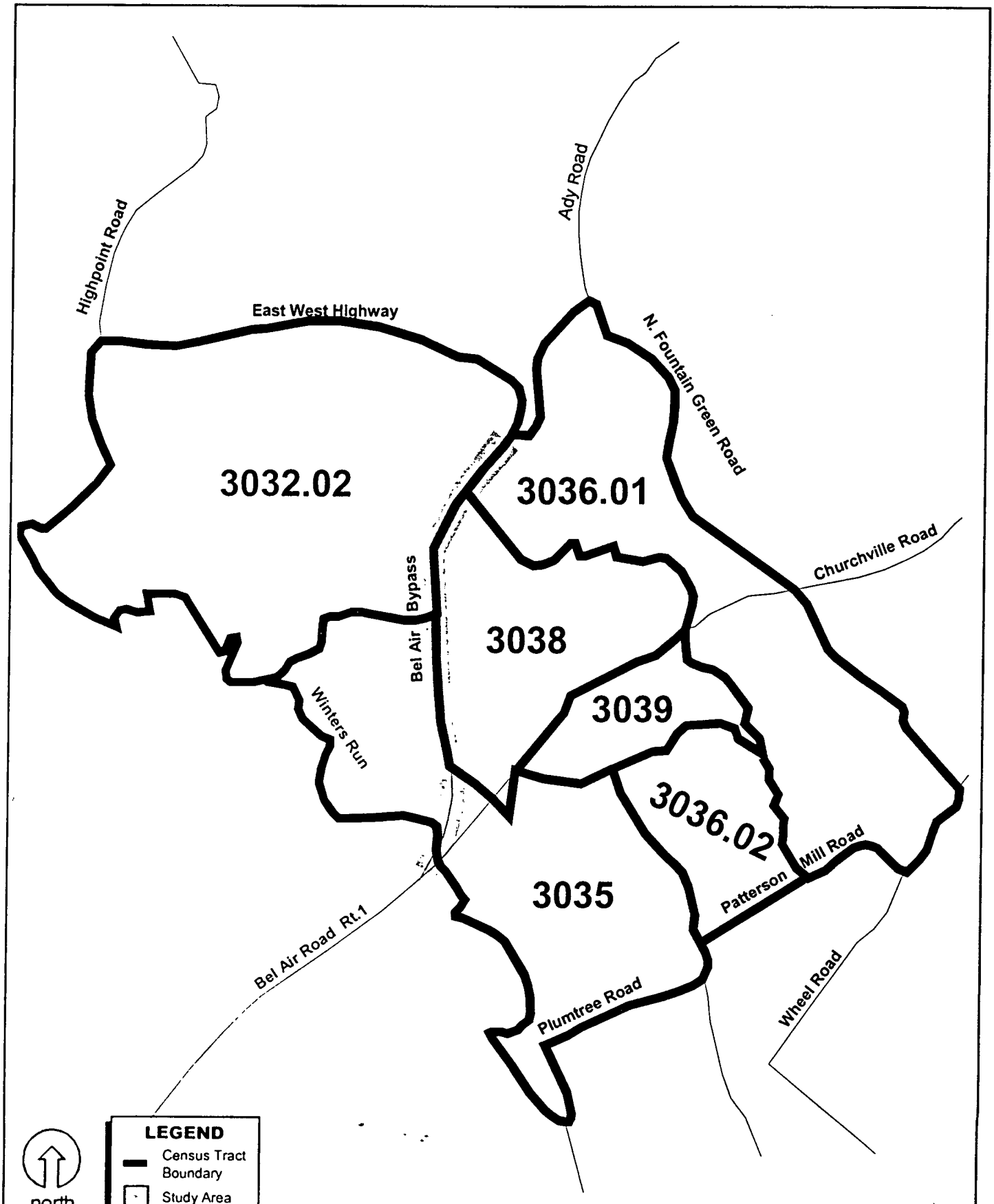


U.S. 1 from MD 147 to North of MD 24/924

STATE HIGHWAY ADMINISTRATION

Figure 3-1

Harford County Development Envelope

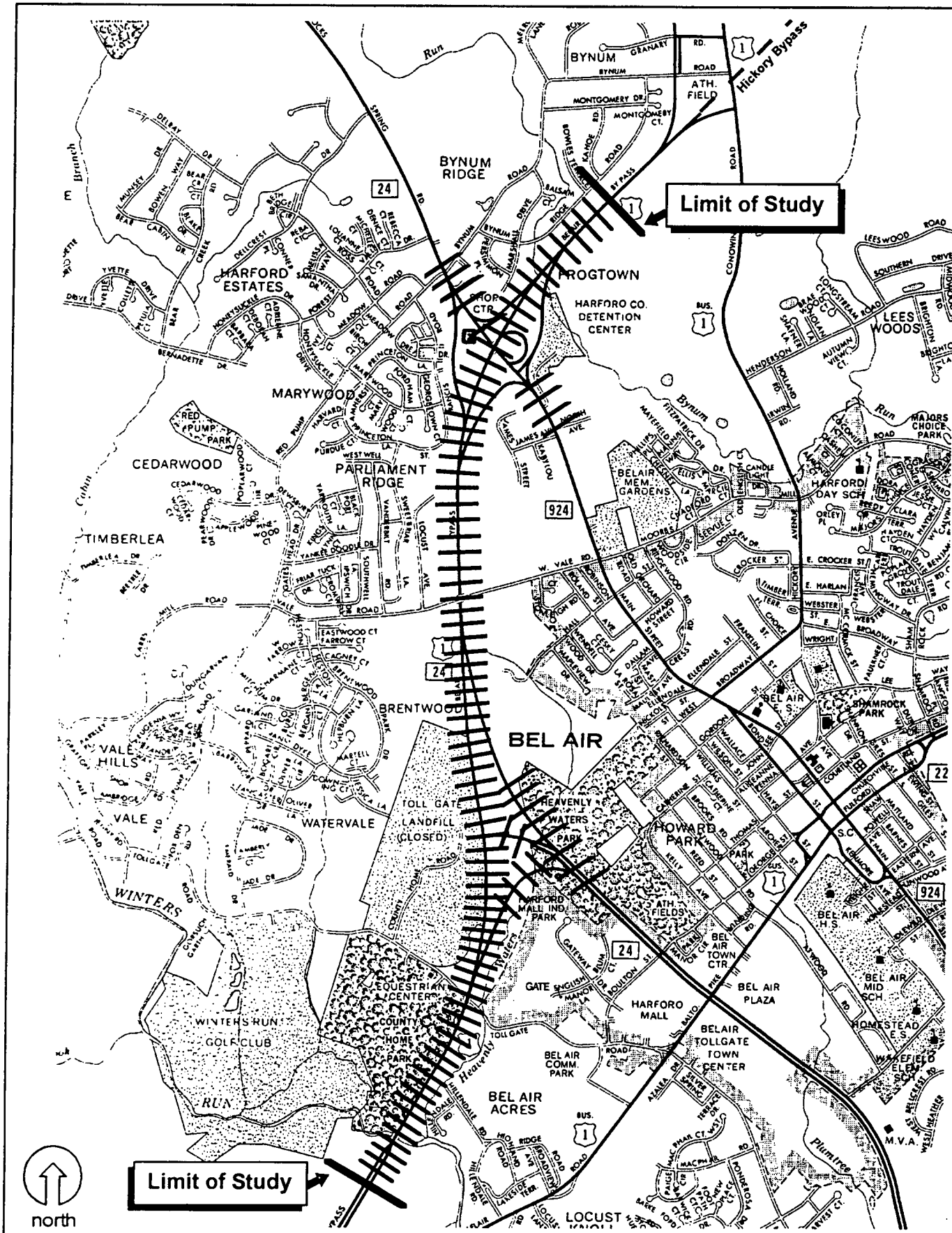


U.S. 1 from MD 147 to North of MD 24/924

STATE HIGHWAY ADMINISTRATION

Figure 3-2

Study Area Census Tracts



U.S. 1 from MD 147 to North of MD 24/924

STATE HIGHWAY ADMINISTRATION

Figure 3-3

Project Study Area

approximately 10,000 in five years. Household trends generally mirror population trends, however, Harford County households grew slightly more than population, as illustrated in Table 3-2. This trend is indicative of the decrease in household size in this area.

TABLE 3-1
STUDY AREA POPULATION TRENDS
1995 TO 2010

Census Tract	1995	2000	1995-2000 % change	2005	2010	2005-2010 % change
3032.02	9,224	10,443	13.0 %	11,795	11,916	1.0 %
3035	8,448	8,592	1.7 %	8,743	8,897	1.7 %
3036.01	9,647	11,646	20.7 %	13,038	14,209	8.9 %
3036.02	3,603	3,608	0.1 %	3,580	3,534	-1.2 %
3038	7,840	7,914	0.9 %	8,006	8,076	0.8 %
3039	2,393	2,345	-2.0 %	2,305	2,262	-1.8 %
Study Area Total	**41,155**	**44,548**	**8.2 %**	**47,467**	**48,894**	**3.0 %**
Harford County	**209,130**	**226,565**	**8.3 %**	**239,560**	**249,260**	**4.0 %**

***Source**: Harford County Department of Planning and Zoning; U.S. Census, 1996*

TABLE 3-2
STUDY AREA HOUSEHOLD TRENDS
1995 TO 2010

Census Tract	1995	2000	1995-2000 % change	2005	2010	2005-2010 % change
3032.02	2,961	3,426	15.7 %	3,944	4,064	3.4 %
3035	2,910	3,035	4.3 %	3,153	3,280	4.0 %
3036.01	3,540	4,335	22.0 %	4,919	5,449	10.7 %
3036.02	1,244	1,272	2.2 %	1,285	1,293	0.6 %
3038	3,074	3,164	2.9 %	3,253	3,341	2.7 %
3039	991	991	--	991	992	--
Study Area Total	**14,720**	**16,223**	**10.2 %**	**17,545**	**18,419**	**4.9 %**
Harford County	**73,640**	**81,720**	**10.9 %**	**88,080**	**93,600**	**6.2 %**

***Source**: Harford County Department of Planning and Zoning; U.S. Census, 1996*

Almost one-half of the study area population is between the ages of 20 and 49. Approximately 10 percent of the population is older than 65. This group lives in an older and more established section of Bel Air which has a higher concentration of over 65 residents than the rest of the County. The average household median income within the study area in 1989 was $48,450 annually, with an average per capita income of $19,585. The average household median income for the study area is higher than that of the County which is $41,700. The study area's per-capita income is also higher than the countywide figure of $16,612. According to the 1990 Census, 96

percent of study area residents were white while 2 percent were African-American and 2 percent were other minorities. This compares to 89 percent white, 9 percent African American and 2 percent other minorities for the entire county. The educational status of the study area population is higher than the County and the State as a whole with 88 percent of persons over the age of 25 having high school diplomas and 33 percent of persons over 25 having college degrees.

The project study area occupies 60 square miles (mi^2) and has a population density of over 1,450 persons per square mile. This is much higher than the average population density for Harford County and the State of Maryland, at 414 persons and 489 persons per square mile, respectively. Population density also varies by census tract. The older and most established tracts in the Town of Bel Air have densities of 2,817 and 3,034 people per square mile, while tract 3032, the newest and fastest growing part of the study area, has a population density of only 924. Table 3-3 shows the 1990 population density in the study area.

TABLE 3-3
POPULATION DENSITY - 1990

Area (census tract)	Land Area (mi^2)	Population	Population Density (persons/mi^2)
3032.02	8	7,069	924
3035	5	6,665	1,264
3036.01	5	6,469	1,230
3036.02	1	3,386	2,274
3038	3	7,905	2,817
3039	1	2,417	3,034
Total Study Area	23	33,911	1,474
Harford County	440	182,132	414

Source: U.S. Census Bureau, 1990

3.1.2 Environmental Justice

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" requires federal agencies to identify and address, as appropriate, "disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." The purpose of Environmental Justice is to assess these impacts resulting from alternates under consideration and to provide the opportunity for these populations to be involved in the public participation process.

As stated above, the 1990 Census indicates that 2 percent of the study area population was African-American while other minorities comprise another 2 percent. Individual census tract populations are all more than 93 percent white. Those with the highest percentages of minorities are located to the east of US 1, especially within the town of Bel Air. Income data for the individual census tracts shows that median household income levels throughout the study area are comparable to or higher than the County median. The lowest household income levels are found within the Town of Bel Air. According to Harford County planners, in conjunction with both County and census data, no known concentrations of minority or low-income populations are found in the study area.

3.1.3 Communities Within the Study area

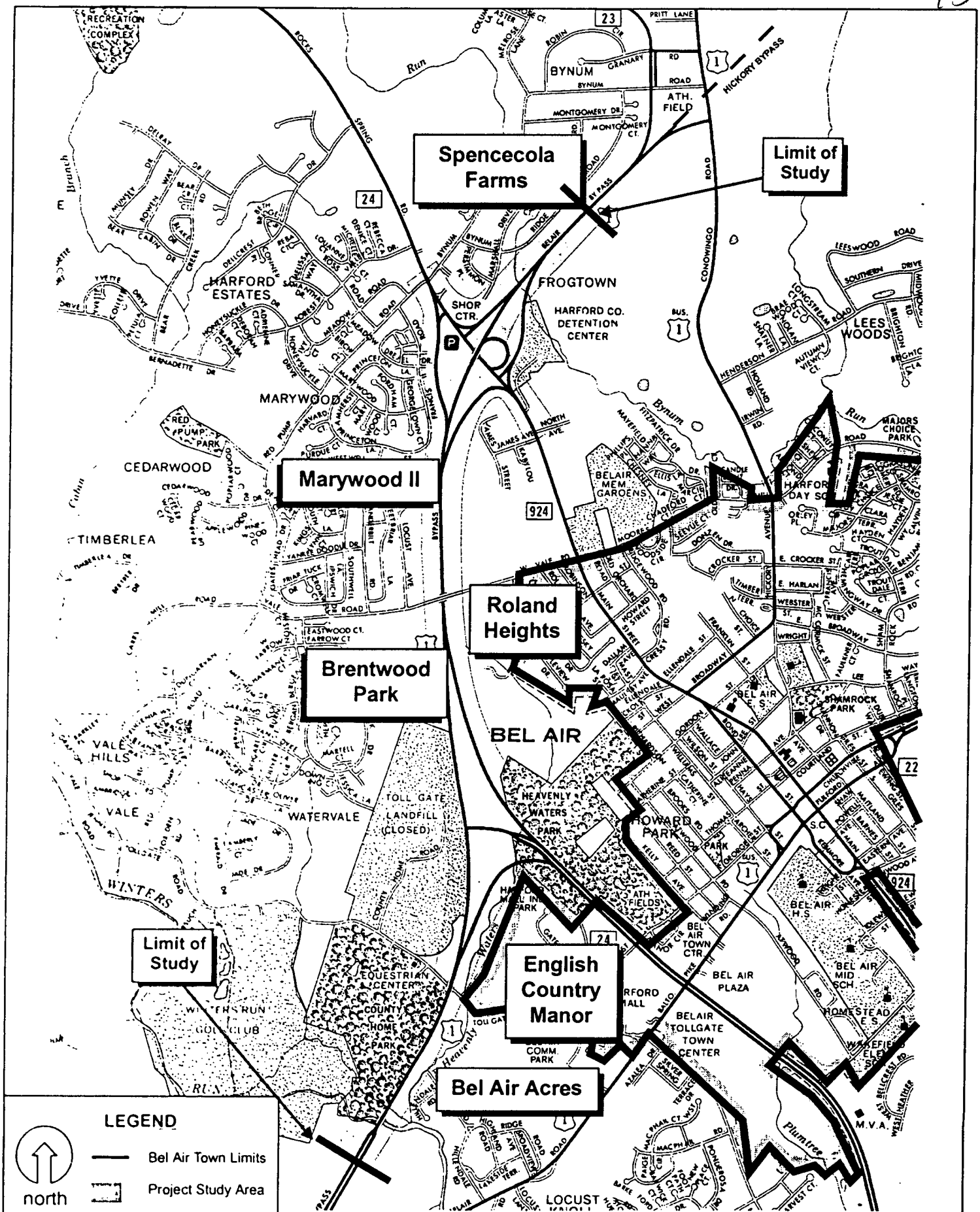
The study area lies directly west of the boundary of the Town of Bel Air. It falls within greater Bel Air in an area known as "Bel Air Plus" which extends west from the town boundary to encompass the Bel Air Bypass. It is primarily a transportation corridor that does not bisect any residential communities. One neighborhood, English Country Manor is part of the Town of Bel Air and is the neighborhood in closest proximity to the project at the MD 24/US 1 interchange. This is a fairly new development of clustered townhouses in an urban, high density residential zone.

Other communities in the study area include Summervale and the developing Spencecola Farms at the northern end, Brentwood Park and Marywood II on the west side of US 1; Roland Heights south of Vale Road and Bel Air Acres at the southern end of the study area (see Figure 3-4).

3.1.4 Community Facilities

Community facilities and civic activity in the project vicinity are generally located in the Town of Bel Air and not adjacent to US 1. These facilities include schools, churches, public safety/ emergency services, water and sewer services, public library, health care facilities/service, post office and a courthouse. Those facilities closest to the study area are shown on Figure 3-5.

Schools - Educational facilities in the Town of Bel Air include Bel Air High School, Bel Air Middle School, Wakefield Elementary School, Bel Air Elementary School, Harford Day School, and St. Margaret's School. All of these facilities are located within the Town of Belair.

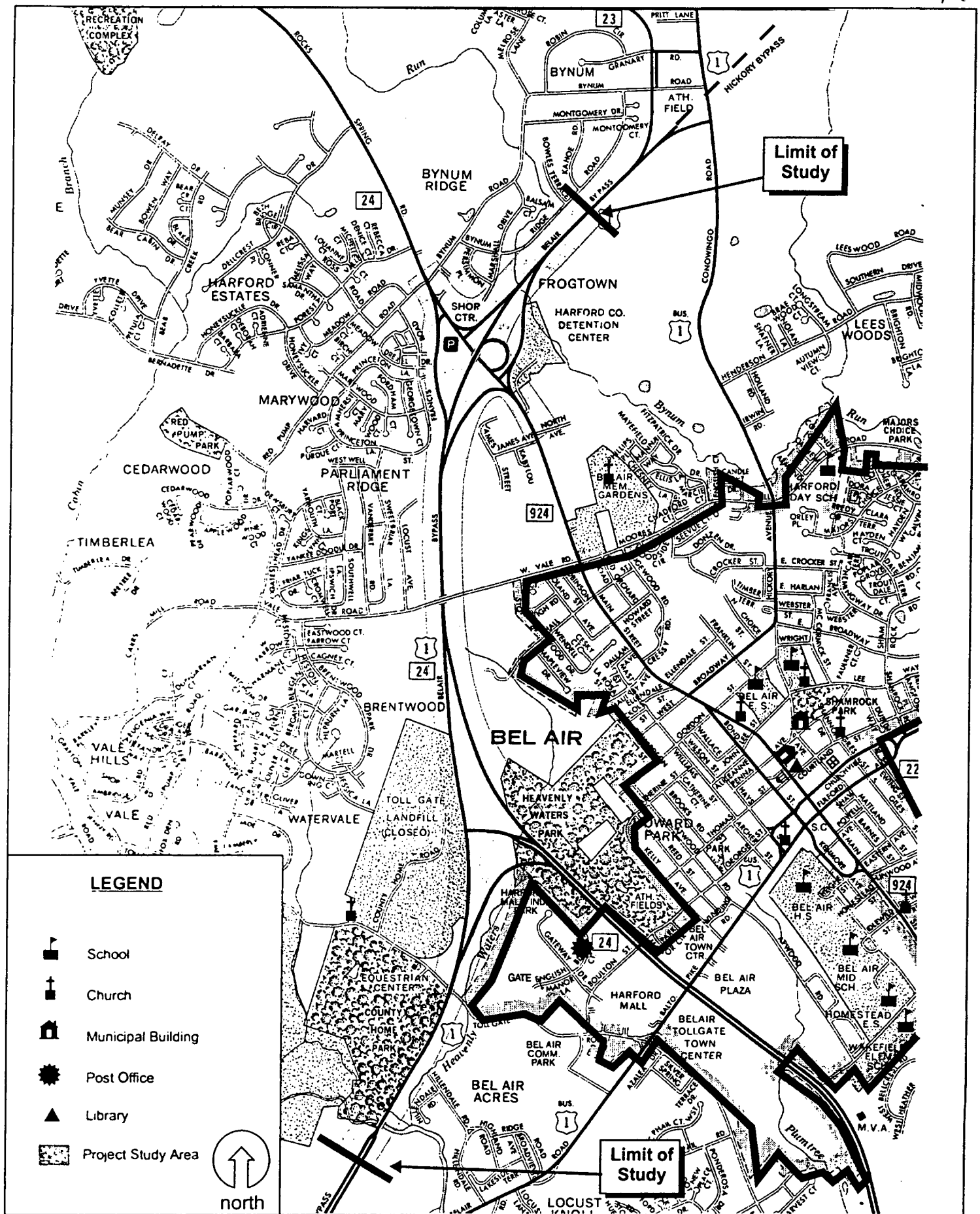


U.S. 1 from MD 147 to North of MD 24/924

STATE HIGHWAY ADMINISTRATION

Figure 3-4

Communities in the Study Area



U.S. 1 from MD 147 to North of MD 24/924

STATE HIGHWAY ADMINISTRATION

Figure 3-5

Community Facililties

Religious Facilities - Religious facilities in the project vicinity include St. Margaret's Catholic Church, Calvary Baptist Church, Emmanuel Church, Bel Air United Methodist Church, Bel Air Memorial Gardens, Ames Church and Heavenly Waters Church. All these facilities are located in or near the Town of Bel Air, east of the bypass, except Heavenly Waters Church on Tollgate Road west of Heavenly Waters Park.

Public Safety - Fire and ambulance services are provided by the Bel Air Volunteer Fire Department. The Town of Bel Air hopes to improve water facilities to provide additional fire protection coverage. Police services which include security, community services and assistance programs, are provided by the Town of Bel Air Police Department, the Harford County Sheriff's Department, and the Maryland State Police Barracks "D", located at the intersection of US 1 and MD 147, south of the study area.

Water and Sewer Service - The Town of Bel Air receives water service from the Maryland-American Water Company (MAWC), a privately-owned water system. The main source of water to the company is Winters Run, although interconnectionss with the County water system are planned. The Town owns and maintains a sewer collection system and pump station. Wastewater is conveyed to the Harford County Sod Run Wastewater Treatment Plant located just outside of Aberdeen Proving Ground along the Bush River.

Library - The Harford County Public Library, Bel Air Branch functions as the main county branch library with the largest collection of the nine-site system. The Bel Air Library also provides services such as a bookmobile. The facility is undergoing an expansion from 22,000 square feet to 50,000 square feet. Renovation of the existing facility began in 1996. The new addition was completed in December of 1997 after which time renovations began on the old part of the library. Those renovations were completed in the summer of 1998.

Harford Community College has a branch in Bel Air with a library that is open to the public. The facility, however, primarily serves the community college student body.

Health Care Facilities and Services - The only health care facility in the study vicinity is the Bel Air Medical Center, located in town but is beyond the area shown in Figure 3-5. Fallston Hospital is the nearest hospital to the project, located in Fallston, Maryland, one mile south of the project area. There are plans to build a hospital in or near Bel Air but a specific location has not yet been determined.

Post Office -. The main post office in the study area is located near the Harford Mall on Blum Court. Having out grown its old facility, a larger post office was constructed in 1989. The new facility serves the Town of Bel Air as well as areas outside the town limits.

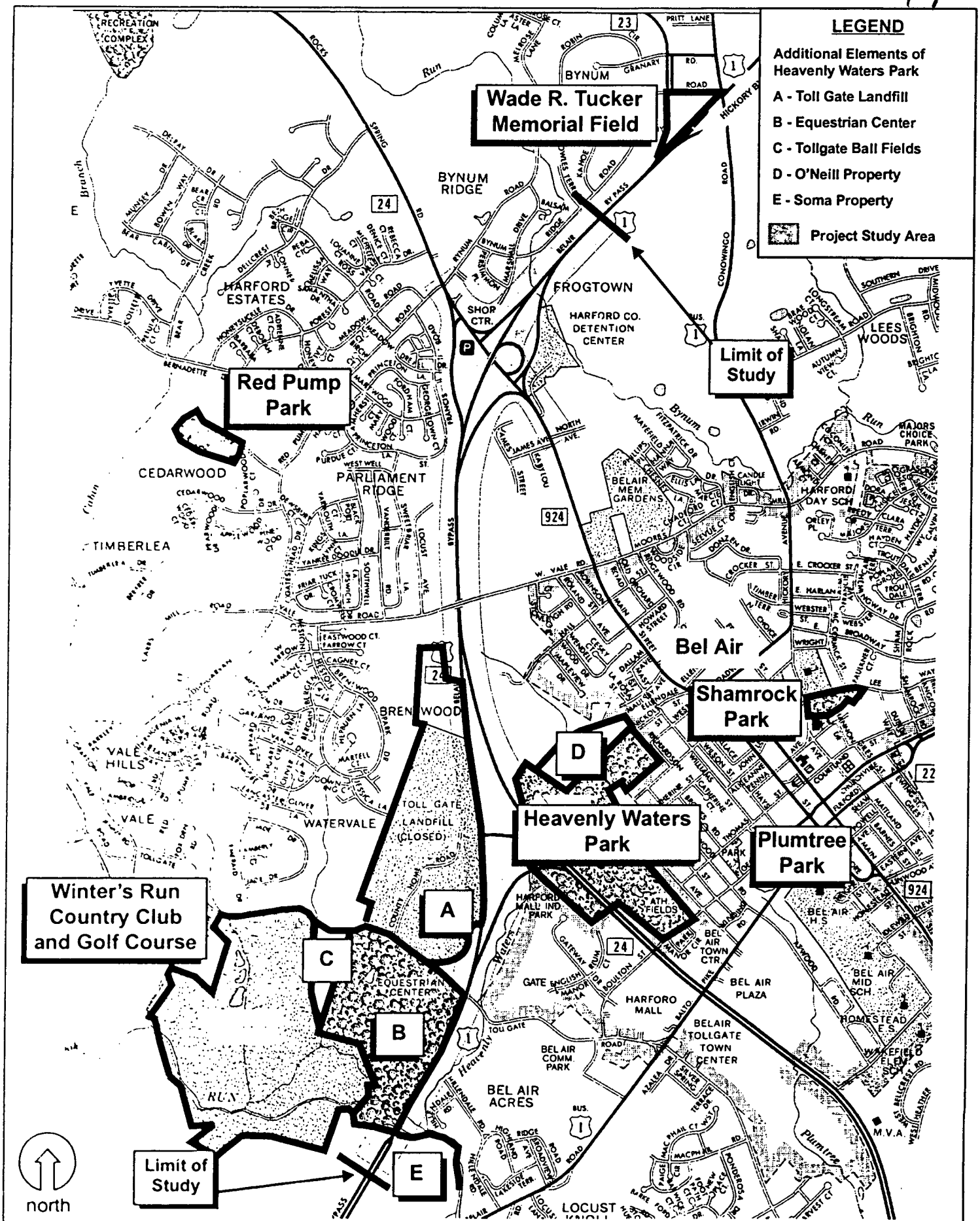
Courthouse - The Harford County Courthouse is on Main Street, in the center of Bel Air. A number of civic buildings, county office buildings, town hall and sheriff's office are located nearby. The court building, which is historically significant, serves as the main court house for all of Harford County.

3.1.5 Parklands and Recreational Facilities

Within the vicinity of this project, there are several small parks, classified in the *1995-2005 Comrehensive Plan: Town of Bel Air* as neighborhood parks or neighborhood play areas, several larger parks, classified as community parks, and one facility classified as a regional county park. Those parks which are closest to the project area are shown on Figure 3-6A. In addition, the MA and PA Heritage Trail is to be constructed in close proximity to the project (see Figure 3-6B).

Neighborhood and Community Parks - The neighborhood parks and play areas include Shamrock Park, Plumtree Park, Major's Choice Park, and Aquila Scott Park. Red Pump Park, though outside the Town of Bel Air and therefore not assigned a classifiaction in the comprehensive plan, is located within the study area and is similar in size to the neighborhood parks. Community parks are found at several schools, including Bel Air Middle, Bel Air Senior High, and Southampton Middle. Additionally, Homestead Elementary and Wakefield Elementary share a community park facility. Of these parks, Shamrock, Plumtree and Bel Air Senior High were built with program open space funding.

Heavenly Waters Park - The regional county park facility within the study area, Heavenly Waters Park, is under the jurisdiction of the Harford County Department of Parks and Recreation and was built with program open space funding. The park has several separate elements which are described in Table 3-4 below.

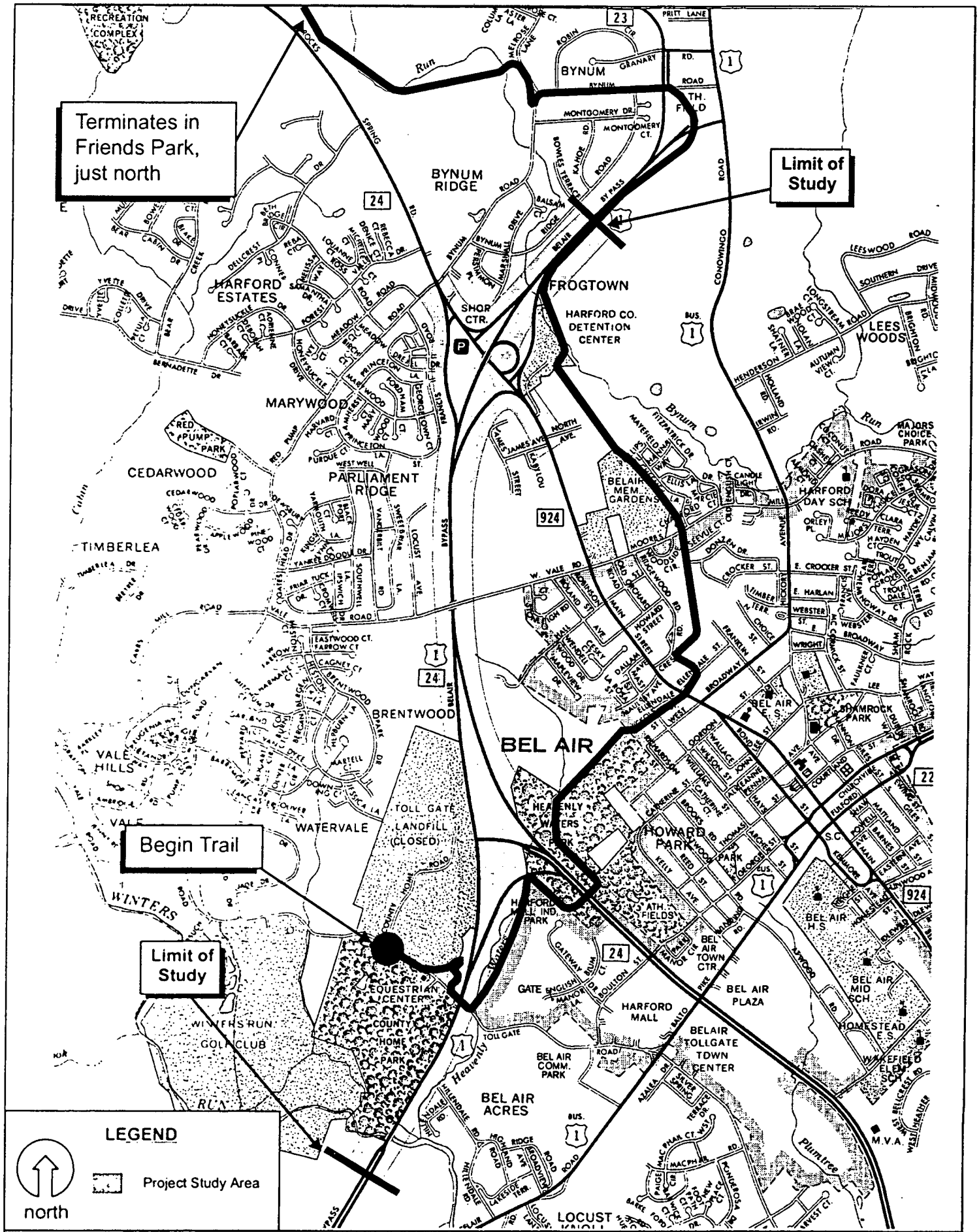


U.S. 1 from MD 147 to North of MD 24/924

STATE HIGHWAY ADMINISTRATION

Figure 3-6a

Parks in the Study Area



U.S. 1 from MD 147 to North of MD 24/924

STATE HIGHWAY ADMINISTRATION

Figure 3-6b

Parks in the Study Area- MA and PA Trail

TABLE 3-4
ADDITIONAL ELEMENTS OF HEAVENLY WATERS PARK

Element	Current Use	Future Use	Annual Users	Funding Source
Equestrian Center; Parks and Rec. Headquarters; Recycling Center	Horse riding center with riding rings, barns, pavilions, announcer's tower	Additional riding rings, pavilions	87,000	Program Open Space
Liriodendron - National Register Property and ball fields	Historic house and outbuildings, ballfields, parking areas	Maryland and Pennsylvania (MA and PA) Heritage Corridor	House - 20,000 Ballfields - 9,760	Program Open Space and Federal Bureau of Recreation
Tollgate Ballfields	Ballfields	none proposed	1997 was the first season of use	Program Open Space
O'Neill Property (recent addition)	none	MA and PA Heritage Corridor and land preservation	No opening date	Land exchange for portion of Program Open Space land
Soma Property (recent addition)	none	Equestrian, Bike trails, Fishing	No opening date	County Bond Fund

Source: *Harford County Department of Parks and Recreation, 1996*

A Master Plan for Heavenly Waters Park was developed in the mid 1970's, however, the plan is no longer feasible due to problems with the former Tollgate Landfill which was to be part of Heavenly Waters Park. As seen in the list above, two new parcels, the O'Neill Property and the Soma Property, have been recently added the park which serves as a regional facility drawing users from across the County and the state. Facilities in the park include ball fields, paved trails, equestrian center, Liriodendron Mansion, fair grounds and an office of the Harford County Department of Parks and Recreation.

MA and PA Heritage Trail - The County is in the process of designing the MA and PA Heritage Corridor, a rails-to-trails project along the former Maryland and Pennsylvania railroad. The seven-mile project is funded by Intermodal Surface Transportation Efficiency Act (ISTEA) and construction of the first phase is currently underway. The trail will begin near the Parks and Recreation offices in Heavenly Waters Park and will terminate north of the study area in Friends Park in Forest Hill.

Other Recreational Facilities - Winters Run Country Club and Golf course are located within the project area as is Wade R. Tucker Memorial Field. Wade R. Tucker Memorial Field, which is owned by SHA and leased to the Harford County, is located north of the US 1 Bypass and MD

924/24 interchange, at the intersection of Conowingo Road and US 1. The field is to be relocated as part of the Hickory Bypass project.

The former Tollgate landfill is currently not a part of Heavenly Waters Park. Certain hazardous conditions exist on the property and there are no current users. The County has been exploring the possibility of using the borrow pits at the northern edge of the property for a BMX or Dog Park, however the feasibility has not been determined. A small portion of the MA and PA trail and a trail parking lot will be constructed on part of the landfill property.

3.2 Economic Environment

Industrial and commercial development in Harford County is generally concentrated along MD 24/924 corridor, US 40/I-95 and within the Town of Bel Air. The greatest concentration of industrial development and employment land uses are located between I-95 and US 40. Most of this non-residential development occurs within the Development Envelope (see Figure 3-1). Other economic development is scattered throughout the County with concentrations in three areas - the City of Aberdeen, the City of Havre de Grace and the Aberdeen Proving Ground. Development is concentrated around population centers where public facilities exist to serve projected growing needs of the population.

There are no industrial parks in the immediate study area, however, there are commercial/business centers. There is a large concentration of commercial/retail development at the intersection of MD 24 and US 1 Business. This area, which contains the Harford Mall and several other commercial parks, has grown extensively in the last 10 years.

Harford County has over 7,500 acres of industrially zoned land of which the majority is located at the southern end of the County. A 1995 Industrial Land Inventory identified 348 developed or partially developed industrial sites. Another 138 undeveloped sites with approximately 3,100 acres of developable acreage exist in the County. The majority of these sites are between 10 and 25 acres in size. Harford County hopes to add more large-sized (greater than 100 acres) sites to the overall inventory.

3.2.1 County Employment Characteristics

Primary employers in the County include Aberdeen Proving Ground, the single largest government employer with approximately 12,000 employees, and Upper Chesapeake Health Systems, Inc. which employs over 1,850 people. The Harford County Public Schools and County

government employ another 5,500 people. As seen in Table 3-5, 1994 Harford County labor force was 100,149, up 1.5 percent from 1993. The labor force of the Baltimore Metropolitan Area grew only 0.7 percent during the same time. In 1993, Harford County's unemployment rate of 6.6 percent was lower than the Baltimore region's rate of 7.3 percent. The 1994 unemployment rate was 6 percent for both jurisdictions.

New economic growth in Harford County is generally occurring in the Greater Aberdeen/Havre de Grace Enterprise Zone. At the beginning of 1998, Solo Cup Company opened a 500,000 s.f. distribution center which employs approximately 50 people. The Becker Group likewise, in the Enterprise Zone, will manufacture automotive components. The plant will create 150-200 new jobs. Additionally, the Rite Aid Corporation has become the second largest private employer in Harford County with the construction of its new 830,000 square foot distribution center that is expected to employ close to 850 - 1,000 people in Perryman (near Aberdeen Proving Ground).

Countywide, construction, manufacturing and federal employment decreased between 1990 and 1995 while wholesale/retail, financial/insurance and service industries steadily increased. In 1994, 71 percent of the workforce was employed in the private sector while 29 percent was employed by federal, state and local governments (see Table 3-6). Of the private sector industries, retail and other services employed almost 50 percent of county workers.

TABLE 3-5
EMPLOYMENT AND UNEMPLOYMENT 1992 - 1996

	1992	1993	1994	1995	1996
Harford County					
Civilian Labor Force	99,836	98,641	100,149	107,068	110,261
Employment	92,617	92,141	94,147	100,912	104,371
Unemployment	7,219	6,500	6,002	6,156	5,890
Unemployment Rate	7.2%	6.6%	6.0%	5.7%	5.3
Baltimore Metropolitan Area (Baltimore City, Baltimore, Carroll, Anne Arundel, Howard, Harford Counties)					
Civilian Labor Force	1,219,829	1,209,498	1,218,196	1,275,766	1,302,856
Employment	1,126,768	1,120,984	1,145,385	1,207,795	1,232,110
Unemployment	93,061	88,514	72,811	71,971	70,746
Unemployment Rate	7.6%	7.3%	6.0%	5.6%	5.4%

Source: *Maryland Department of Economic and Employment Development, Office of Labor Market Analysis and Information*

TABLE 3-6
AVERAGE ANNUAL COUNTY EMPLOYMENT DISTRIBUTION
1990 - 1995

	1990		1992		1995	
Sector	# Employed	%	# Employed	%	# Employed	%
Federal Government	10,470	20.1	10,252	19.2	8,438	14.8
State Government	249	0.5	270	0.5	297	0.5
Local Government	5,922	11.4	6,366	12.0	7,482	13.2
Total Government	**16,641**	**32.0**	**16,888**	**31.7**	**16,217**	**28.5**
Construction	4,666	9.0	4,010	7.5	4,344	7.6
Manufacturing	4,129	7.9	4,124	7.7	3,957	6.9
Transp./Comm./Util.	1,140	2.2	1,602	3.0	1,928	3.4
Wholesale/Retail	13,434	25.8	13,731	25.8	15,380	27.0
Finance/Ins./Real Est.	1,499	2.9	1,635	3.1	1,970	3.5
Services and Other	10,511	20.2	11,269	21.2	13,140	23.1
Total Private Sector	**35,379**	**68.0**	**36,371**	**68.3**	**40,719**	**71.5**
Total Employment	**52,020**	**100.0**	**53,259**	**100.0**	**56,936**	**100.0**

Notes: % = Percent of Total
Source: *Maryland Department of Economic and Employment Development, Office of Labor Market Analysis and Information*

Harford County residents work in all the surrounding counties as well as Baltimore City and the Washington D.C. area. Approximately 53 percent of employed county residents work in Harford County, while 23 percent commute to jobs in Baltimore County and 15 percent to Baltimore City.

3.2.2 Study Area Employment Characteristics

Figures for employment within the study area were obtained from the Harford County Department of Planning and Zoning. Total 1995 employment in the study area was 13,862. Total projected job growth for the year 2020 is 22,411, a 62 percent increase. The 1995 retail employment was 4,950 while non-retail jobs which include government positions, were 8,912. Employment projections for the study area are illustrated in Table 3-7 below. No major job expansion in the study area is in the economic development pipeline at this time.

TABLE 3-7
STUDY AREA EMPLOYMENT PROJECTIONS

	1995	2000	2005	2010	2020
Retail	4,950	5,261	5,604	6,023	6,028
Non-retail	8,912	9,439	10,120	10,964	16,383
Total	**13,862**	**14,700**	**15,724**	**16,987**	**22,411**

Source: *Harford County Dept. of Planning & Zoning, 1995*

3.2.3 Household Income

Households in the study area have higher median incomes than the County as a whole and the state. Highest household incomes are found in the newer developing areas outside of the Town of Bel Air; census tract 3036.02 maintains the highest median household and per capita incomes in the study area (see Table 3-7). Tract 3032.02, one of the newer developing areas of the study area, has a high median household and very few residents are living below the poverty level (0.6 percent), compared with 8.3 percent for the State of Maryland. The lowest median household income is found in tract 3038. With an average median household income of $48,676, the study area households are wealthier than the County and the State by roughly $7,000 and $9,000 respectively.

TABLE 3-8
INCOME DISTRIBUTION - 1989

Census Tract (Area)	Households	Median Household Income	Per Capita Income	Percent Below Poverty Level
3032.02	2,277	$52,169.00	$18,101.00	0.6
3035.00	2,316	$48,237.00	$19,411.00	2.4
3036.01	2,393	$48,736.00	$19,800.00	1.3
3036.02	1,169	$61,048.00	$22,947.00	1.1
3038.00	3,042	$40,112.00	$18,305.00	2.7
3039.00	967	$41,754.00	$18,944.00	1.1
Study Area	12,164	$48,676.00	$19,585.00*	1.5*
Harford County	63,094	$41,680.00	$16,612.00	5.1
State of Maryland	1,749,342	$39,386.00	$17,730.00	8.3

* Per Capita Income and Percent Below Poverty Level were not available for the study area. The figures shown reflect the averages of the six census tracts.
Source: U.S. Department of Commerce, Census Bureau, 1990

3.3 Land use

3.3.1 Existing Land Use in the Study Area

Primary land uses in the study area are residential and open space with a limited amount of commercial and industrial land uses. Residential areas consist mostly of single family homes and townhouses. The northern end of the study area, at the confluence of Red Pump Road, Rock Spring Road and US 1, is a bustling district of commercial land use.

Traveling south on US 1, land uses encountered include residential zones with single-family detached and multi-family residential units, the former Tollgate landfill, and a large industrial/commercial area (the Harford Mall Business Center) at MD 24. A single parcel of land for institutional use is located on Tollgate Road across from the Equestrian Center near the US 1 right-of-way. This is the site of Anna's House, a shelter run by Catholic Charities.

Most commercial land use occurs within the center of the Town of Bel Air, although substantial commercial development, mostly in the form of strip shopping centers and "big box" stores, has occurred in the vicinity of the Harford Mall (US 1 and MD 24).

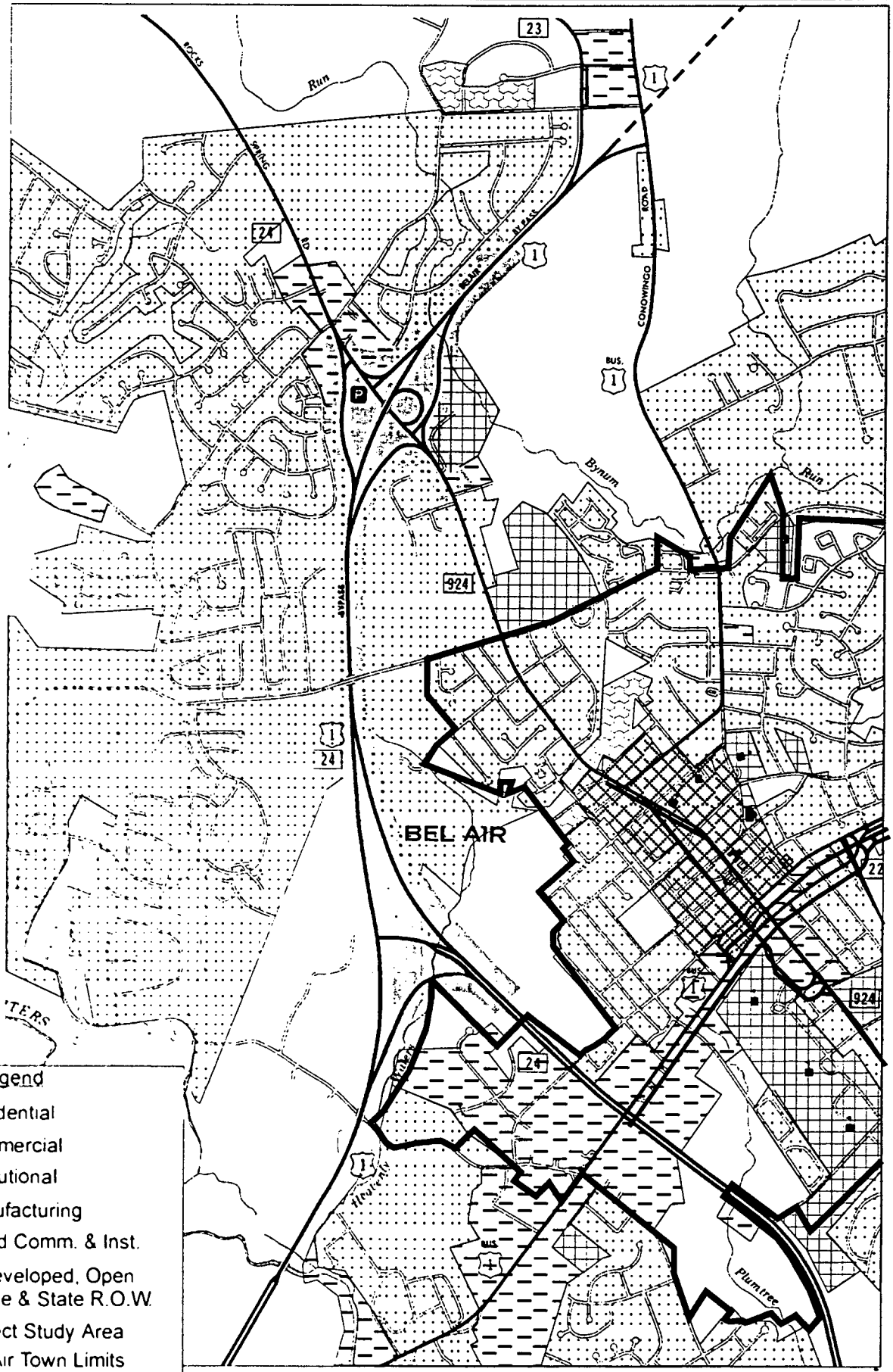
The study area lies within the Harford County Development Envelope (shown in Figure 3-1). This area is generally defined as the MD 24/924 corridor north to MD 23, and the area south of I-95. The Envelope was anticipated to capture 87 percent of the County's growth when it was established in 1977, and has actually captured 75 percent of County growth since that time. The study area, located within the Development Envelope, is served by public water and sewer. In an effort to discourage intense development beyond the Envelope limits, these utilities has not been extended beyond the envelope boundaries.

Figure 3-7 shows the existing and planned land uses within the study area. Harford County is in the process of producing an existing land use map for the entire county, however, it is not yet completed.

3.3.2 Future Land Use In the Study Area

The MD 24 corridor is one of the main growth areas in the Development Envelope. The Harford County Land Use Plan maintains that "to support this growing population and maintain the present high quality of life, the County must be prepared to make public improvements, including road improvements, recreational facilities, and possibly school and/or library construction. These public improvements should be planned with particular attention to the development of viable communities in the area." The Land Use Plan, published in 1996 as the central component of Harford County's Master Plan, describes the pattern and intensity of development for the ensuing decade, and serves as the guide for making future public and private land use and development decisions.

Goals of the Land Use Plan include:



U.S. 1 from MD 147 to North of MD 24/924

STATE HIGHWAY ADMINISTRATION

Figure 3-7

Existing/Future Land Use

- Maximizing compatibility between man-made development and the natural environment by designing development with due consideration to land and water resources, by maintaining and enhancing streams and forest resources, and by protecting agricultural and other sensitive land uses;
- Promoting development within the Development Envelope and preserving the remainder of the rural countryside;
- Promoting design standards to enhance the built and natural environments, buffering or mitigating incompatible uses;
- Locating commercial uses near the population they are expected to serve and close to Town, Community, Neighborhood, and Village Centers, and;
- Providing a transportation system which is compatible with the environmental and community patterns for future development.

Most of the project study area is zoned for residential development. However, new commercial development is being encouraged in areas contiguous to existing commercial development. For example, in the US 1/MD 24 corridor enough commercial development has been approved to increase the existing building area by 50 percent . Furthermore, there is the potential to increase it by another 50 percent which would effectively double the existing amount of commercial building area.

Beginning in July, 1996, Harford County was in the process of a countywide comprehensive re-zoning, during which the County reviewed re-zoning requests. The process is now complete and the re-zoning will be put to referendum in November 1998. It is anticipated that future growth will be concentrated in the Development Envelope, and that re-zoning will take place in accordance with provisions of the 1996 Master Plan and Land Use Element Plan.

The former landfill presents potential recreation opportunities for the County which is actively pursuing its options. Currently, a small part of the landfill is used for parking during the annual Farm Fair. In addition, ISTEA funds are being used to design portions of the MA and PA Heritage Corridor which would run along the southern end of the landfill. The County is also investigating the creation of a BMX or Dog Park in a northern section. Any future use of the landfill would have to receive approval from the Department of Public Works which has jurisdiction over the property.

3.4 Historic and Archaeological Resources

Section 106 of the National Historic Preservation Act of 1966 requires that federal agencies take into account the effects of their undertakings or actions on properties included on or eligible for inclusion on the National Register of Historic Places.

3.4.1 Historic Sites

No historic standing structures listed on or eligible for listing on the National Register are within the area of potential effect (Ape) for project alternates. The Maryland Historical Trust concurred with this determination on January 3, 1997.

3.4.2 Archaeological Sites

Phase I archaeological survey and Phase II evaluation of the previously recorded sites (18HA185 and 18HA186) was undertaken in 1996. This archaeological survey for the project's APE recorded two additional cultural resources, a lithic scatter (18HA250) and an isolated find (18HAX46). The report concluded that none of the archaeological resources are eligible for the National Register of Historic Places, and no further archaeological work is warranted. The Maryland Historical Trust concurred that the project would have no effect on historic properties by letter dated January 3, 1997.

In July of 1997 the project was reassessed for archaeology based on design changes made subsequent to the initial survey. No previously recorded archaeological sites are located within the area of additional proposed construction. The re-assessment indicated that the project, as modified would have no effect on significant archaeological resources. The Maryland Historical Trust concurred with this determination on March 30, 1998.

3.5 Natural Environment

3.5.1 Physiography/Topography, and Geology

Study area topography consists of upland dissected by many small streams and drainageways with elevations ranging from 180 feet along Winters Run to 450 feet above sea level in the southern portion of the study area. The area is within the Eastern Piedmont Plateau of the Piedmont

Physiographic Province within the Bush River drainage sub-basin, Maryland Watershed Designation 02-13-07.

The Piedmont is characterized by a broad undulating surface punctuated by low knobs and ridges. The topography is broken by numerous deep and narrow stream valleys. All streams within the study area flow into the Chesapeake Bay. As a result of the generally resistant geology of the area, the streams have a relatively steep gradient, with small rapids and waterfalls.

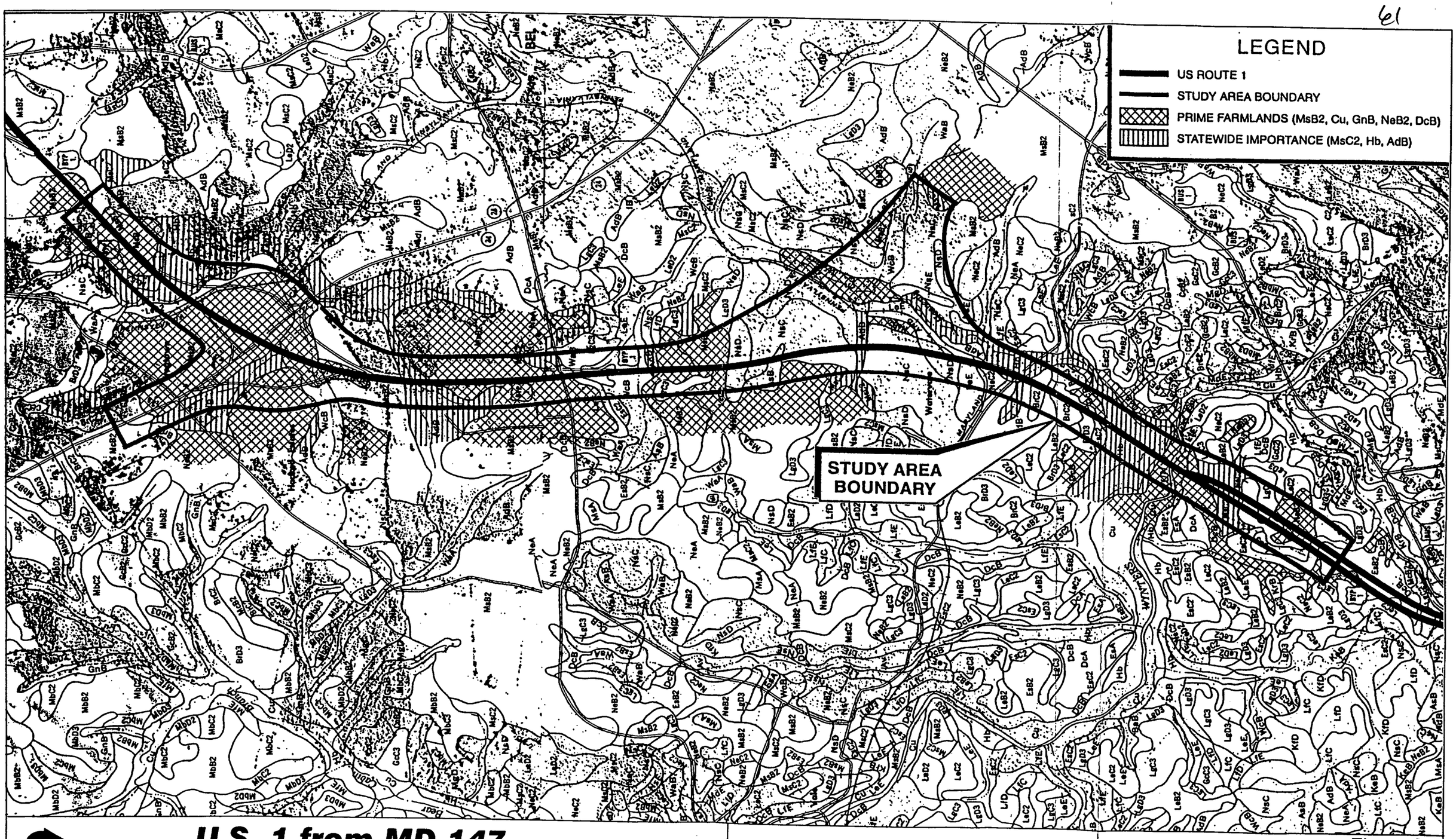
3.5.2 Soils

Soils of the study area are found within four soil associations: Neshaminy-Aldino-Watchung, Montalto-Neshaminy-Aldino, Legore-Neshaminy-Aldino, and Codorus-Hatboro-Alluvial land. Twenty-one soil series belonging to these associations are located within the study area. Soils were identified using the "Soil Survey of Harford County, Maryland" (USDA Soil Conservation Service, 1975). During field investigations soil color was determined using "Munsell Soil Color Charts" (Kollmorgen Corp., 1975).

Associated with the Piedmont Plateau are the Neshaminy-Aldino-Watchung, Legore-Neshaminy-Aldino, and Montalto-Neshaminy-Aldino soil associations. The Neshaminy-Aldino-Watchung association is typically described as deep, steep to nearly level, well drained to poorly drained soils that are underlain by basic, semi-basic, or mixed basic and acidic rocks. This association is usually found in uplands with broad flats. The Legore-Neshaminy-Aldino association is described as deep, nearly level to steep, well drained and moderately well drained soils that are underlain by basic, semi-basic, or mixed basic and acidic rocks. This association is generally found in uplands. The Montalto-Neshaminy-Aldino association also typically occurs in uplands, and is described as deep, steep to nearly level, well drained and moderately well-drained soils, underlain by basic, semi-basic, or mixed basic and acidic rocks.

Associated with floodplains and low terraces is the Codorus-Hatboro-Alluvial land soil association. This land association is typically described as deep, nearly level, with moderately well drained to very poorly drained soils, underlain by stratified alluvial sediments. Within the study area this association is found along the Winters Run and Bynum Run waterways.

The soils as mapped in the *Soil Survey of Harford County, Maryland* (USDA SCS, 1975) are shown on Figure 8 and listed in Table 3-9. The majority of the soils within the study area are classified as silty loam. According to the National and Maryland hydric soils list, Hatboro silt loam (Hb), Watchung very stony silt loam (0-8 percent slopes) (WcB), and Watchung



U.S. 1 from MD 147 to North of MD 24/924

STATE HIGHWAY ADMINISTRATION

Figure 3-8

Study Area Soils

silt loam (3-8 percent slopes) (WaB) are hydric soils. The hydric soils list of Harford County coincides with the state listing. The county information also lists Aldino silt loam (AdA), Glenville silt loam (3-8 percent slopes) (GnB), and Codorus silt loam (Cu) as containing hydric inclusions.

TABLE 3-9
STUDY AREA SOILS

Symbol	Mapping Unit	Hydric Characteristics	Prime Farmland	State-wide Importance
AdB	Aldino silt loam, 3-8% slopes	Contains Inclusions (Watchung)	Yes	Yes
Asb	Aldino very stony silt loam, 0-8% slopes	None		
BrC2	Brandywine gravelly loam, 8-15% slopes	None		
BrD3	Brandywine gravelly loam, 15-25% slopes	None		
Cu	Codorus silt loam	Contains Inclusions (Hatboro)	Yes	
DcB	Delanco silt loam, 3-8% slopes	None	Yes	
GnB	Glenville silt loam, 3-8 % slopes	Contains Inclusions (Baile)	Yes	
Hb	Hatboro silt loam	Hydric (Typic Fluvaquents)	Yes	Yes
LeB2	Legore silt loam, 3-8% slopes	None		
LeE	Legore silt loam, 25-45% slopes	None		
LgC3	Legore silty clay loam, 8-15% slopes	None		
LgD3	Legore silty clay loam, 15-25% slopes	None		
LfE	Legore very stony silt loam, 25-45% slopes	None		
MsB2	Montalto silt loam, 3-8% slopes	None	Yes	Yes
MsC2	Montalto silt loam, 8-15% slopes	None	Yes	
NeB2	Neshaminy silt loam, 3-8% slopes	None	Yes	
NeC2	Neshaminy silt loam, 8-15% slopes	None		
NsC	Neshaminy and Montalto very stony silt loams, 0-15% slopes	None		
NsD	Neshaminy and Montalto very stony silt loams, 15-25% slopes	None		
WaB	Watchung silt loam, 3-8% slopes	Hydric (Typic Ochraqualfs)		
WcB	Watchung very stony silt loam, 0-8% slopes	Hydric (Typic Ochraqualfs)		

Prime farmland soils found within the study area, include Aldino silt loam (3-8 percent slopes). (AdB), Montalto silt loam, 3-8 percent slopes (MsB2), Codorus silt loam (Cu), Glenville silt loam,

3-8 percent slopes (GnB), Hatboro silt loam (Hb), Neshaminy silt loam, 3-8 percent slopes (NeB2), and Delanco silt loam, 3-8 percent slopes (DcB). Soils of state-wide importance are designated by Maryland, and are a subset of the prime farmland soils, selected for unusual value and/or properties. The soils of state-wide importance within the study area include: Montalto silt loam (MsB2), Hatboro silt loam (Hb), and Aldino silt loam (AdB).

3.5.3 Water Resources

Surface Water - Maryland water quality is regulated by the Code of Maryland (COMAR) 26.08.02.03-3, Water Quality Criteria Specific to Designated Uses. Two use classifications are present in the study area. Class III waters are protected as natural trout waters. Class IV waters are protected as recreational trout waters. All waters having a "P" designation also serve as a public water supply. The code cites seven parameters for Classes III and IV to be used to characterize water quality. The parameters include both chemical and bacteriological elements considered in water quality. The parameters are: 1) fecal coliform density; 2) dissolved oxygen; 3) water temperature; 4) Ph; 5) turbidity; 6) toxic materials; and 7) total residual chlorine. Table 3-10 lists these standards for Classes III and IV.

TABLE 3-10
MARYLAND WATERS CLASS III AND IV
WATER QUALITY PARAMETERS

Criteria	Class III	Class IV
Fecal Coliform	Log mean of <200/100ml, based on a minimum of 5 days samples over any 30 day period OR < 10% of total # of samples taken during any 30-day period may exceed 400/100ml	Same as Class III
Dissolved Oxygen	> 5.0 mg/l, with a minimum daily average of 6.0 mg/l	> 5.0 mg/l
Temperature	< 68.0 F(20 C) OR < ambient temperature of receiving water, whichever is greater	< 75.0 F (23.9 C) or < ambient temperature of receiving water, whichever is greater
pH	> 6.5 and < 8.5	Same as Class III
Turbidity	< 150 NTU or < 50 NTU as a monthly average	Same as Class III
Total Residue Chlorine	No Chlorine or Chlorine containing compounds in the treatment of wastewater discharging to Use III or III-P waters.	
Toxic Materials	All toxic substance criteria to protect freshwater aquatic organisms and the wholesomeness of fish for human consumption apply.	All toxic substance criteria to protect freshwater aquatic organisms and the wholesomeness of fish for human consumption apply. P-designation also protects public water supplies.

Surface waters of the project area include several perennial streams and their tributaries (perennial and intermittent), all within the Bush River Drainage Area. Stream classifications within the study area were confirmed with the Maryland Department of Natural Resources, Environmental Review Unit, as follows: 1) Winters Run and all its tributaries, including Heavenly Waters Run, are classified as Use IV-P waters (Recreational Trout Waters and Public Water Supplies); 2) Bynum Run is classified as a Use III stream (Natural Trout Waters).

Streams within the project study area were characterized during a field assessment, conducted on August 14, 1997. Stream characteristics and classifications for specific assessment locations

are found in Table 3-11. Water quality criteria for specific Use Classifications are above, in Table 3-10.

The headwaters of the study area streams have various land uses, including the following: open-space, residential, commercial, and landfill.

TABLE 3-11
STREAM CHARACTERISTICS

Location	Use Class	Width ft	Depth in.	Flow gpm	Watershed ac.	Vegetation (streambank and/or in-stream)
Winters Run	Class IV-P	60	12	509	17,830	American sycamore (*Platanus occidentalis*) Black willow (*Salix nigra*) Box elder (*Acer negundo*) Spicebush (*Lindera benzoin*) Elderberry (*Sambucus canadensis*) Jewelweed (*Impatiens capensis*) Arrowleaf tearthumb (*Polygonum sagittatum*)
Heavenly Waters Run	Class IV-P	18	3	34	284	American elm (*Ulmus americana*) American sycamore (*Platanus occidentalis*) Green ash (*Fraxinus pennsylvanica*) Multiflora rose (*Rosa multiflora*) Spicebush (*Lindera benzoin*) Jewelweed (*Impatiens capensis*) Clearweed (*Pilea pumila*)
Unnamed Tributary to Heavenly Waters Run (Route 24 Interchange)	Class IV-P	12	2	15	34	American beech (*Fagus grandifolia*) Black locust (*Robinia pseudoacacia*) Tulip tree (*Liriodendron tulipifera*) Witch-hazel (*Hamamelis virginiana*) Privet (*Ligustrum vulgare*) Maple-leaf arrowwood (*Viburnum acerifolium*) Christmas fern (*Polystichum acrostichoides*)
Unnamed Tributary to Heavenly Waters Run (south of Vale Road)	Class IV-P	3	1	0.2	57	Black cherry (*Prunus serotina*) Red maple (*Acer rubrum*) Green ash (*Fraxinus pennsylvanica*) Multiflora rose (*Rosa multiflora*) Japanese honeysuckle (*Lonicera japonica*) Wild grape (*Vitis spp.*)
Bynum Run	Class III	15	8	13,464	1,763	Tulip tree (*Liriodendron tulipifera*) Red maple (*Acer rubrum*) Black willow (*Salix nigra*) Black walnut (*Juglans nigra*) Black raspberry (*Rubus occidentalis*) Halberd-leaf tearthumb (*Polygonum arifolium*) Jewelweed (*Impatiens capensis*)

Groundwater - The mean annual precipitation for Harford County is reported to be 45 inches; an estimated 30 percent (13.5 inches) of which goes to recharge groundwater. Groundwater is used for nearly all domestic, commercial, industrial, and public water supplies in the County. Bel Air, Edgewood and Aberdeen Proving Ground are the only major users of surface water supplies, but even these municipalities maintain some standby groundwater supplies that are occasionally required to meet high demands.

The study area is situated over the crystalline rocks aquifers of the Piedmont, consisting primarily of the Baltimore Gabbro. Water in this formation occurs primarily in fractures, resulting in a highly variable availability of water. Well yields from these crystalline rock aquifers are usually limited, with a range of 2 to 65 gal/min. Groundwater in the study area occurs primarily in joints, faults, and other fractures in the rock aquifers and saturated part of the weathered overburden (Saprolite). The distribution of fractures in the rock is the most important factor governing the availability of groundwater in the study area. The geology of the road construction site consists of formations in units 3,4 and 5 as outlined in Table 3-13, with aquifers in the Baltimore Gabbro. This area has a mean specific yield of 0.31 (gal/min.)/ft; a well yield ranging from 2 to 65 gal/min., with an average of 13 gal/min. According to the Harford County Health Department, there are no well head protection areas in the County. Therefore, there are none in the area surrounding the project site.

The hydrogeology of Harford County is dominated by either the Piedmont or Coastal Plain features. Depending on the differences between the water bearing and transmitting characteristics of these formations, two types of aquifers are present in the County: crystalline bedrock aquifers (Piedmont) in the north and northwest 80 percent of the County, and coastal plain aquifers in the south and southeast 20 percent of the County. The Piedmont rocks consist of intensely metamorphosed schist, gneiss, slate and mafic rocks that have undergone intensive folding, faulting and intrusion. As a result, these rocks can contain and transmit substantial amounts of water in areas where these geophysical actions have caused cavities and faults where water can collect and/or be transmitted. The coastal plain aquifers also vary widely, but generally are a better source for water than the Piedmont because water can be obtained from the pore spaces of the unconsolidated deposits that constitute these aquifers. Based on the yield characteristics of wells tested in the County, the aquifers can be classified into several hydrogeologic units (Nutter, 1977). Table 3-12 lists the geologic formations contained in each unit.

TABLE 3-12
GEOLOGIC FORMATIONS OF THE FIVE HYDROGEOLOGIC UNITS
HARFORD COUNTY

(Formations listed in approximate order of productivity)

Hydrogeologic Unit 1 Talbot Formation
- Potomac Group

Hydrogeologic Unit 2 Cockeysville Marble

Hydrogeologic Unit 3 Upper Pelitic Schist of Wissahickon Formation
- Baltimore Gabbro
- Quartz Gabbro and Quartz Diorite Gneiss
- Cardiff Metaconglomorate
- Peach Bottom Slate

Hydrogeologic Unit 4 Port Deposit Gneiss
- Wissahickon Formation Undivided
- Boulder gneiss of Wissahickon Formation
- Metagraywacke of Wissahickon Formation
- Baltimore Gneiss
- Muscovite Quartz Monzonite Gneiss
- Metaconglomorate of Wissahickon Formation
- Metagabbro and Amphibolite

Hydrogeologic Unit 5 James Run Gneiss
- Ultramatic Rocks
- Setters Formation
- Lower Pelitic Schist of Wissahickon Formation
- Amphibolite (associated with Wissahickon Formation undivided)

Source: Maryland Geological Survey. 1969. *The Geology of Harford County.*

The availability of water in the crystalline rock aquifers is dependent on the distribution of secondary openings (joints, faults, and cleavage planes). Individual well yields and specific capacities are governed by permeability, thickness and aerial extent of the formation. The aquifers of the Piedmont are generally low yielding aquifers, with extreme variability, yielding anywhere from 0 to 140 gal/min. to wells. The aquifers in the coastal plain are good sources for water, yielding more than 500 gal/min. in many areas (Nutter, 1977).

The study area lies within hydrogeologic units 3,4 and 5 (see Table 3-12). A review of groundwater quality data for wells in the study area suggests the groundwater to have the characteristics shown in Table 3-13. Generally, this groundwater is of good quality, soft to moderately hard, and slightly acidic with low dissolved solids characteristics. In some areas, iron, magnesium and nitrate levels may be high. Based on the high nitrate levels, it appears that

the study area may be in close proximity to sources of contamination, particularly agricultural fields where fertilizers have been applied. No documentation has been located to indicate any contamination in the aquifers in the study area. A review of well inventory data indicates numerous domestic wells within 1/2 mile of the study area, but no industrial and/or public water supply source.

TABLE 3-13
GROUNDWATER QUALITY CHARACTERISTICS

Parameter	Value (units)	MCL
Temperature	53.7 °F	None
Conductivity	66 umho/cm	None
pH	6.8	None
Hardness	27 mg/L	None
Alkalinity	0 mg/L	None
Total Dissolved Solids	61 mg/L	500
Corrosivity	-0.09	None
Turbidity	3.5 (TU)	1
Chloride	1.9 mg/L	0.25
Sulfate	0.8 mg/L	0.25
Fluoride	0.1 mg/L	0.0014
Nitrate -Nitrogen	1.8 mg/L	0.01
Iron	20 ug/L	0.3
Manganese	10 ug/L	0.05
Pesticides	ND	--
Volatile Organics	ND	--
Coliform Bacteria	9 col./100ml	1

MCL: Maximum Concentration Limits, set for Safe Drinking Water Act
ND: Non Detect

Source: Maryland Geological Survey. 1975. *Harford County Groundwater Information.*

3.5.4 Floodplains

The project area lies within the Winters Run and Bynum Run watersheds. All proposed alternates cross Winters Run at the 200-foot elevation, approximately one mile upstream from a waterworks reservoir. The road alignment also parallels, and passes close to the headwaters of Heavenly Waters, a tributary of Winters Run. Approximately 0.2 miles to the north of the Route 24/924 intersection, the road alignment for all alternates crosses Bynum Run, a tributary of James Run and the Bush River. 100-year floodplains are shown on the plan drawings in Chapter IV.

The road alignment for all alternates cross Winters Run in the south, and Bynum Run in the north. The Winters Run crossing is located about one mile north of the intersection of US 1 and US 1 Business; and the Bynum Run intersection is approximately 1,000 feet north of the 24/924 interchange. The drainage area at the Winters Run crossing is approximately 17,830 acres; and at the Bynum Run crossing the drainage area is about 1,500 acres.

The 100-year floodplains were delineated on the project mapping using the flood elevations shown on the Federal Emergency Management Agency (FEMA) floodplain maps. Floodplains were delineated for the major stream crossings of the alternates.

3.5.5 Hazardous Materials/Waste Sites

An Initial Site Assessment (ISA) was conducted for the area along MD 24 between US 1 and Forest Valley Drive. The study area for this ISA encompassed a variable width of not less than 50 feet from each side of MD 24. The properties adjacent to and within a one mile radius of the ISA study area were also investigated for potential hazardous material sites. A number of sites were identified but further analysis concluded that there is no evidence of existing subsurface or surface contamination within the study area and that no further action is needed.

As part of the Section 404 Clean Water ACT (CWA) permit review, the U.S. Army Corps of Engineers (USACE) performed aquatic macroinvertebrate population surveys on May 24, 1996 and June 13, 1996 within Heavenly Waters Run above and within the zone of influence of Tollgate Road Sanitary Landfill (Tollgate Landfill). As a result of these investigations, USACE determined that populations of macroinvertebrate species are below expected numbers within the portion of Heavenly Waters Run in the vicinity of Tollgate Landfill. USACE has stated "that there is reason to believe that there may be contaminants bound within the substrate in the lower reaches of Heavenly Waters Run."

A Preliminary Site Investigation (PSI) of Heavenly Waters Run, adjacent to the Tollgate Landfill. was performed in accordance with direction and conditions provided by the USACE. This PSI concluded that it is highly unlikely that contaminants exist within the study area at concentrations sufficient to produce the reported depressed macroinvertebrate populations. For more information, please see *Heavenly Waters Run Preliminary Site Investigation Study.*

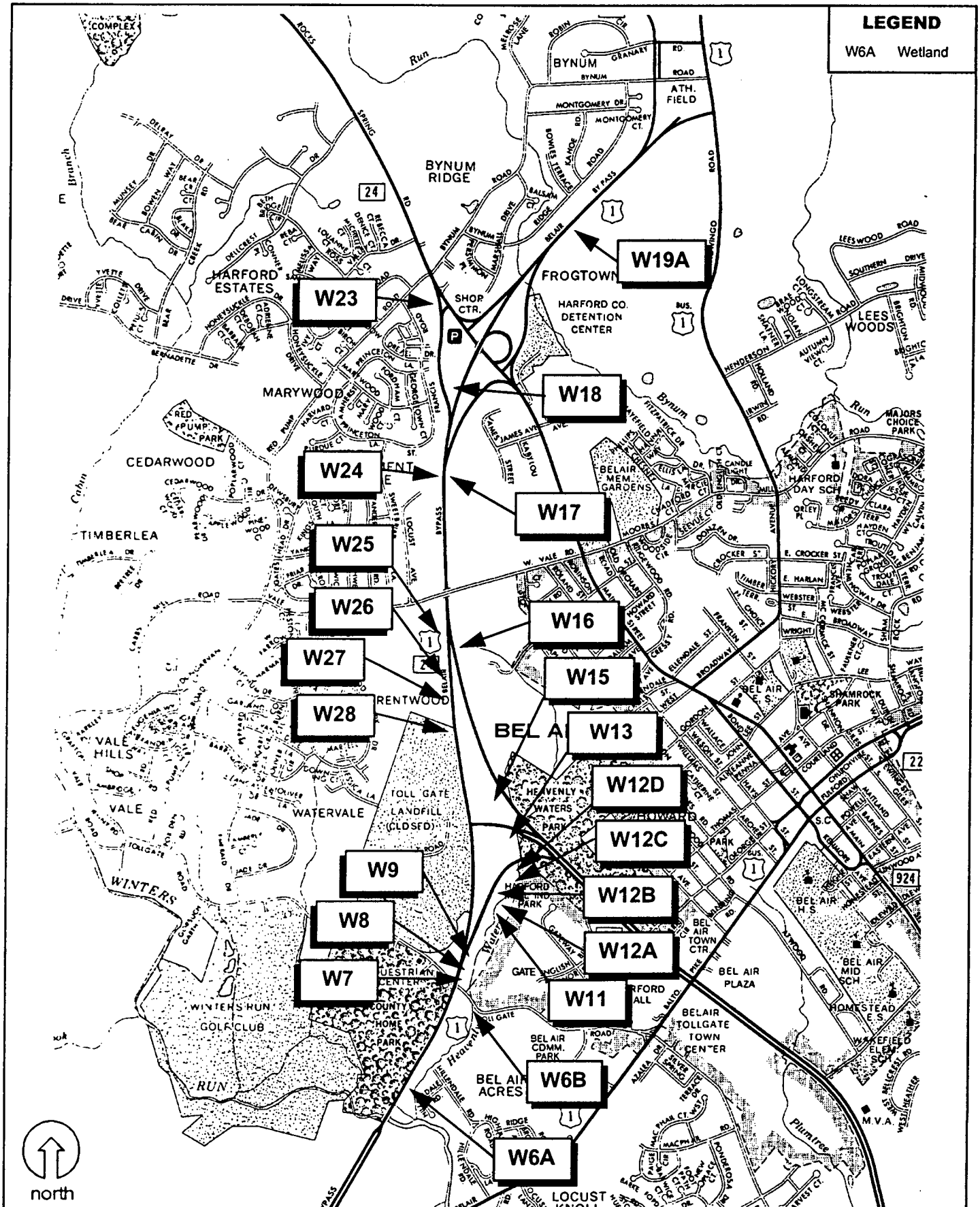
3.6 Ecological Conditions

3.6.1 Wetlands

Wetlands are often classified as a blend of terrestrial and aquatic habitats. A total of twenty-two individual wetlands occur within eleven (11) palustrine wetland systems occupying approximately 12.2 acres in the US 1 Bel Air Bypass study area. These wetlands are classified as riverine, and palustrine forested, scrub-shrub, and emergent environments. All field delineated wetland boundaries were confirmed during jurisdictional determinations by the U.S. Army Corps of Engineers (see Figure 3-9).

Wetland Identification and Delineation - Wetland identification and delineation was conducted in accordance with the 1987 Army Corps of Engineers Wetland Delineation Manual. Routine on-site determination methods were used due to the uniform characteristics of the area. Wetland classification was done in accordance with the United States Fish and Wildlife Service's (USFWS) "Classification of Wetlands and Deepwater Habitats of the United States" (Cowardin et al., 1989). Soils were identified using field indicators and the "Soil Survey of Harford County, Maryland" (USDA Soil Conservation Service, 1975). Soil Color was determined using "Munsell Soil Color Charts" (Kollmorgen Corp., 1975). Plant species were identified using "Flora of West Virginia" (Strausbaugh and Cole, 1974), "The Shrub Identification Book" (Symonds, 1963), "The Tree Identification Book" (Symonds, 1958), and the USFWS's "National List of Plant Species That Occur in Wetlands: 1988 National Summary" (USFWS Biological Report 88 (24), 1988). Wetland hydrology was determined based on soil pit evaluations and observations noted in the field. National Wetlands Inventory (NWI) mapping was obtained for preliminary identification of wetland areas. Both palustrine and riverine wetlands were identified within the study area, encompassing a total of approximately 12.2 acres.

Function and Value Analysis - Wetland functions and values were assessed using two techniques. Originally, the delineated wetlands were subjected to an overall function and value assessment based upon an adaptation of *A Method for Wetland Functional Assessment* (US Department of Transportation [USDOT] Federal Highway Administration, 1983). This approach evaluates relative functional values based on observations during field investigations. An overall function and value rating of high, medium, or low was assigned to each wetland based on the specific function(s) identified. Then, in 1997, the U.S. Army Corps of Engineers (USACE) requested that wetlands within the transportation study corridor receive more intensive function and value analysis. The functions and values of the major wetland complexes was subsequently assessed by applying the USACE, New England District, Method of Wetland Function and Value



U.S. 1 from MD 147 to North of MD 24/924

STATE HIGHWAY ADMINISTRATION

Figure 3-9

Wetlands

Assessment, as prescribed in *The Highway Methodology Workbook Supplement* (N.E. Method). For this investigation, "major" wetland complexes were defined as those wetlands occupying an area of greater than 0.25 acres within the study area.

Wetland Descriptions -Wetland 6A is a highly disturbed palustrine, emergent (PEM1C) wetland. The wetland is located east of US 1, south of Tollgate Road, and north of the Heavenly Waters crossing. This wetland extends beyond the study area, however, 0.38 acres are located therein. The principle functions provided by this wetland include: sediment/toxicant/pathogen retention, wildlife habitat, and uniqueness/heritage.

Heavenly Waters Run and Wetlands 6B through Wetland 12D are part of a riverine and palustrine, forested, broad-leaved deciduous (PFO1B) wetlands complex. This stream/wetland complex is located along the eastern side of the study area, extending from south of the Tollgate Road crossing, to beyond the US 1 Business crossing in the north. More than 1.15 acres of this wetland complex are located in the study area and the complex extends beyond its boundaries. The principle functions provided by the Heavenly Waters Run complex include: groundwater recharge/discharge, floodflow alteration, fish and shellfish habitat, nutrient removal/retention/transformation, production export, wildlife habitat, recreation, and uniqueness/heritage.

Wetland 6B (0.09 acres) extends beyond the US 1 right-of-way. Wetlands 7 (0.21 acres), 8 (0.01 acres), 9 (0.06 acres), 11 (0.08 acres), 12A (0.02 acres), 12B (0.10 acres), 12C (0.42 acres), and 12D (0.16 acres) are contained entirely within the Heavenly Waters stream complex. Although the areas designated as Waters 10 (0.09 acres) did not demonstrate the dominance of hydrophytic vegetation or hydric soils typical of a wetland, it is part of the Heavenly Waters stream complex.

Wetland 13 is a palustrine, forested, broad-leaved deciduous, saturated wetland (PFO1B) located east of US 1. This wetland is approximately 0.16 acres in size, and is contained entirely within the study area. The major functions provided by Wetland 13 include: passive recreation, habitat for wildlife and fisheries, short-term sediment trapping/stabilization, and groundwater discharge/recharge.

Wetland 15 is a man-made stormwater management basin, containing a palustrine, emergent, persistent, saturated, artificial (PEM1Br) wetland. There is a defined intermittent stream channel flowing through this area. This wetland contains a dam, receives surface run-off, is approximately 0.28 acres in size, and is entirely contained within the study area. This is a functioning man-

made stormwater area inundated for long durations. The principle functions provided by this wetland include: floodflow alteration, sediment/toxicant/pathogen retention, and nutrient removal/retention/transformation.

Wetlands 16, 25, and 26 are naturally occurring palustrine, forested, broad-leaved deciduous, persistent, saturated wetlands (PFO1E). Wetland 16 (1.27 acres) is located east of US 1, south of Mill Road. Wetland 25 (0.30 acres) is north of wetland 26 (0.10 acres) and both are located west of US 1, and south of Vale Road. Each of these wetlands extends beyond the study area. Wetland 16 contains an emergent portion along US 1, and Wetland 25 contains a spring seep that hosts a palustrine, emergent, persistent (PEM1B) wetland portion at its headwaters. While approximately 2.07 acres of these wetlands are located in the US 1 right-of-way, the total wetland area extends beyond the study area. The principle functions provided by this wetland complex include: groundwater recharge/discharge, floodflow alteration, sediment/toxicant/pathogen retention, production export, and wildlife habitat.

Wetlands 17 and 24 are naturally occurring palustrine, forested, broad-leaved deciduous, seasonal (PFO1C) wetlands. Wetland 17 (1.61 acres) is located east of US 1 and Wetland 24 (0.45 acres) is west of US 1. Both wetlands extend beyond the study area. This system of wetlands is bisected by US 1. The principle functions provided by these wetlands include: groundwater recharge/discharge, floodflow alteration, sediment/toxicant/pathogen retention, nutrient removal/retention/transformation, production export, and wildlife habitat.

Wetland 18 is a palustrine, forested, broad-leaved deciduous, saturated wetland (PFO1B) located southwest of US 1, in the southwest quadrant of the MD 24/US 1 interchange. This wetland is approximately 0.23 acres in size, and is contained entirely within the study area. Wetland 18 was evaluated as having one major function: groundwater discharge/recharge.

Wetland 19A is a palustrine, forested, broad-leaved deciduous, seasonal wetland (PFO1C) located east of US 1, north of the MD 24 interchange. Approximately 0.01 acres of this wetland is located in the study area, and the wetland extends beyond the study area. The major function provided by Wetland 19A is short-term sediment trapping/stabilization.

Wetland 23 is a palustrine, shrub/scrub, deciduous, saturated, partially ditched wetland (PSS1Bd) located west of US 1. Approximately 0.02 acres of this wetland are located in the study area and the wetland extends beyond the study area. The major functions provided by Wetland 23 include: habitat for wildlife, short term sediment trapping/stabilization, flood desynchronization, nutrient export, dissipation of erosive forces.

Wetland 27 is a palustrine, emergent, persistent, excavated wetland (PEM1Kx) located on the west side of US 1, south of wetland 26, where the median between the US 1 opposing lanes disappears. This square shaped wetland is a man-made stormwater retention pond, surrounding topography suggests that this area was excavated. This wetland is approximately 0.06 acres and is contained within the expanded study area. The major functions provided by Wetland 27 include: short-term sediment trapping/stabilization, flood desynchronization, dissipation of erosive forces, groundwater discharge/recharge, nutrient removal/retention, and long-term sediment trapping/stabilization.

Wetland 28 is a palustrine, emergent, persistent, temporary, excavated wetland (PEM1Kx) located on the west side of US 1, and south of Wetland 27. The surrounding topography suggests that this area was excavated. Less that 0.01 acres of this wetland is located within the expanded study area or US 1 right-of-way. The major functions provided by Wetland 28 include: habitat for wildlife and fisheries, short-term sediment trapping/stabilization, nutrient export, and groundwater discharge/recharge.

Stormwater Management Ponds - A few areas within the study area were determined to be isolated stormwater management ponds (SWMPs), during jurisdictional determinations by the USACE. Although most of these areas are palustrine, emergent, persistent, saturated, artificial wetlands (PEM1Br), they were deemed not suitable for regulatory jurisdiction. These areas may provide the following functions: short-term sediment trapping/stabilization, flood desynchronization, dissipation of erosive forces, long-term nutrient retention/removal, and long-term sediment trapping/stabilization.

Drinking Water Intakes - A surface water drinking water intake is located within the study area, at the US 1 Business crossing of Winters Run, downstream of Heavenly Waters Run.

3.6.2 Forest Areas

The two forest associations occurring within the study area are the Tulip Poplar Association and the Sugar Maple-Basswood Association. Within Maryland, forest associations are distinguished by the presence of common species within discontinuous distributions referred to as "characteristic species."

Characteristic species of the Tulip Poplar Association are red maple, flowering dogwood, virginia creeper, black gum, white oak, sassafras, black cherry, mockernut hickory, southern arrowwood,

japanese honeysuckle, pignut hickory, black oak, poison ivy, greenbriers, beech, spicebush, northern red oak, maple-leaf viburnum, early low blueberry, choke cherry, and brambles.

Characteristic species of the Sugar Maple-Basswood Association are northern red oak, black cherry, red maple, white oak, white ash, flowering dogwood, virginia creeper, witch hazel, black locust, greenbriers, grape, hop hornbeam, poison ivy, pignut hickory, black birch, serviceberries, sassafras, mockernut hickory, sweet pignut hickory, hawthorn, and brambles.

Field investigations of the study area in August 1997 revealed that recent construction activities in the vicinity of both US 1/MD 24 and the US 1/MD 24/924 interchanges have dramatically reduced the areas of forest habitat. A total of approximately 141.3 acres of forested land presently exists within the study area.

3.6.3 Wildlife, Terrestrial and Aquatic Habitat

Wildlife - Requests for comments on wildlife concerns within the corridor were sent to the Maryland Department of Natural Resources (MDDNR), Wildlife Division and USFWS on August 4, 1997. Habitats within the study corridor support a variety of wildlife. The three major habitat types within the study area that serve as wildlife habitat are forest, scrub-shrub, and wetland area. Old field areas that are successional in growth also provide wildlife habitat. Wetlands and habitat areas with streams provide increased wildlife habitat value. In addition, the forested areas within the study are parts of relatively large tracts of undisturbed land. Streams with vegetated littoral areas also act as corridors for wildlife travelling between undisturbed areas. A variety of avian and mammalian fauna common to the region are expected to occur in these areas.

Although the study corridor is narrow and associated with an existing heavily traveled roadway, the habitats could be used for feeding, cover, and travelways. It is expected that some birds and small mammals would use the habitats within the study area on a constant basis, while the larger and more mobile animals, such as the raccoon and white-tailed deer, would use those habitats primarily as travelways.

Some mammal species that may use all the habitat types including man-dominated habitat are: striped skunk, cottontail rabbit, opossum, and raccoon. Other species expected to use only the more rural habitats are fox and white-tailed deer.

Forested habitat may be expected to support grey squirrel, white-footed mouse, and Eastern Chipmunk. Abandoned field habitat may be expected to support woodchuck, cottontail rabbit,

meadow vole and meadow jumping mouse; these species may also be found in smaller numbers in agricultural areas. The house mouse and Norway rat may be found in association with buildings, waste places and other human activities. Mammals associated with corridor waterways could include the muskrat, raccoon and weasel.

Many species of birds are expected to utilize corridor habitats for nesting, resting, and/or feeding. Nesting species are probably limited to those which will tolerate traffic noise. Species observed in the study corridor include: robin, crow, cardinal, flicker, mourning dove, goldfinch, mocking bird, catbird, turkey vulture, brown thrasher, Canada goose, and several types of sparrow.

Terrestrial Habitat - The study area was inspected in August of 1997 to assess land use and habitat characterization. Terrestrial habitat consists of five general vegetative types. These habitats include 1)Wetlands, 2) Forests, 3) Man-dominated Land and Pasture, 4) Scrub-shrub, and 5) Old Field. Wetlands and forests were previously discussed in section 3.6.1 and 3.6.2, respectively.

For the purpose of this investigation Man Dominated Land and Pasture are considered one habitat type. The Man-Dominated and pasture habitats within the study area are perpetually influenced by human activity. This habitat is typified by mowed aprons, residential lawns, parking lots, roadbeds, landscape managed areas, and lightly pastured areas. Man-Dominated habitat is generally found within highway right-of ways, and commercial and residential development areas. There are pockets of Man-Dominated habitats associated with lightly pastured areas, however, it is unclear whether these pockets are maintained by grazing or mowing. A total of approximately 229.6 acres of Man-Dominated Land and Pasture are located within the study area.

Vegetation within Scrub-shrub habitat consists of upland shrubs and small trees, which generally have a diameter at breast height of 5 inches or less and reach heights 3 and 20 feet. Areas in the latter stages of old field succession are also included in this habitat type. A total of approximately 19.8 acres of Scrub-shrub are located within the study area. This vegetation is often found near wetlands and in areas that are difficult to maintain.

Old Field includes former agricultural areas reverting to natural conditions. At least two-thirds of the field must include herbaceous vegetation (ie., grass and grass-like species) to be classified as Old Field. Should natural succession processes continue within Old Fields, they usually become dominated by shrubs and trees, at which time they are re-classified as scrub-shrub or forest. Herbaceous vegetation typically identified in these areas includes common evening primrose (*Oenothera biennis*), clover (*Trifolium spp.*), curly dock (*Rumex crispus*), goldenrod

(*Solidago spp.*), grasses (*Graminacea spp.*), poison ivy (*Toxicodendron radicans*), teasel (*Dipsacus laciniatus*), wild carrot (*Daucus carota*), and yarrow (*Achillea millefolium*). These areas may be mowed once a year or less, or are subjected to periodic grazing. A total of approximately 17.5 acres of old field are located within the study area.

Aquatic Habitat - Channelized riverine environments (including unnamed intermittent streams) are located throughout the study area. Riverine environments qualify for jurisdictional regulation as "Waters of the United States". However, these areas do not satisfy the criteria of nontidal wetlands as defined in US Army Corps of Engineers Manual. All perennial, and most intermittent, watercourses within the project area qualify as jurisdictional "Waters of the United States". Waterways located in the study area include a number of unnamed intermittent streams. Heavenly Waters Run and Winters Run are both upper perennial streams found within the study area. Heavenly Waters Run is a tributary to Winters Run and Winters Run is a tributary to the Bush River. All tributaries to Winters Run above Atkinson Road are classified as Use IV, recreational trout streams. The Bush River is a lower perennial stream located outside of the study area.

Located in the Bush River watershed, the streams that flow through the study area provide an abundance of aquatic habitat. The existing habitats include stream bottoms that consist of fine silts and sand to medium sized cobbles. Fish species known to inhabit the Bush River and its tributaries are listed in Table 3-14. The stream banks are well vegetated, providing excellent cover for wildlife. The stream water quality provides conditions for a wide range of aquatic life. Vegetation on stream banks, and in surrounding areas, provides shade and cover for protection of aquatic habitats. All of the perennial streams in the area provide habitat for amphibians and macroinvertebrates.

TABLE 3-14
BUSH RIVER WATERSHED FISH SPECIES

Cyprinidae		
	Blacknose dace	*Rhinichthys atratulus* (Hermann)
	Longnose dace	*Rhinichthys cataractae* (Valenciennes)
	Roseyside dace	*Clinostomus funduloides* (Girard)
	Cutlips minnow	*Exoglossum maxillingua* (Lesueur)
	Creek chub	*Semotilus atromaculatus* (Mitchill)
	River chub	*Nocomis micropogon* (Cape)
	Fallfish	*Semotilus corporalis* (Mitchill)
	Common Shiner	*Notropis analostanus* (Mitchill)
	Bluntnose minnow	*Pimephales notatus* (Rafinesque)
	Satinfin shiner	*Notropis analostanus* (Girard)
	Spottail shiner	*Notropis hudsonius* (Clinton)
	Swallowtail shiner	*Notropis procne* (Cope)
Centrarchidae		
	Smallmouth bass	*Micropterus dolomieui* (Lacepede)
	Redbreast sunfish	*Lepomis auritis* (Linnaeus)
	Bluegill sunfish	*Lepomis macrochirus* (Rafinesque)
Percidae		
	Tessellated darter	*Etheostoma olmstedi* (Storer)
	Fantail darter	*Etheostoma flabellare* (Rafinesque)
Catostomidae		
	Northern hogsucker	*Hypentelium nigricans* (Lesueur)
	White sucker	*Catostomus commersoni* (Lacepede)
Icataluridae		
	Margined madtom	*Noturus insignis* (Richardson)
Cattidae		
	Mottled sculpin	*Cottus bairdi* (Girard)
Anguillidae		
	American eel	*Anguilla rostrata* (Lesueur)

From: Stinefelt, H.H. S. E. Rivers, C. R. Gougeon, and D.E. Wornecki. 1985. *Survey,Inventory,and Management of Maryland's Cold Water Fishery Resources*. Fed. Aid Project F-37-R, of Natural Resources, Tidewater Administration.
Note: Fish Species Collected in the Bush River Basin, 1974 through 1984

As mentioned in Section 3.5.3, stream characteristics were provided previously in Table 3-11. However, during the stream characterization field inspection, fish populations were observed in Winters Run, Heavenly Waters Run, and Bynum Run. In Heavenly Waters Run (upstream from Tollgate Road), the mottled sculpin (*Cottus bairdi*), a pollution-sensitive fish species, was caught by hand, identified, and released.

The Heavenly Waters Run Preliminary Site Investigation Study (Gannett Fleming, 1997), was reviewed for this project. This study was conducted due to allegations that the macroinvertebrate populations observed in Heavenly Waters Run may be depressed due to contamination from the

Tollgate Landfill, located upstream from Heavenly Waters Run. The following conclusion was made from the study:

> "The absence of significant concentrations of inorganics, organics, VOCs, pesticides, or PCBs in the surface water and sediments of Heavenly Waters Run, leads to the conclusions that it is highly unlikely that contaminants exist in these media within the study area at concentrations sufficient to produce the reported depressed macroinvertebrate populations."

3.6.4 Rare, Threatened and Endangered Species

Requests for comments on rare species within the study area were sent to the USFWS and MDDNR, Heritage and Biodiversity Conservation Program (MHBCP) on August 4, 1997. Coordination with the USFWS and MDDNR, MHBCP was conducted to determine the status of rare, threatened, and endangered species within the study area. Correspondence from the USFWS, dated August 18, 1997, indicated that a "proposed threatened species, the bog turtle (*Clemmys muhlenbergii*), may be present" in the study area. On November 4, 1997, the bog turtle was officially listed as a threatened species. No other known populations of Federal- or State-listed threatened or endangered species, except for occasional transient individuals (e.g., bald eagle), are known to occur within the study area.

The MHBCP has also provided input that approximately 0.5 miles east of the northern part of the project is a current location for Fringe-tip Closed Gentian (*Gentiana andrewsii*), listed by MDDNR as threatened. After further study, it was determined that this species does not occur within the study area.

Bog Turtle - The aforementioned USFWS correspondence (August 18, 1997) discussed the potential for bog turtles to exist within the study area, and recommended that MDSHA thoroughly inspect the study area for the presence of appropriate bog turtle habitat. The bog turtle "was proposed for Federal listing in the Federal Register of January 29, 1997 and was actually listed in November of the same year." Therefore, the bog turtle is now protected by the requirements of Section 7 of the US Endangered Species Act. The bog turtle is also listed as a "threatened" species by the State of Maryland. The correspondence states that should "a bog turtle habitat investigation reveal the presence of emergent or shrub/scrub wetlands, the USFWS recommends that a survey for bog turtles be completed." The USFWS has recommended coordinating with Scott Smith of the MDDNR, MHBCP as a state expert on the habitat requirements of the bog turtle. Additional correspondence from Scott Smith also highly recommended that MDSHA

conduct full bog turtle surveys for several wetlands in the study area including wetlands 12C, 16, and 25. A field meeting with Scott Smith was held in the summer of 1998 and it was determined that wetlands 16 and 25 must be surveyed for bog turtles. However, due to the short period of time during which a bog turtle survey can be conducted, this survey will not be conducted until late spring of 1999. A decision regarding a preferred alternate will not be made until after the results of these surveys are surveyed.

Maryland is at the core of the bog turtle's range. This turtle is one of the world's smallest turtles (maximum length of approximately 4 inches) with conspicuous orange blotches on the sides of its head. Bog turtles are found primarily in palustrine emergent wetlands, many of which include some shrub/scrub wetland component. Bog turtles live in fens, bogs, wet meadows, and freshwater marshes, often below spring seeps or in rivulets adjacent to streams. Bog turtles frequently occupy wet pastures that are lightly to moderately grazed. Characteristic bog turtle habitat includes soft mud bottom, shallow water, or exposed mud, in association with sedges, low grasses, and tussocks of emergent vegetation.

During field evaluations conducted in 1996 and 1997, each wetland within the US 1 Bel Air Bypass, study area was evaluated and categorized to describe its suitability as potential bog turtle habitat. If a wetland was determined to contain habitat suitable for bog turtle, it was assigned a qualitative value of low, moderate, or high. This information is a qualitative evaluation of the potential of each wetland to contain habitat suitable for bog turtles, not actual bog turtle individuals. A presence/absence study for bog turtles has not yet been conducted. The data was compiled using field observations and evaluated using best professional judgement and previously established bog turtle habitat specifications. Table 3-15, Bog Turtle Habitat Suitability, below summarizes those findings:

TABLE 3-15
BOG TURTLE HABITAT SUITABILITY

Wetland No.	Habitat Suitability	Reasons and Site Characteristics
6A	LOW	Filled, insufficient hydrology, near known habitat, managed
6B	LOW	Forested, firm substrate, disturbed
7	LOW	Forested, firm substrate, disturbed
8	LOW	Partially forested, small size, highly disturbed
9	LOW	Partially forested, small size, highly disturbed
11	LOW	Forested, firm substrate, small size, topographically isolated
12A	LOW	Forested, firm substrate, small size, topographically isolated
12B	LOW	Forested, mucky in areas, small size
12C	MODERATE	Forested, mucky in areas, clayey substrate, seeps
12D	LOW	Forested, mucky in areas, small size, cobble substrate
13	LOW	Forested, mucky, topographically isolated, small size
15	UNSUITABLE	Stormwater management pond, too small, firm substrate
16	MODERATE	Forested, mucky, evidence of former tussock sedge dominance, contiguous to stream
17	LOW	Forested, mucky in small pockets, clay substrate
18	LOW	Forested, small size, adjacent to stream, disturbed
19A	LOW	Forested, firm substrate
23	LOW	Scrub/Shrub, highly disturbed, firm substrate, near stream
24	LOW	Forested, cobble substrate
25	MODERATE	Mostly forested, mucky, evidence of former tussock sedge dominance, spring seep, small emergent area
26	LOW	Forested, mucky, evidence of former tussock sedge dominance, contiguous to stream
27	LOW	Forested, mucky, evidence of former tussock sedge dominance, contiguous to stream
28	UNSUITABLE	Shallow bedrock, limited hydrology

3.6.5 Reforestation

The State 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. The build alternates for this project would comply with the Forest Conservation Act.

3.7 Existing Noise Conditions

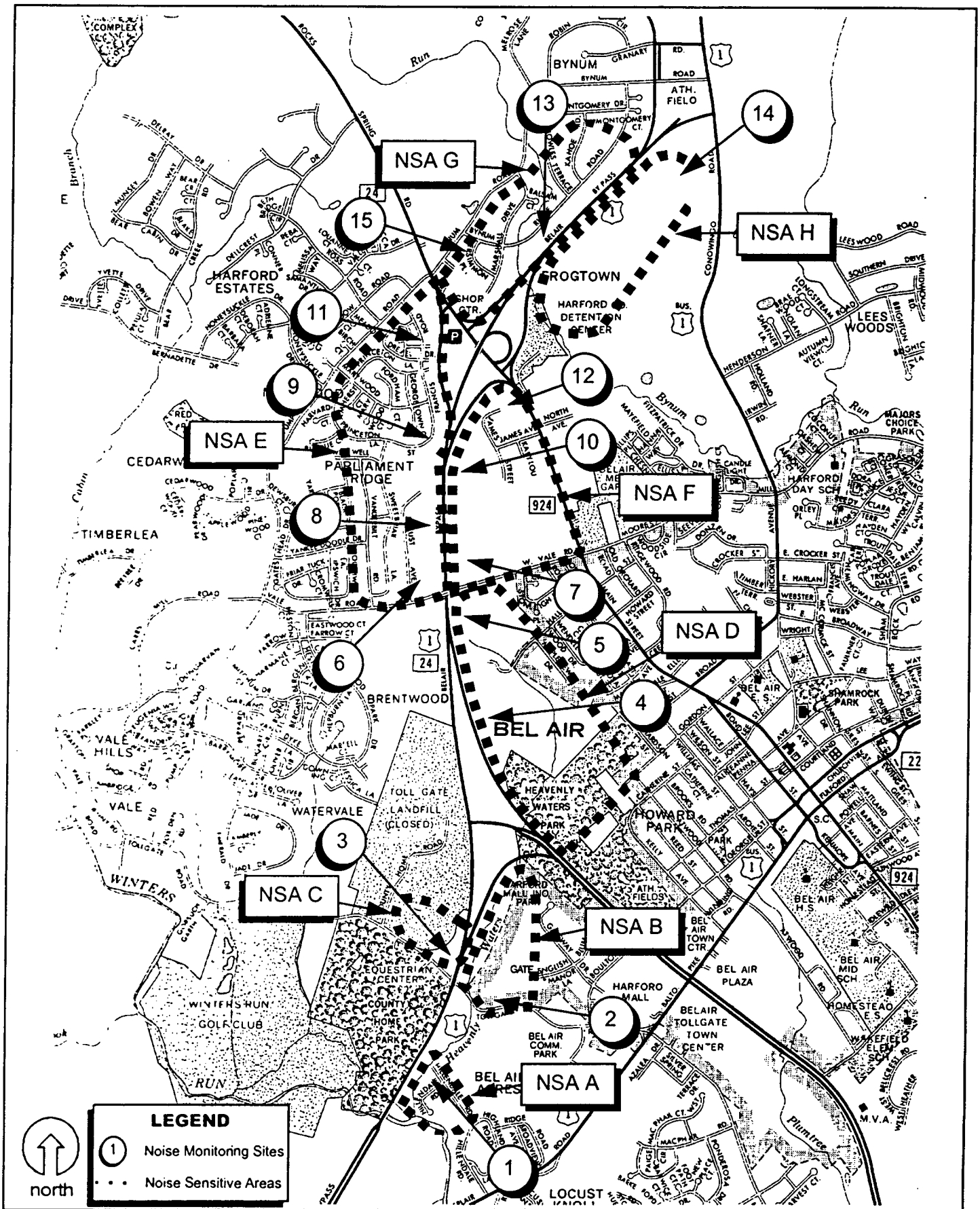
3.7.1 Description of Noise Sensitive Areas

Fifteen receptor sites were selected to represent the eight noise-sensitive areas (NSA's) which were identified by the MDSHA and verified through field visits (see Figure 3-10). Four 24 hour monitoring sites and nine 30 minute monitoring sites were monitored. Of the four 24 hour sites, two had been previously monitored and of the nine 30 minute sites three had been previously monitored. The remaining two sites identified by MDSHA were not monitored. The eight NSAs included single-family and multi-family residences.

3.7.2 Ambient Noise Level Measurements

Noise measurements were conducted in accordance with techniques described in the FHWA Report Number FHWA-DP-45-IR, "Sound Procedures for Measuring Highway Noise." A set of four Metrosonics 3100 Intergrade Sound Level Meters was used to monitor ambient long-term (24-hour) and short term (30-minute) noise levels using the established FHWA procedures. Acoustic calibrators were used to calibrate the meters before and after each measurement interval. Locations where measurements were collected would be representative of existing worst-case ambient noise levels for front-row sensitive receptors throughout each noise sensitive area. The sound level meters were operated on the A-weighting network and the fast meter response as recommended by the manufacturer. Measurements were not collected if roadway pavement was wet, or if wind speed exceeded 10 miles per hour. A porous windscreen was used on the sound level meter during all measurement procedures. All of the measurements were taken at ground level. For these measurements the sound level meters were mounted approximately 5 feet above the sidewalk or ground surface. This height is generally considered representative of the pedestrian's ear level. Wherever possible, measurement sites were located in open areas away from buildings or other potentially reflective surfaces.

For noise measurement sites located near existing roadway facilities, existing ambient noise levels were modeled using the FHWA prediction model STAMINA 2.0 and traffic counts collected during the ambient peak hour measurement interval. Results of the modeling exercise were used to compare measured ambient noise levels with modeled results to calibrate the STAMINA 2.0 model and validate future noise level predictions of traffic operations associated with the referenced project. Short-term (30-minute) and long term (24-hour) noise levels were monitored on Weekdays on June 5-6, 1997.



U.S. 1 from MD 147 to North of MD 24/924

STATE HIGHWAY ADMINISTRATION

Figure 3-10

Noise Sensitive Areas and Monitoring Sites

3.7.3 Results of Noise Monitoring

The long-term noise monitoring was performed at two locations. Noise levels measured during the continuous 24-hour period were variable and ranged from 50 - 65 dBA for site 1 in NSA A. The noise level maximums observed between the hours of 6:30 AM - 8:30 AM, 10:00 AM, 3:00 PM - 5:00 PM were 61 - 64 dBA and did not approach or exceed FHWA Noise Abatement Criteria of 67 dBA, Leq.

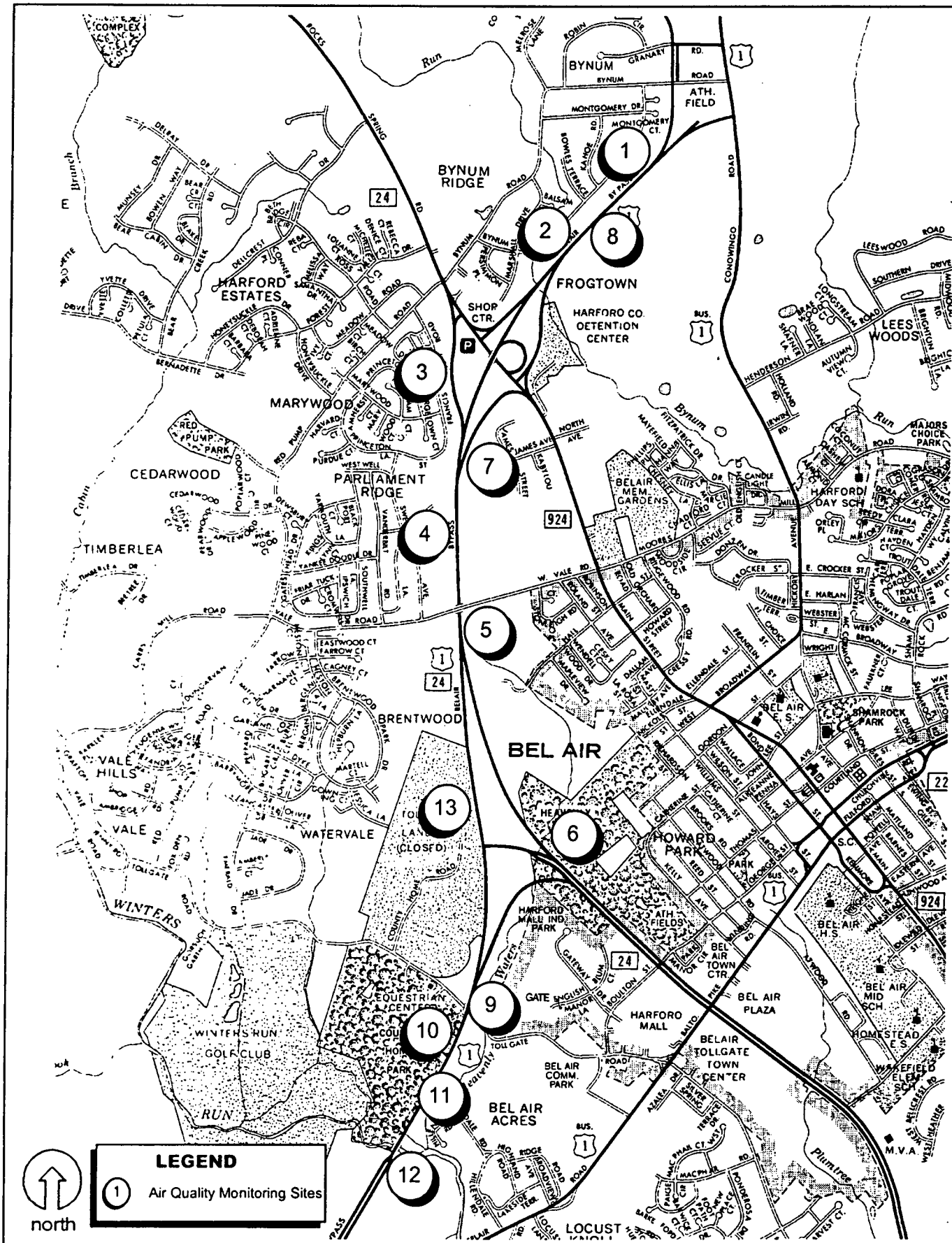
The 24-hour noise levels for site 13 in NSA G ranged from 54 - 68 dBA. The noise level maximums observed for hours 6:30 AM - 8:30 AM, 10:00 AM, 3:00 PM - 5:00 PM were 66 - 68 dBA. The noise levels approach or exceed the FHWA NAC of 67 dBA, Leq.

Measurements were collected during periods between 11 a.m. to 5 p.m. for short-term noise monitoring at six locations. The existing on-site traffic data was recorded during the measurement period to validate the monitoring results to the measured noise levels at four locations. Existing monitored noise levels ranged from 56 to 69 dBA for short-term periods. Measured short-term noise levels approach or exceed FHWA NAC of 67 dBA, Leq at site 9. All measurements versus modeled results varied by less than 3 dBA.

3.8 Existing Air Quality

The US 1 Bel Air Bypass is located in Harford County, Maryland, which is a severe nonattainment area for ozone. The County, however, is not a nonattainment area for carbon monoxide. This project conforms to the State Implementation Plan (SIP) as it originates from a conforming Transportation Improvement Plan (TIP) and a county transportation plan.

A detailed mircoscale air quality analysis has been performed to determine the CO impact of the proposed project. The location of air quality sensitive receptors used in the analysis is shown on Figure 3-11. The results are summarized in Section 5.8. A copy of the technical analysis report is avaliable at the Maryland State Highway Administration, 707 N. Calvert Street, Baltimore, MD 21202.



U.S. 1 from MD 147 to North of MD 24/924

STATE HIGHWAY ADMINISTRATION

Figure 3-11

Air Quality Receptor Sites

Existing and Planned Transportation Network

3.9.1 Study Area Roadways

Interstate 95

I-95, also known as the John F. Kennedy Memorial Highway, is the primary north-south route in the study vicinity. It is a six-to eight-lane interstate highway with full control of access, connecting the eastern seaboard states. I-95 is currently an eight-lane freeway from I-695, the Baltimore Beltway, to MD 24, and is a six-lane freeway from MD 24 to the Delaware state line (see Figure 3-12).

Improvements to I-95 are planned to begin construction in the years 2000 and 2002. I-95 will be widened to provide four lanes in each direction between MD 24 and MD 22, and between MD 272 and the Delaware state line.

US 1

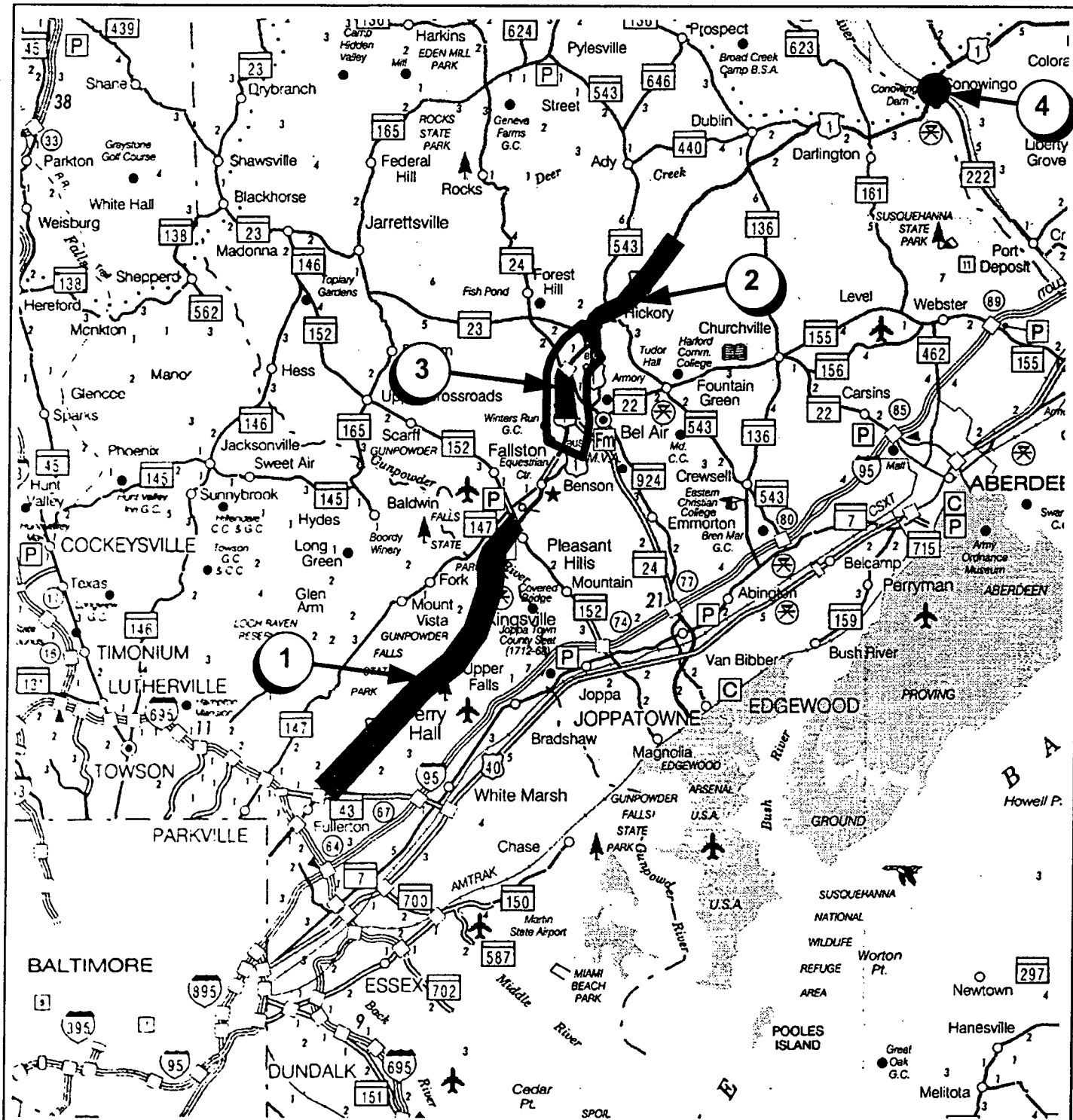
US 1, also known as the Bel Air Bypass and Belair Road, is a north-south commuter and local route through Harford and Baltimore Counties. It extends from downtown Baltimore to the Pennsylvania state line. US 1 is a multi-lane facility from I-695, the Baltimore Beltway, to north of MD 147, where it becomes a two-lane road.

US 1 between MD 24 and MD 24/924 was recently widened from a two-lane roadway to a four-lane roadway, with two lanes in each direction. In addition to mainline widening, the ramp from MD 24/924 southbound onto US 1 southbound is being widened to a two-lane ramp, and additional lanes are being provided at the MD 24/924 and Red Pump/Bynum Road intersection.

Relocation of US 1 is planned between US 1 Business and north of MD 543. This project, also known as the Hickory Bypass, will construct a new two-lane roadway as the southbound lanes of an ultimate four-lane divided section. The section of US 1 from MD 152 to MD 147 is being studied for congestion and safety improvements, in an effort to meet projected traffic demand.

Other Area Roadways & Facilities

- MD 24 is a divided, four-lane expressway from I-95 to US 1. It is a major link between I-95 and US 1, and when taken in conjunction with I-95, forms the Harford County Development Envelope.



1. US 1 - MD 152 to MD 147 (Development and Evaluation Program)
2. US 1 - Relocated, Hickory Bypass (Construction Program)
3. US 1 - TSM Improvements Belair Bypass, MD 24 to MD 924 (Under Construction)
4. US 1 - Truck Weight and Inspection Station (Systems Minor Project)

\- Study Area

north

U.S. 1 from MD 147 to North of MD 24/924

STATE HIGHWAY ADMINISTRATION

Figure 3-12

Existing and Planned Transportation Network

- US 1 Business is classified as a principal arterial from Winters Run to Broadway. It parallels US 1 to the east, serving businesses and residential communities.

- MD 152 is a two-lane rural arterial from US 1 to I-95, running parallel to MD 24. It is an alternate route to MD 24 for vehicles traveling between the US 1 and I-95 corridors.

3.9.2 Transit Services

Public transit efforts are concentrated in the Development Envelope. Public transit serving Harford County includes:

- Harford County Transportation Service (HCTS) bus lines for transit within the County (Routes 1 and 2 and Bel Air Town-Go-Round);
- Mass Transit Administration (MTA) bus lines from Havre de Grace (Line 420) and Bel Air (Lines 410, 411) to Baltimore in the AM and back in the PM;
- MARC Penn Line (operated by Mass Transit Administration under contract with Amtrak) from Aberdeen and Edgewood to Baltimore and Washington in the AM and back in the PM;
- a commuter assistance/ridesharing program; and
- a paratransit service for the elderly and handicapped population.

According to 1990 Census data, of the 85,000 residents that commute to work, most travel to the US 40 corridor or to Baltimore City. The Baltimore Metropolitan Council (BMC) estimates that between 40 and 55 percent of daily commuters travel outside of the County, yet only 1.0 percent of these commuters use mass transit.

3.9.3 Pedestrian/Bicycle Facilities

Bicycle Facilities

Harford County developed a Bikeway Study in 1977 to promote bicycling as a viable alternative mode of transportation. The findings identified a need for bicycle facilities along major commuting routes in the Development Envelope. The 1994 Transportation Plan modified and updated the Bikeway Study. That plan re-evaluated suggested bikeway locations in accordance with the American Association of State Highway and Transportation Officials' (AASHTO) "Guide for Development of New Bicycle Facilities 1991".

No bikeways have been developed in the County thus far, however, recommended routes have been identified. One recommended bicycle route lies within the study area: the Route 24 corridor

which includes several bicycle links along portions of MD 24, Tollgate Road and MD 924. Although a specific bicycle trail has not been designed, the project does not preclude bicycling in the vicinity of the MD 24/924 interchange. The MA and PA Heritage Trail (described in section 3.1.5) will use right of way from the detention center to MD 23 and can be accessed from the Town of Bel Air. Bicyclists, as well as pedestrians, are prohibited from using the US 1 Bel Air Bypass. According to the Transportation Plan, bicycle facilities in the County should be designed for both recreation and transportation uses. A county Open Space and Recreation Plan Element is being developed to incorporate recreational trails.

Pedestrian Facilities - The 1994 Transportation Plan includes a pedestrian element that specifies the promotion of safe pedestrian facilities and the elimination of obstacles to short walking/biking trips. Provisions that would facilitate safe travel by foot include sidewalks, safe intersection crossings, pavement designations, containers for pedestrian refuse, signage, and appropriately phased signals. Pedestrian facilities, including sidewalks, are required of new developments, but a contiguous network of sidewalks does not exist in areas that have not been fully developed.

3.9.4 Future Road Network

Land use and transportation planning are closely coordinated in Harford County. Transportation planning is conducted to support land use objectives and patterns, including the encouragement of development within the Development Envelope. The County published a Transportation Plan in 1994 as part of the County Master Plan. The goals of the Plan are consistent with those of the Land Use Plan, the central component of the Master Plan.

Goals of the Transportation Plan include:

- Providing a multi-modal transportation system that is compatible with the environmental and community patterns for future development;
- Ensuring that safe pedestrian facilities are incorporated into all land developments;
- Supporting the expansion of Mass Transit Administration (MTA) services;
- Establishing commuter rail service in the County, and;
- Implementing public transportation services when and where there is sufficient demand.

Roads and Highways - Harford County roads and highways are rated by a functional classification process that determines how efficiently they serve the overall channelization of traffic within the County. Priority highway improvements are listed in the Transportation Plan in anticipation of the County's population growth. The subject project is listed as a medium priority roadway improvement.

Public Transit - Harford County's strategy to increase transit ridership is to increase the frequency and diversity of existing services. Recommendations listed in the Transportation Plan include:

- Increase frequency of the intra-county bus service;
- Add bus routes to service between towns;
- Provide mid-morning, mid-afternoon, weekend and reverse MARC train services;
- Increase the number of Park and Ride facilities near residential areas, and;
- Improve ridesharing system and services.

No definite deadlines have been provided for implementation of these recommendations. However, the poor ridership on the various transit systems and the requirements of the Clean Air Act Amendment are likely to promote timely implementation of these recommendations.

The Transportation Plan provides a strategy and recommendations for implementing a contiguous network of bikeway and pedestrian facilities to connect adjacent residential, commercial, employment, recreational and school sites within the Development Envelope. No time frame is given for implementation of these recommendations.

4.0 ALTERNATES CONSIDERED

4.1 Background

The Bel Air Bypass portion of US 1 was constructed in the early 1960's. The two-lane section was originally constructed as the southbound lanes of an ultimate four-lane freeway design with a 78-foot median. Sufficient right-of-way was acquired to accommodate the ultimate design prior to original construction.

The section of MD 24 (relocated) between US 1 and I-95 received Location Approval in 1979. The approved alternate included a fully directional interchange with five bridges at US 1. This interchange concept was changed to a fully directional interchange with two stacked bridges during final design of MD 24 to avoid impacts to the Tollgate Landfill west of US 1. MD 24 opened to traffic in 1986 with a temporary at-grade intersection at US 1. The MD 24 interchange of this project was proposed as the fully directional interchange that received Location Approval under the MD 24 project.

This Bel Air Bypass Project Planning Study for US 1 from MD 147 to north of MD 24/924 was initiated in early 1989. It was added to the project planning study of US 1 from MD 152 to MD 147 and US 1 Business from US 1 to MD 24, which started in 1987.

4.2 Alternates Public Meeting

Shortly after the Bel Air Bypass section was added to the scope of the US 1 / US 1 Business study, an Alternates Public Meeting was held on June 22, 1989. This meeting identified the Bel Air Bypass as "Segment 3" of the larger study. In preparation for this meeting, the planning team reviewed the 78-foot median concept as envisioned in the original Bel Air Bypass plan. However the 78-foot median concept was quickly dropped because design guidelines had changed to include safety grading adjacent to the outer shoulders. Inclusion of safety grading with a 78-foot median would have required right-of-way acquisition beyond that which was already purchased. To avoid additional right-of-way purchases, the median was reduced to 58 feet. At the Alternates Public Meeting, two alternates were presented to the public for comments: Alternate 1 - the No-Build; and Alternate 2 - the 58-foot median concept. The interchange of US 1 at MD 24 (relocated) which had received Location/Design Approval in 1979 was an element of Alternate 2. Although preliminary concepts for improvements at the MD 24/924 interchange had not been drafted in time for the 1989 Public Meeting, it was noted in the meeting brochure that

improvements at the MD 24/924 interchange would also be an element of Alternate 2 and would be determined during the next study stage.

4.3 Alternates Developed Following the Alternates Public Meeting

In response to citizen, agency, and study team comments following the Alternates Public Meeting, the Bel Air Bypass project was separated from the other segments of the US 1 / US 1 Business study and the study team developed additional preliminary alternates. In order to minimize environmental impacts associated with the 58-foot median and to remain consistent with the Hickory Bypass project (which meets this project north of the MD 24/924 interchange), a narrower, 34-foot median concept was developed. Alternate 2 as presented at the public meeting was split into Alternate 2A and 2B with median width options of 58 feet and 34 feet, respectively. Ten interchange options were developed with Options 1 through 8 referring to the MD 24 (relocated) interchange and Options 9 and 10 referring to the MD 24/924 interchange.

After further analysis, Alternate 2A, Option 2, and Option 4 were dropped and the others were renamed. Alternate 2A (58-foot median) was dropped in favor of Alternate 2B (34-foot median) because the smaller median minimized impacts to the environment and was also more consistent with the Hickory Bypass. Options 2 and 4 were dropped in favor of Option 5. All three options proposed trumpet interchanges at MD 24, however, Options 5 had the least environmental impacts (i.e. did not impact as many wetlands or the Tollgate Landfill) while still providing the same operational benefit as Options 2 and 4. The renaming changed the remaining MD 24 interchange options (Options 1, 3, 5, 6, 7, and 8) to Alternates 2 through 7. These alternates each included a mainline with a 34-foot median and one MD 24 interchange design. The MD 24/924 interchange options (Options 9 and 10) became Options A and B. Alternate 1 remained the No-Build Alternate. Table 4-1 illustrates the renaming of the alternates.

TABLE 4-1
RENAMING OF ALTERNATES/OPTIONS

	Old Alternates	Description	New Alternates
Mainline	Alternate 1 (No-Build)	No-Build	Alternate 1
	Alternate 2A	58' Median	**Dropped**
	Alternate 2B	34' Median	(all Alt's have 34' median)
MD 24 Interchange	Option 1	MD 24 Directional - 3 Bridge	Alternate 2
	Option 2	MD 24 Trumpet - wetland impact	**Dropped**
	Option 3	MD 24 Diamond plus at grade	Alternate 3
	Option 4	MD 24 Trumpet - landfill impact	**Dropped**
	Option 5	MD 24 Trumpet - lower design speed	Alternate 4
	Option 6	MD 24 Directional - 2 bridge stacked	Alternate 5
	Option 7	US 1/MD 24 roundabout	Alternate 6
	Option 8	Ramp C and Ramp D jug handle	Alternate 7
MD 24/924 Interchange	Option 9	5-lane MD 924	Option A
	Option 10	Dualize MD 924	Option B

Alternate 1 - No Build - Alternate 1 is the No-Build Alternate which includes maintenance and minor rehabilitation on the existing road and interchanges. These improvements would not increase the capacity of the existing road network.

Dropped – 58' Median - This alternate proposed the dualization of US 1 from south of MD 24 to north of MD 924/MD 24. US 1 would be reconstructed as a 4-lane divided highway, with a 6-lane section proposed between MD 24 and MD 924/MD 24. The existing roadway section would become the southbound lanes of the divided highway and new northbound lanes would be constructed to the east. This option proposed modifying the median width between MD 24 and MD 924/MD 24. A 54-foot median would be necessary in this area in order for the proposed northbound lanes to clear the bridge piers for the existing Vale Road overpass. Due to greater environmental impacts, this alternate was dropped in favor of the 34-foot median concept.

Retained - 34' Median - This alternate proposes the dualization of US 1 from south of MD 24 to north of MD 924/MD 24. US 1 would be reconstructed as a 4-lane divided highway, with a 6-lane section proposed between MD 24 and MD 924/MD 24. The existing roadway section would become the southbound lanes of the divided highway and new northbound lanes would be constructed to the east. This option proposed modifying the median width between MD 24 and MD 24/924. A 38-foot median would be necessary in this area in order for the proposed northbound lanes to clear the bridge piers for the existing Vale Road overpass.

The 34-foot median was incorporated into each of the following MD 24 interchange alternates.

Alternate 2 - Three Bridge Directional Interchange - Alternate 2 proposed a three bridge directional interchange at MD 24. Under this alternate, the existing at-grade intersection of MD 24 and US 1 would be eliminated. Directional ramp D is proposed to provide access for the southbound US 1 to southbound MD 24 movement. Ramp D would pass over northbound US 1 and then pass over directional ramp C. Ramp C would be provided for the northbound MD 24 to southbound US 1 movement, passing under Ramp D and then northbound US 1.

Dropped - Trumpet Interchange - This option proposed a trumpet interchange at US 1 and MD 24. This design had one loop ramp and one directional ramp, and avoided impacts to the Tollgate Landfill. This option was dropped because it had a large impact on wetlands and required two bridges in the interchange.

Alternate 3 - Diamond Interchange with At-Grade Ramp - Alternate 3 proposes a diamond interchange that utilizes the existing at-grade intersection. The northbound and southbound US 1 traffic will be free flow but the movements to and from southbound US 1 would require a traffic signal. The design would require one left exit and one left entrance along southbound US 1.

Dropped - Trumpet Interchange - This option proposed a trumpet interchange with a 50 MPH directional ramp. This was a modification to the trumpet interchange above which reduced wetland impacts and reduced costs, however, it impacted the Tollgate Landfill. Therfore, this option was also dropped.

Alternate 4 - Trumpet Interchange - Alternate 4 proposes a trumpet interchange with the southbound US 1 lanes relocated to the east through the MD 24 Interchange. This design avoids impacts to the Tollgate Landfill without significant increases to the wetlands impacts. This is the only option proposed for the MD 24 interchange which has a right lane exit for the southbound US 1 to eastbound MD 24 movement.

Alternate 5 - Two Bridge Directional Interchange - Alternate 5 would eliminate the existing at-grade intersection by constructing a three-level directional interchange with US 1 northbound, ramp C and ramp D crossing at a single point. Directional ramp D is proposed to provide for the southbound US 1 to southbound MD 24 movement. A bridge is required that would pass over the northbound US 1 mainline bridge and directional ramp C (northbound MD 24 to southbound US 1). Ramp C would be constructed at the lowest level.

Alternate 6 - Roundabout - Alternate 6 would eliminate the existing at-grade intersection by constructing a three-level directional interchange with US 1 northbound, ramp C and ramp D crossing at a single point. Directional ramp D is proposed to provide for the southbound US 1 to southbound MD 24 movement. A bridge is required that would pass over the northbound US 1 mainline bridge and directional ramp C (northbound MD 24 to southbound US 1). Ramp C would be constructed at the lowest level.

Alternate 7 - Jug Handle - The northbound and southbound lanes of US 1 would have continuous traffic flow under Alternate 7. Directional ramp D would provide the southbound US 1 to southbound MD 24 movement. Connector ramp C would provide for northbound MD 24 to southbound US 1 traffic, crossing ramp D at grade with either a signal or stop sign control.

Option A - MD 24/924 would be widened by adding one through-lane in each direction from north of Red Pump and Bynum Roads to approximately 800 feet south of the interchange as well as turning lanes and a 4-foot monolithic concrete median. Turn lanes would also be added on the Bynum Road approach to MD 24. Sidewalks would be provided along both sides of MD 24/924 through the interchange. The park-and-ride lot would be replaced near its present location.

The northbound US 1 to northbound MD 24 movement, loop ramp C, is proposed to be a double lane loop ramp. Ramp A would take off from the existing northbound US 1 to southbound MD 924 ramp.

Spur ramp B is proposed to provide for access from northbound MD 924 to southbound US 1. Ramp B is a relocation of an existing substandard ramp. It would intersect MD 24/924 directly across from the existing ramp from southbound US 1 to southbound MD 924 with a new signalized intersection. Access to the park-and-ride lot will be provided at spur ramp B and a right-in-right-out adjacent to the US 1 overpass.

Option B - MD 24/924 would be widened to a four-lane divided highway with turning lanes from north of Red Pump and Bynum Roads to approximately 800 feet south of the interchange and would include a landscaped closed median which varies in width. The existing US 1 bridge provides adequate space for this roadway dualization. No modifications to the bridge would be necessary. Turn lanes would also be added on the Bynum Road approach to MD 24. Sidewalks would be provided along both sides of MD 24/924 through the interchange. The park-and-ride lot would be replaced near its present location and would have a single access point.

Loop ramp C , from northbound US 1 to northbound MD 24 would be widened to two lanes. The alignment of the ramp would be modified to tie into the proposed northbound US 1 lanes.

Spur ramp B is proposed to provide for improved access from northbound MD 924 to southbound US 1. Ramp B is a relocation of an existing substandard ramp. The ramp would originate at the existing northern egress from the park-and-ride lot.

4.4 Alternates Dropped as a Result of the Interagency Review Meeting

In late 1996, an interagency review meeting was held. Prior to this meeting Alternates 1 through 7 and Options A and B were being considered. As a result of the meeting, Alternates 2, 6, and 7 were dropped from the study. Alternates 3, 4 and 5 remained, along with the No-Build alternate and Options A and B. There were no changes made to the alternates which were retained after the interagency review meeting. Table 4-2 lists all of the alternates studied before the interagency review meeting and the changes that occurred as a result of the meeting. The alternates retained are the alternates currently being studied.

TABLE 4-2
ALTERNATES/OPTIONS BEFORE AND AFTER
THE INTERAENCY REVIEW MEETING

Pre-Meeting Alternates	Description	Alternates Retained
Alternate 1	No Build	√
Alternate 2	Directional	Dropped
Alternate 3	Diamond (ramps C & D at grade)	√
Alternate 4	Trumpet	√
Alternate 5	Directional	√
Alternate 6	Roundabout	Dropped
Alternate 7	Jug Handle	Dropped

Each Alternate may be selected with a single option

Option A	Monolithic divider on MD 24/924	√
Option B	Grass median on MD 24/924	√

The explanations for the elimination of Alternates 2, 6, and 7 as a result of the interagency review meeting are shown below.

Alternate 2 (Directional - 3 Bridge) - Alternate 2 is very similar to Alternate 5, in that both are directional interchanges with left exits from southbound US 1 to southbound MD 24 and a left entrance from northbound MD 24 to southbound US 1. Both alternates have similar impacts and right-of-way requirements and provide similar level of service. Since Alternate 2 would produce the same results as Alternate 5 at a higher cost, Alternate 2 was dropped from further study.

Alternate 6 (US 1/MD 24 Roundabout) - This alternate provides the same level of service as the two at-grade alternates (Alternate 3 and Alternate 7), but would cost $1.0 million more to construct. Therefore, Alternate 6 was dropped from further study.

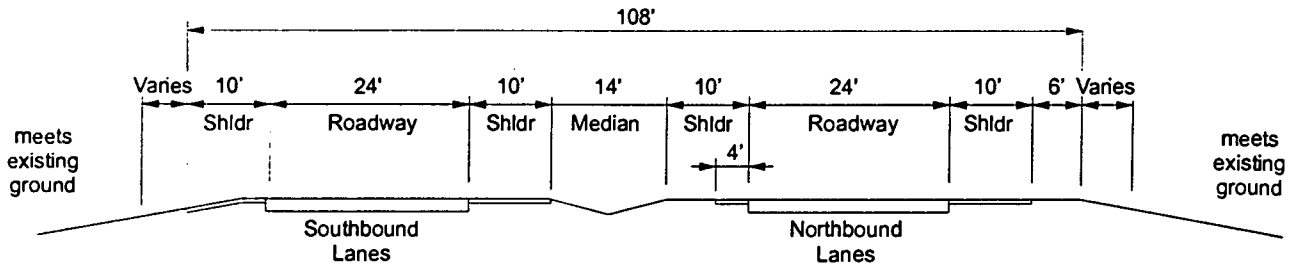
Alternate 7 (Ramp C and Ramp D Jug Handle) - Alternate 7 is similar to Alternate 3, with both providing an at-grade intersection for the southbound US 1 to southbound MD 24 movement with the northbound MD 24 to southbound US 1 movement. Both intersections are operationally identical and produce identical levels of service. Because of greater construction costs, Alternate 7 was dropped in favor of Alternate 3.

4.5 Alternates Retained for Detailed Study

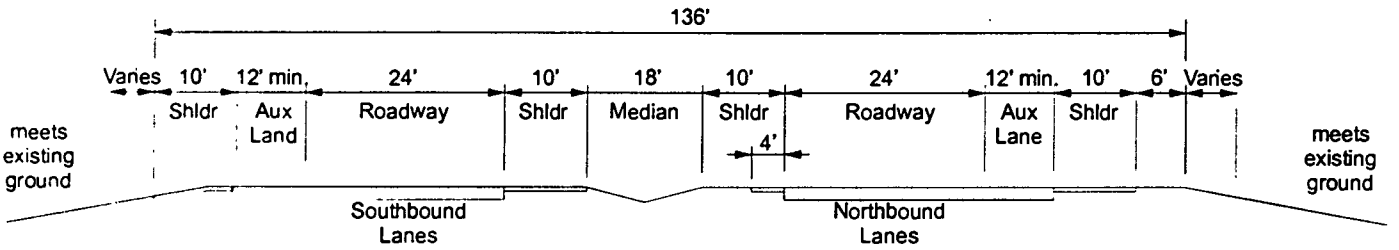
Alternate 1 (the No-Build Alternate), Alternates 3, 4, and 5, and Options A and B have been retained for further study. The typical sections for the build alternates are shown on Figures 4-1a, 4-1b and 4-1c and detailed plan drawings for Alternates 3, 4, and 5 and Options A and B are found at the end of this chapter.

All retained build alternates include dualization of US 1 from south of Winters Run to north of MD 24/924. The existing roadway section would become the southbound lanes of the dual highway. Four lanes are proposed from south of Winters Run to MD 24 and north of the MD 24/924 interchange (two lanes in each direction). The proposed nominal median width is 34 feet. Between MD 24 and MD 24/924 six lanes are proposed (three lanes in each direction). Within this section, the proposed median width is 38 feet due to constraints imposed by the Vale Road bridge over US 1. The Vale Road bridge was designed to cross a four-lane divided highway with a 78-foot median. The median width varies with each alternate through the MD 24 interchange to accommodate differing ramp configurations. In addition, for the portion of US 1 from south of Winters Run to the MD 24 interchange, a 22-foot median has been proposed to reduce impacts to wetlands.

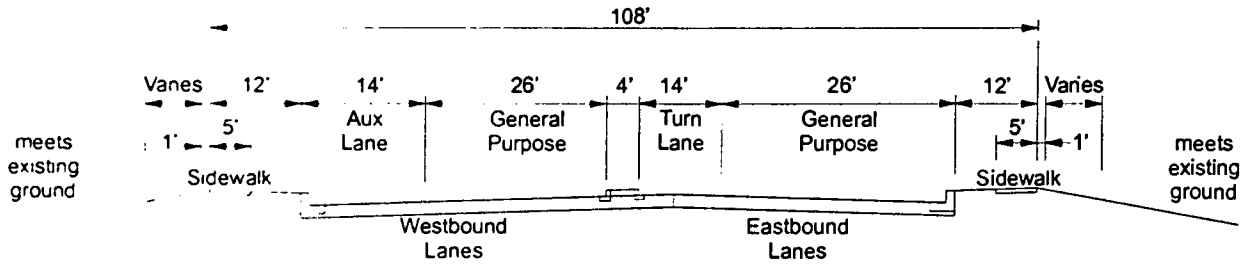
Alternate 1 (No-Build) - Alternate 1 is the No-Build Alternate. It differs from the No-Build Alternate described in the previous section because it includes widening of the existing roadway



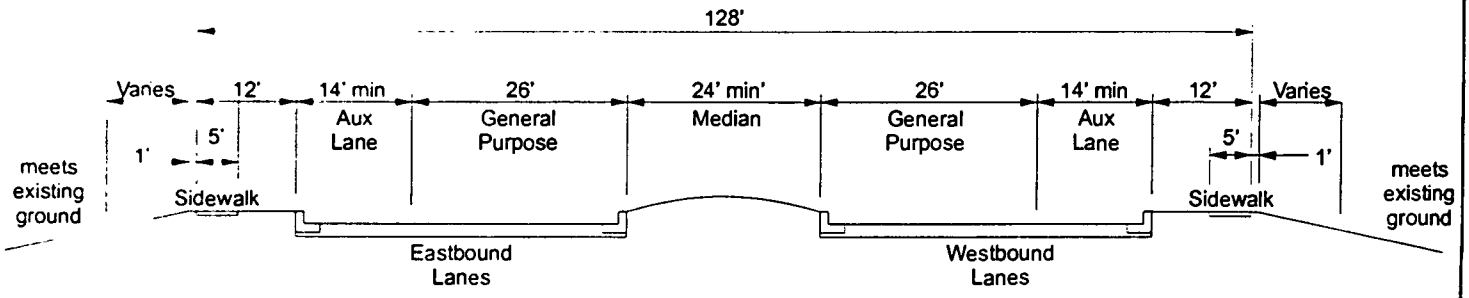
US 1 - Typical 4 Lane Section



US 1 / MD 24- Typical 6 Lane Section



Option A - MD 924/MD 24 - 5 Lane Section



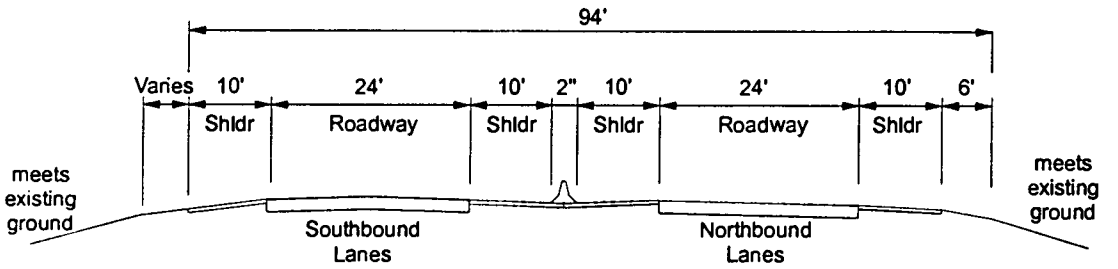
Option B - MD 924/MD 24 - 5 Lane Divided Section

U.S. 1 from MD 147 to North of MD 24/924

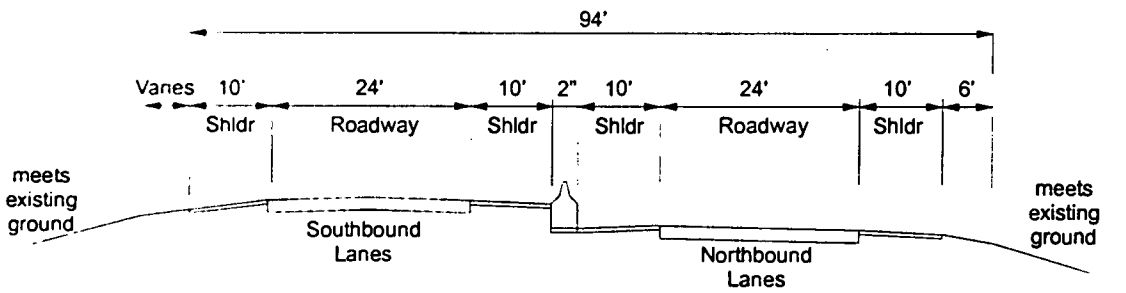
STATE HIGHWAY ADMINISTRATION

Figure 4-1a

Typical Sections



US 1 - Typical 4 Lane 22' Median Section



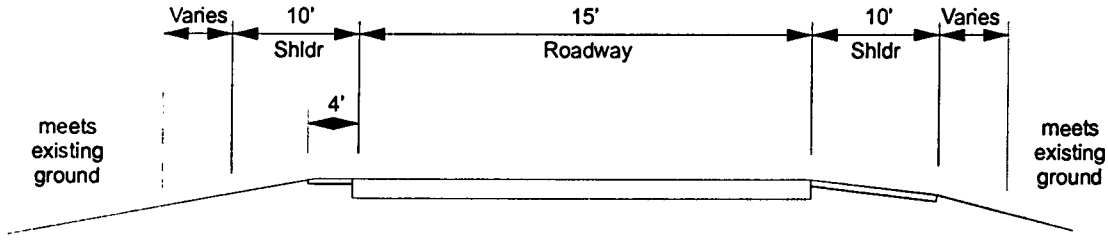
US 1 - Typical 4 Lane 22' Bifurcated Median Section

U.S. 1 from MD 147 to North of MD 24/924

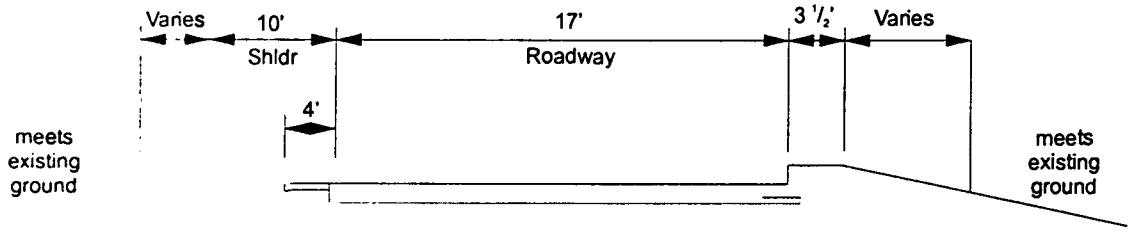
STATE HIGHWAY ADMINISTRATION

Figure 4-1b

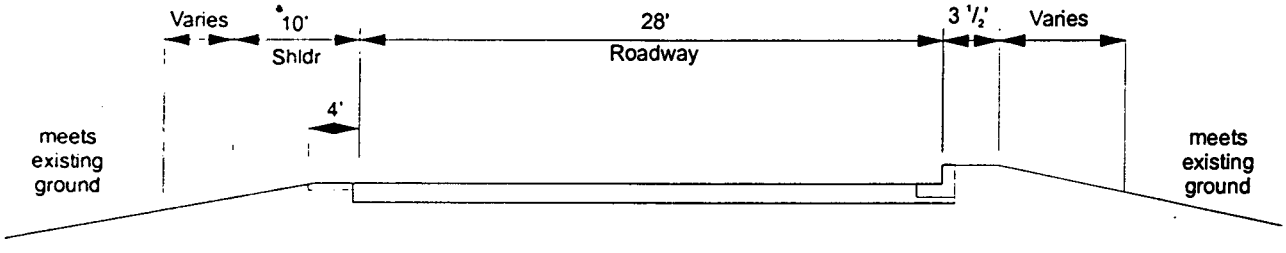
Typical Sections



Typical Open Section Ramp (R > 400')



Typical Combination Section Ramp (R > 400')



Typical Combination Section Double Lane Ramp

U.S. 1 from MD 147 to North of MD 24/924

STATE HIGHWAY ADMINISTRATION

Figure 4-1c

Typical Sections

to add one auxiliary lane in each direction between MD 24 and MD 24/924 and the addition of auxiliary lanes on MD 24 at the Red Pump/Bynum Road intersection and on the ramp from southbound MD 24 to southbound US 1, in order to reduce peak hour congestion and delay. These improvements are are now in place and will be considered as the existing condition and now part of the No-Build Alternate.

Alternate 3 (Diamond Plus At Grade) - Under Alternate 3, northbound and southbound US 1 traffic would be free flowing but the movements to and from southbound US 1 would utilize an at-grade intersection. The design would require a left exit and left entrance along southbound US 1. This option requires the construction of one bridge to carry MD 24 over northbound US 1.

Alternate 4 (Trumpet Interchange) - The existing at-grade intersection would be eliminated with Alternate 4 and would be replaced with a trumpet interchange. The existing southbound US 1 lanes would be relocated to the east. Semi-directional ramp D would provide for the southbound US 1 to southbound MD 24 movement. Loop ramp C is proposed to provide for the northbound MD 24 to southbound US 1 movement.

Alternate 5 (Directional - 2 Bridge Stacked) - Alternate 5 would eliminate the existing at-grade intersection by constructing a three-level directional interchange with US 1 northbound, ramp C and ramp D crossing at a single point. Directional ramp D is proposed to provide for the southbound US 1 to southbound MD 24 movement. A bridge is required that would pass over the northbound US 1 mainline bridge and directional ramp C (northbound MD 24 to southbound US 1). Ramp C would be constructed at the lowest level.

Option A - MD 24/924 would be widened by adding one through-lane in each direction from north of Red Pump and Bynum Roads to approximately 800 feet south of the interchange as well as turning lanes and a 4-foot monolithic concrete median. Turn lanes would also be added on the Bynum Road approach to MD 24. Sidewalks would be provided along both sides of MD 24/924 through the interchange. The park and ride lot would be replaced near its present location.

The northbound US 1 to northbound MD 24 movement, loop ramp C, is proposed to be a double lane loop ramp. Ramp A would take off from the existing northbound US 1 to southbound MD 924 ramp.

Spur ramp B is proposed to provide for access from northbound MD 924 to southbound US 1. Ramp B is a relocation of an existing substandard ramp. It would intersect MD 24/924 directly across from the existing ramp from southbound US 1 to southbound MD 924 with a new

signalized intersection. Access to the park-and-ride lot will be provided at spur ramp B and a right-in-right-out adjacent to the US 1 overpass.

Option B - MD 24/924 would be widened to a four-lane divided highway with turning lanes from north of Red Pump and Bynum Roads to approximately 800 feet south of the interchange and would include a landscaped closed median which varies in width. The existing US 1 bridge provides adequate space for this roadway dualization. No modifications to the bridge would be necessary. Turn lanes would also be added on the Bynum Road approach to MD 24. Sidewalks would be provided along both sides of MD 24/924 through the interchange. The park-and-ride lot would be replaced near its present location and would have a single access point.

Loop ramp C , from northbound US 1 to northbound MD 24 would be widened to two lanes. The alignment of the ramp would be modified to tie into the proposed northbound US 1 lanes.

Spur ramp B is proposed to provide for improved access from northbound MD 924 to southbound US 1. Ramp B is a relocation of an existing substandard ramp. The ramp would originate at the existing northern egress from the park-and-ride lot.

22' Median - In order to further minimize impact to wetlands in the study area, two reduced median options are being studied for the 0.3 mile segment of US 1 from south of Winters Run to the MD 24 interchange. These options could be implemented as part of Alternate 3, 4, or 5 and would replace the proposed 38-foot median with a 22-foot median. One of these reduced median options not only includes a 22-foot median, but also proposes a bifurcated highway through this section. By constructing a bifurcated highway (building one side of the roadway on a lower elevation than the other), there would be less grading necessary through this section and wetland impacts could be further reduced.

Transportation Systems Management (TSM) Alternate - The MD State Highway Administration (SHA) has recently completed Transportation System Management improvements within the study area. This project added auxiliary lanes between MD 24/924 and MD 24 and added lanes at the MD 24 and Red Pump/Bynum Road intersection. No other roadway improvements are planned for the area under this alternate.

4.6 Effects on Traffic Operations

A Level-of-Service (LOS) analysis was performed for the proposed alternates using volume projections for the year 2020. The LOS calculations for the roadway portion of the project are identical for each build alternate and are shown in Table 4-3.

TABLE 4-3
US 1 2020 LEVEL-OF SERVICE
NO-BUILD VS. BUILD

Existing US 1 Link	AM		PM	
	2020 No-Build	2020 Build	2020 No-Build	2020 Build
4 Lanes Northbound South of MD 24	A	A	C	C
4 Lanes Southbound South of MD 24	D	D	A	A
2 Lanes Northbound South of MD 24[1]	B	A	F	C
2 Lanes Southbound South of MD 24[1]	F	D	B	A
4 Lanes Northbound MD 24 to MD 24/924[2]	B	B	F	C
4 Lanes Southbound MD 24 to MD 24/924[2]	B	A	C	A
2 Lanes Northbound North of MD 924[3]	B	A	F	A
2 Lanes Southbound North of MD 924[3]	F	B	C	A

[1] The 2020 Build LOS for this segment reflect an upgrade of the roadway to a 4-lane divided highway.
[2] The 2020 Build LOS for this segment reflect an upgrade of the roadway to a 6-lane divided highway.
[3] The 2020 Build LOS for this segment reflect an upgrade of the roadway to a 4-lane divided highway.
***Source**: State Highway Administration, 1995*

As indicated in Table 4-3, the US 1 mainline would operate at LOS D for any build alternate in the 2020 AM peak direction between MD 147 and MD 24. The remaining segments of the US 1 mainline will operate at LOS C or better in 2020.

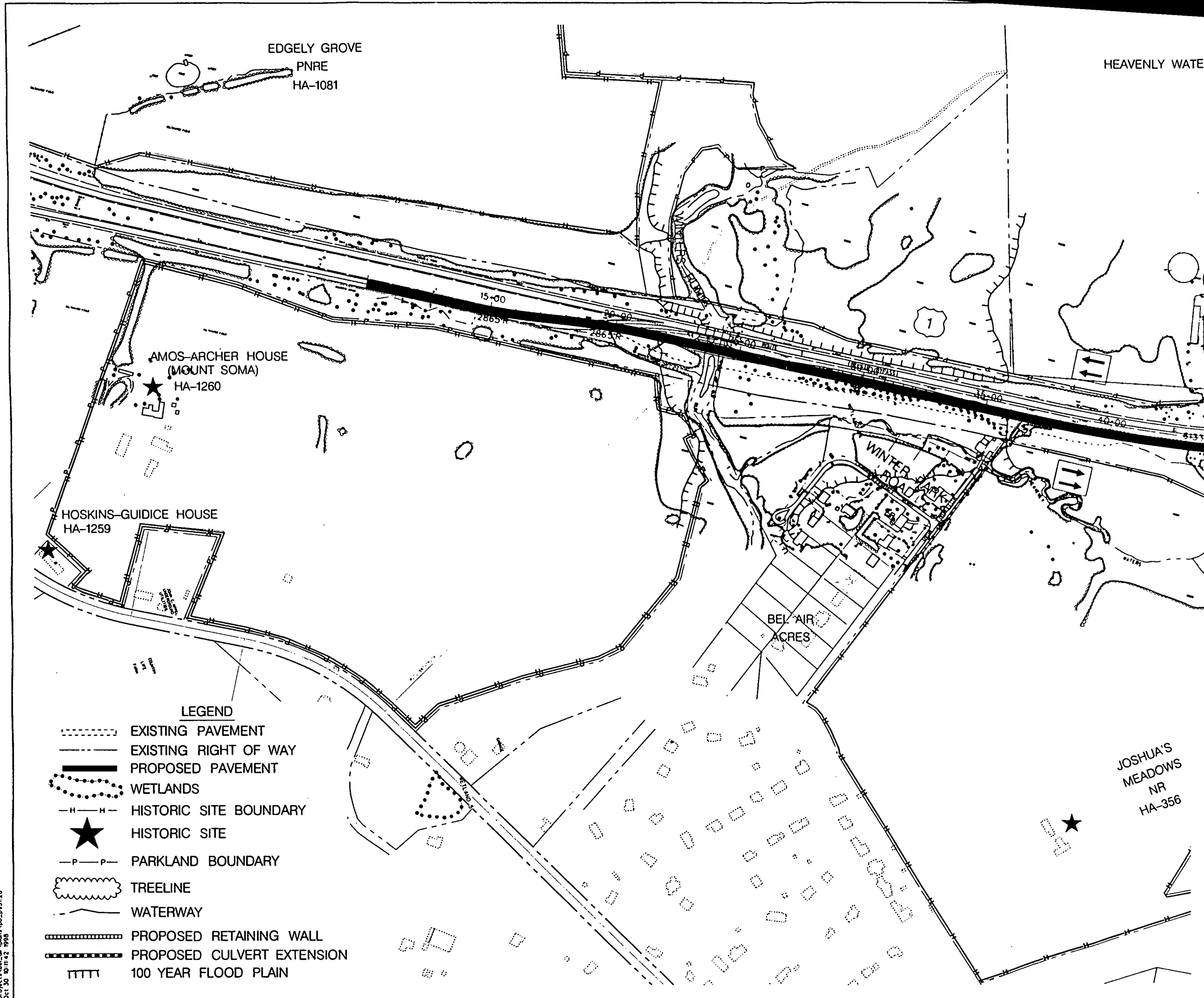
Under 2020 No-Build conditions, the intersection of MD 24 and US 1 will operate at LOS F in both the AM and PM peak hours. Alternate 3 proposes an at-grade intersection at MD 24 and southbound US 1 for the southbound US 1 to southbound MD 24 and northbound MD 24 to southbound US 1 movements. This intersection is predicted to operate at LOS D in both the AM and PM peak hours. LOS calculations for intersections are shown in Table 4-4. Alternates 4 and 5 eliminate the intersection of US 1 and MD 24 in favor of a full movement interchange. All of the ramps at the US 1/MD 24/924 intersection, which is associated with Options A and B, will operate at LOS B or better in 2020.

TABLE 4-4
INTERSECTION LEVEL-OF-SERVICE

		AM		PM	
Alternate	Intersection	2000	2020	2000	2020
No Build Alternate	US 1/MD 24	C	F	E	F
Alternate 3	US 1/MD 24	A	D	A	D
Alternate 4*	N/A	N/A	N/A	N/A	N/A
Alternate 5*	N/A	N/A	N/A	N/A	N/A
Option A*	N/A	N/A	N/A	N/A	N/A
Option B*	N/A	N/A	N/A	N/A	N/A

*Alternates 4 and 5 as well as Options A and B propose fully directional interchanges instead of intersections. Therefore intersection LOS was not applicable to these build alternates.

***Source**: State Highway Administration, 1995*



U.S. ROUTE 1 PROJECT PLANNING STUDY

FROM MD 147 TO NORTH OF MD 24 / 924

ALTERNATIVE 3

MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

Sheet 1 of 2

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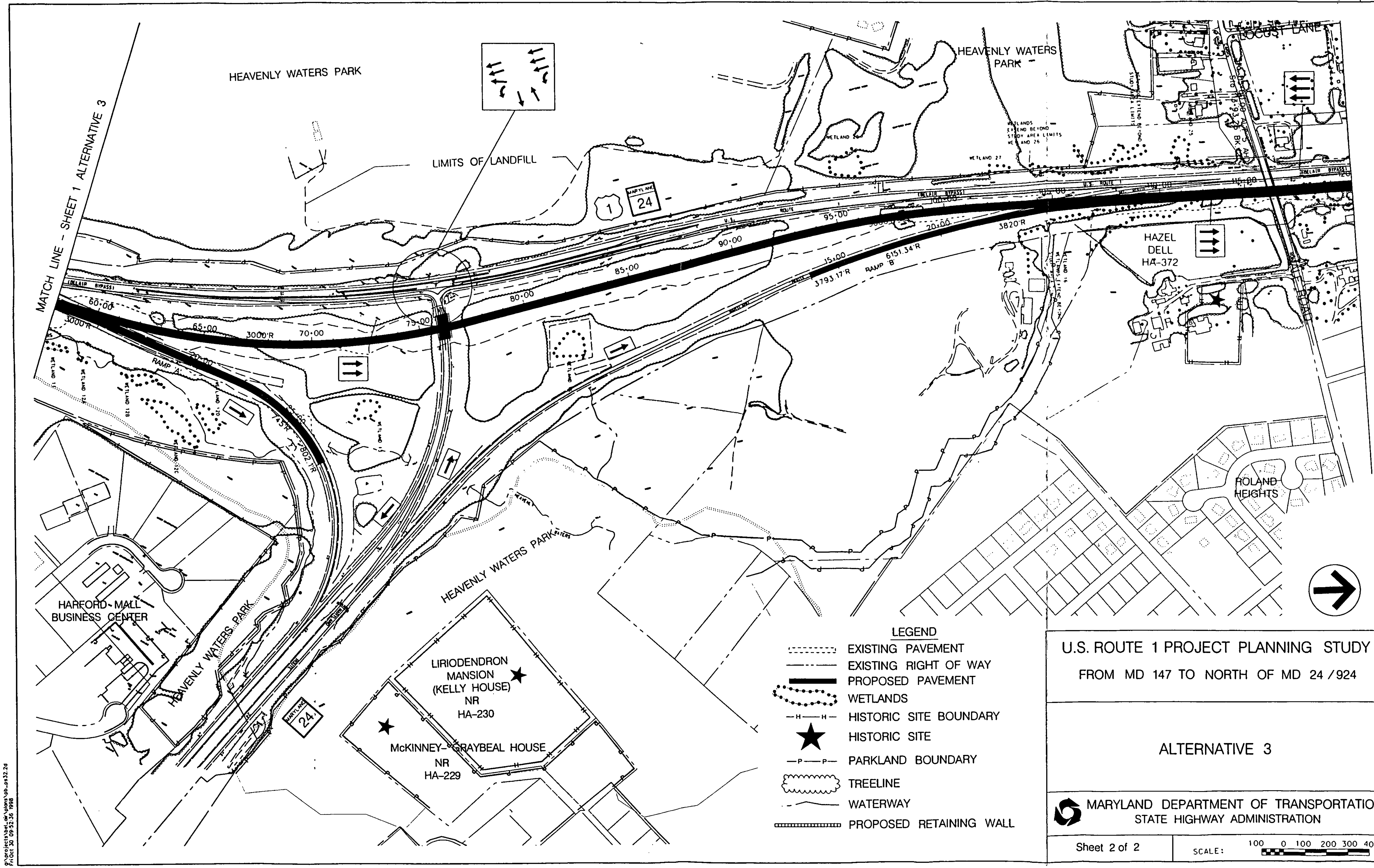

HEAVENLY WATERS PARK
LIMITS OF LANDFILL
MATCH LINE - SHEET 1 ALTERNATIVE 3
HEAVENLY WATERS PARK
LOCUST LANE
HAZEL DELL
HA-372
ROLAND HEIGHTS
HARFORD MALL BUSINESS CENTER
HEAVENLY WATERS PARK
HEAVENLY WATERS PARK
LIRIODENDRON MANSION (KELLY HOUSE) NR HA-230
McKINNEY-GRAYBEAL HOUSE NR HA-229
RAMP 'A'
RAMP 'B'
LEGEND
EXISTING PAVEMENT
EXISTING RIGHT OF WAY
PROPOSED PAVEMENT
WETLANDS
HISTORIC SITE BOUNDARY
HISTORIC SITE
PARKLAND BOUNDARY
TREELINE
WATERWAY
PROPOSED RETAINING WALL
U.S. ROUTE 1 PROJECT PLANNING STUDY
FROM MD 147 TO NORTH OF MD 24 / 924
ALTERNATIVE 3
MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
Sheet 2 of 2
SCALE: 100 0 100 200 300 400

EDGELY GROVE
PNRE
HA-1081

HEAVENLY WATERS PARK

AQUILA SCOTT HOUSE
HA-370

ALMS HOUSE (SITE)
HA-371

EQUESTRIAN CENTER

TOLL GATE ROAD

AMOS-ARCHER HOUSE
(MOUNT SOMA)
HA-1260

WINTER PARK ROAD

PROPOSED RETAINING WALL

HOSKINS-GUIDICE HOUSE
HA-1259

LIMITS OF THE TOWN OF BEL AIR

BEL AIR ACRES

JOSHUA'S MEADOWS
NR
HA-356

MATCH LINE - SHEET 2 ALTERNATIVE 4

LEGEND

- EXISTING PAVEMENT
- EXISTING RIGHT OF WAY
- PROPOSED PAVEMENT
- WETLANDS
- HISTORIC SITE BOUNDARY
- HISTORIC SITE
- PARKLAND BOUNDARY
- TREELINE
- WATERWAY
- PROPOSED RETAINING WALL
- PROPOSED CULVERT EXTENSION
- 100 YEAR FLOOD PLAIN

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U.S. ROUTE 1 PROJECT PLANNING STUDY

FROM MD 147 TO NORTH OF MD 24 / 924

ALTERNATIVE 4

MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

Sheet 1 of 2

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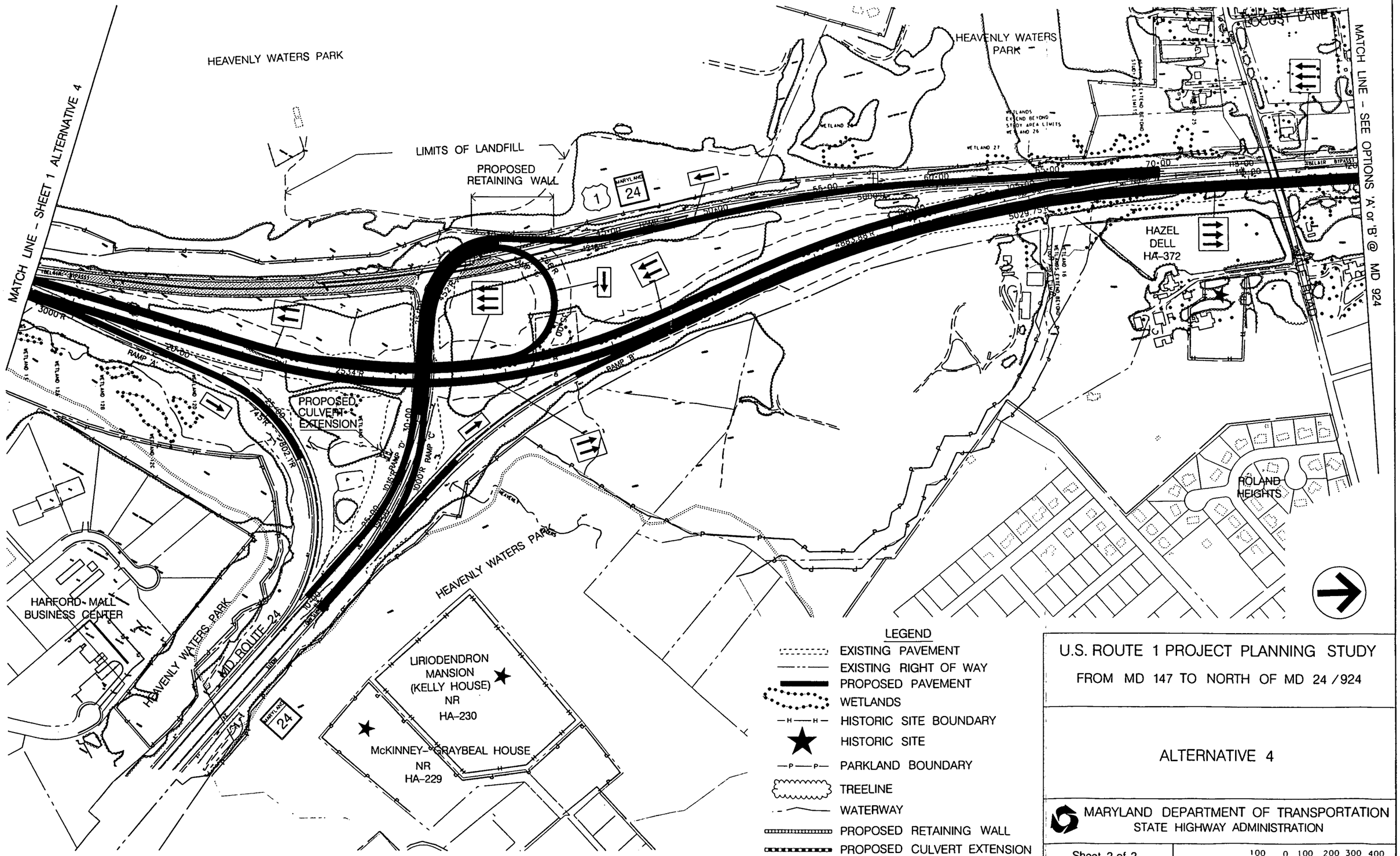

U.S. ROUTE 1 PROJECT PLANNING STUDY

FROM MD 147 TO NORTH OF MD 24 / 924

ALTERNATIVE 4

MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

Sheet 2 of 2

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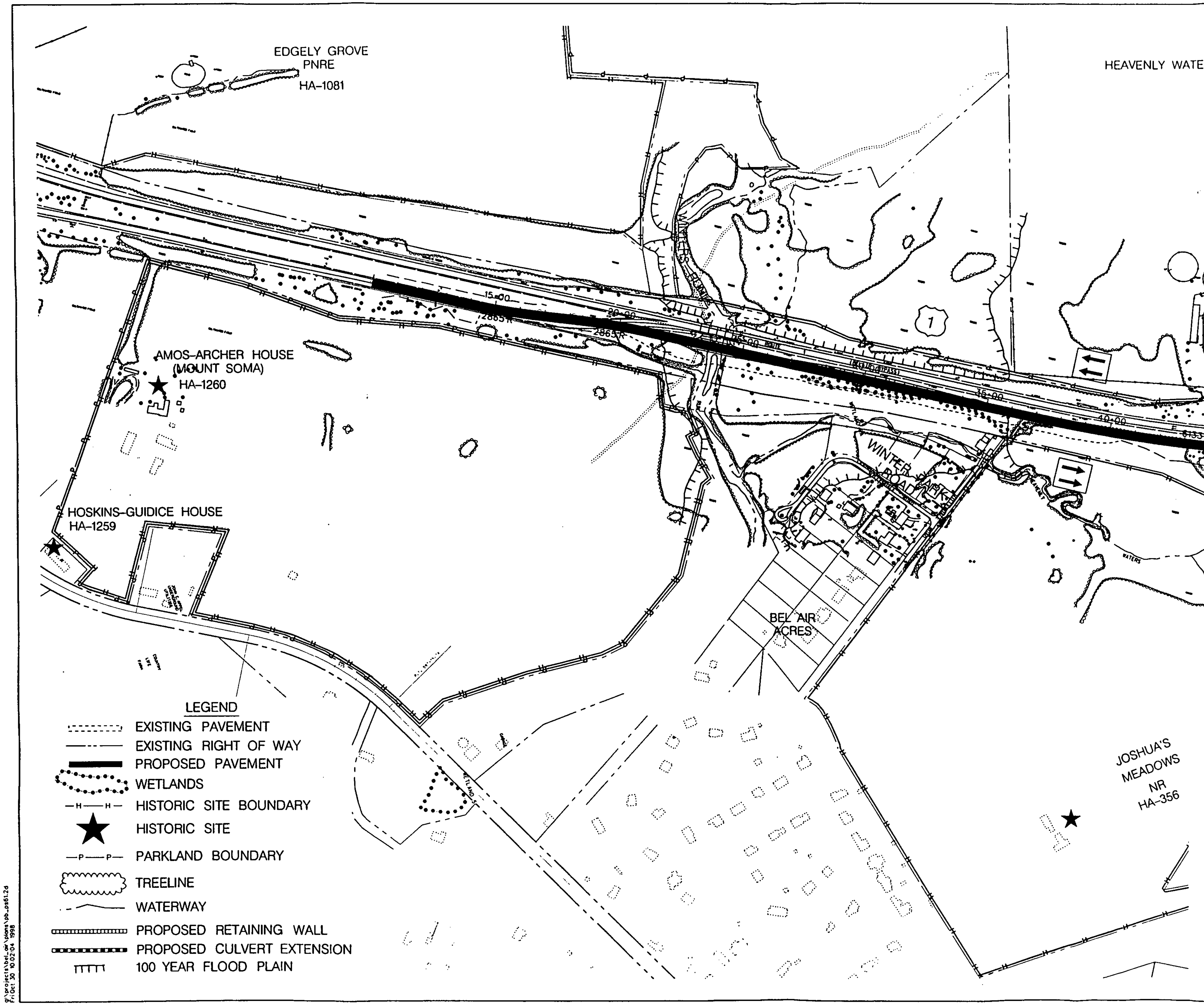

U.S. ROUTE 1 PROJECT PLANNING STUDY

FROM MD 147 TO NORTH OF MD 24 / 924

ALTERNATIVE 5

MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

Sheet 1 of 2

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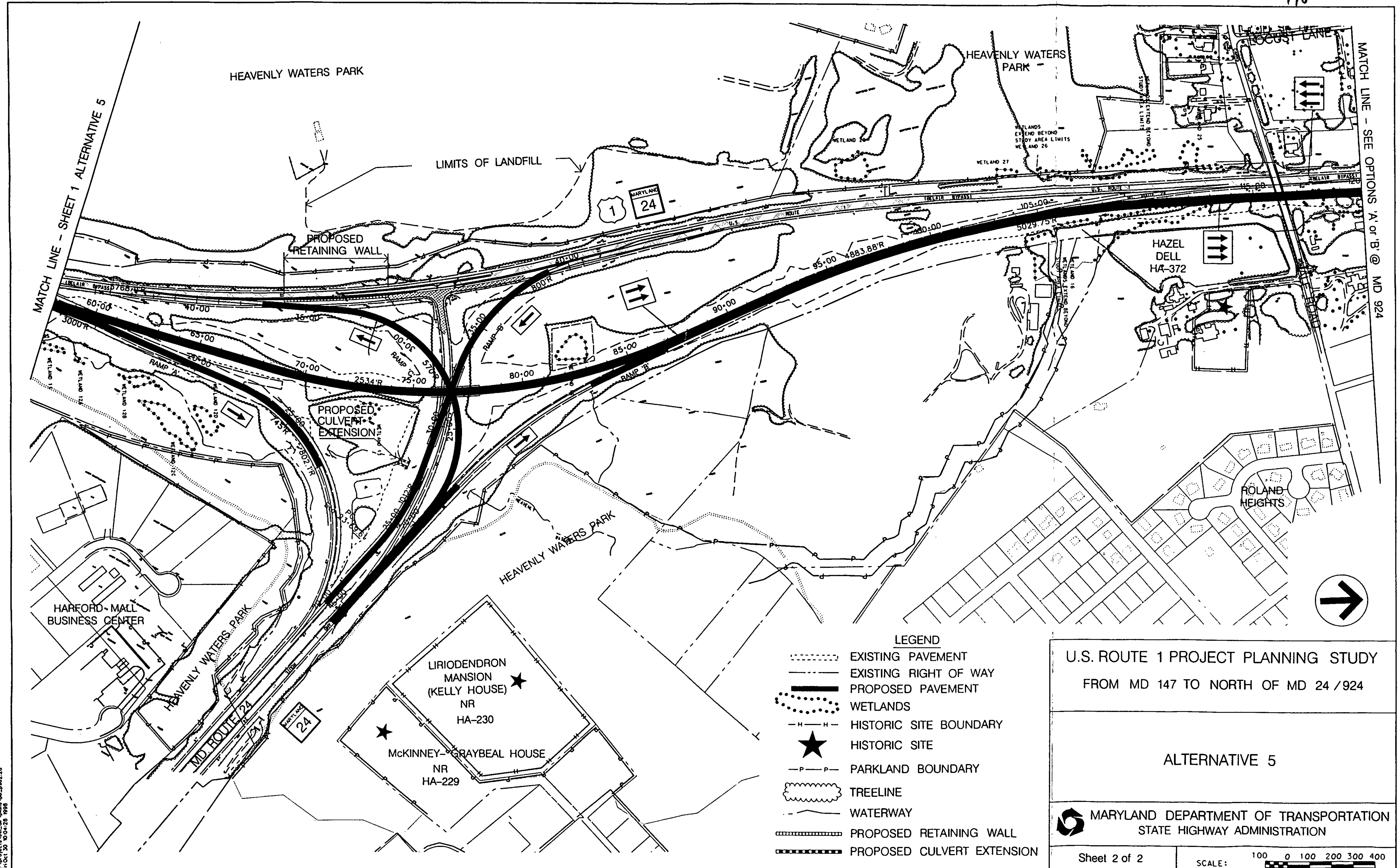
HEAVENLY WATERS PARK
LIMITS OF LANDFILL
PROPOSED RETAINING WALL
MATCH LINE - SHEET 1 ALTERNATIVE 5
HEAVENLY WATERS PARK
HAZEL DELL HA-372
MATCH LINE - SEE OPTIONS 'A' or 'B' @ MD 924
LOCUST LANE
RAMP 'A'
RAMP 'B'
RAMP 'C'
PROPOSED CULVERT EXTENSION
HEAVENLY WATERS PARK
ROLAND HEIGHTS
HARFORD MALL BUSINESS CENTER
HEAVENLY WATERS PARK
MD. ROUTE 24
LIRIODENDRON MANSION (KELLY HOUSE) NR HA-230
McKINNEY-GRAYBEAL HOUSE NR HA-229
LEGEND
EXISTING PAVEMENT
EXISTING RIGHT OF WAY
PROPOSED PAVEMENT
WETLANDS
HISTORIC SITE BOUNDARY
HISTORIC SITE
PARKLAND BOUNDARY
TREELINE
WATERWAY
PROPOSED RETAINING WALL
PROPOSED CULVERT EXTENSION
U.S. ROUTE 1 PROJECT PLANNING STUDY
FROM MD 147 TO NORTH OF MD 24 / 924
ALTERNATIVE 5
MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
Sheet 2 of 2
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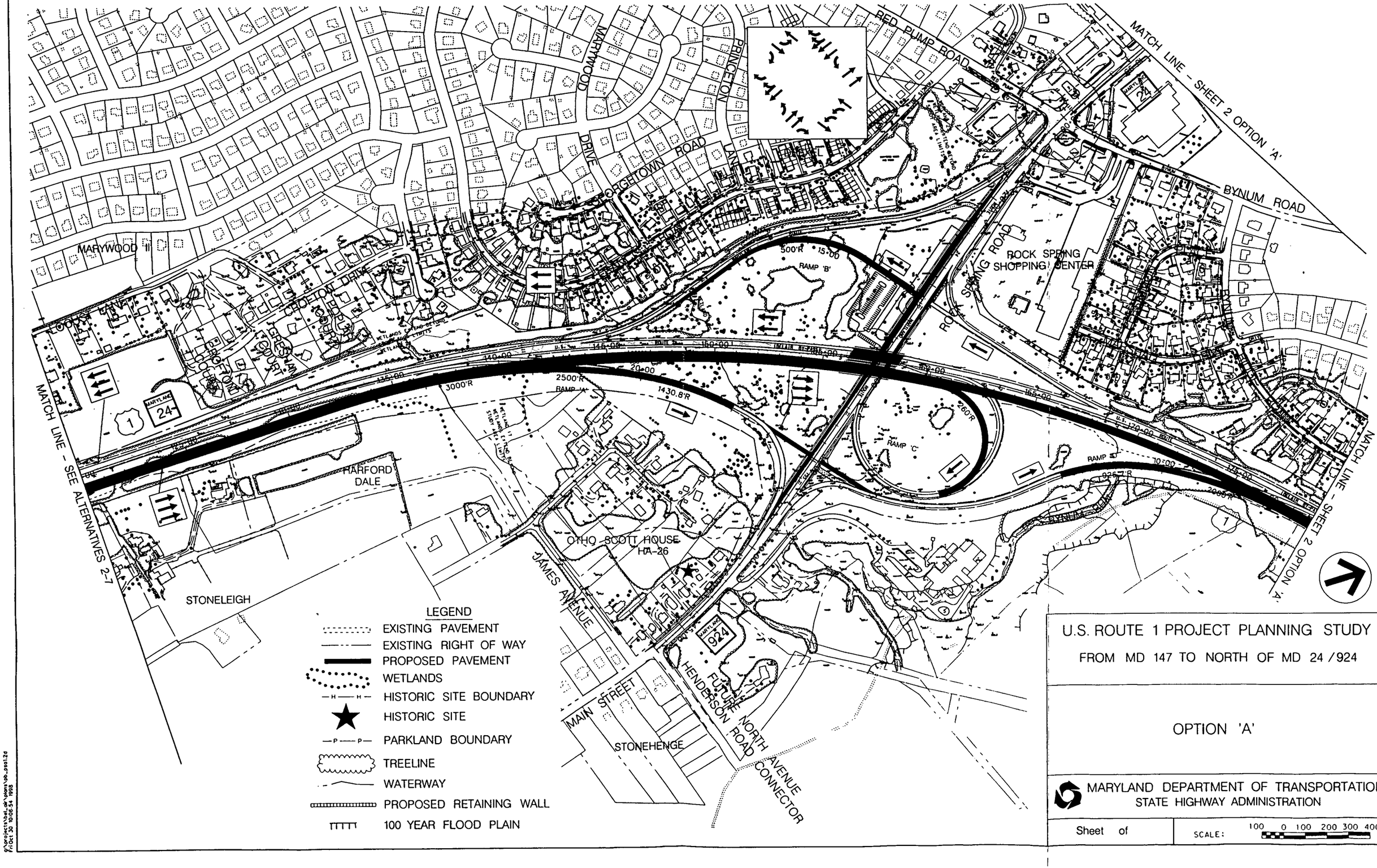

U.S. ROUTE 1 PROJECT PLANNING STUDY

FROM MD 147 TO NORTH OF MD 24 / 924

OPTION 'A'

MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

Sheet of

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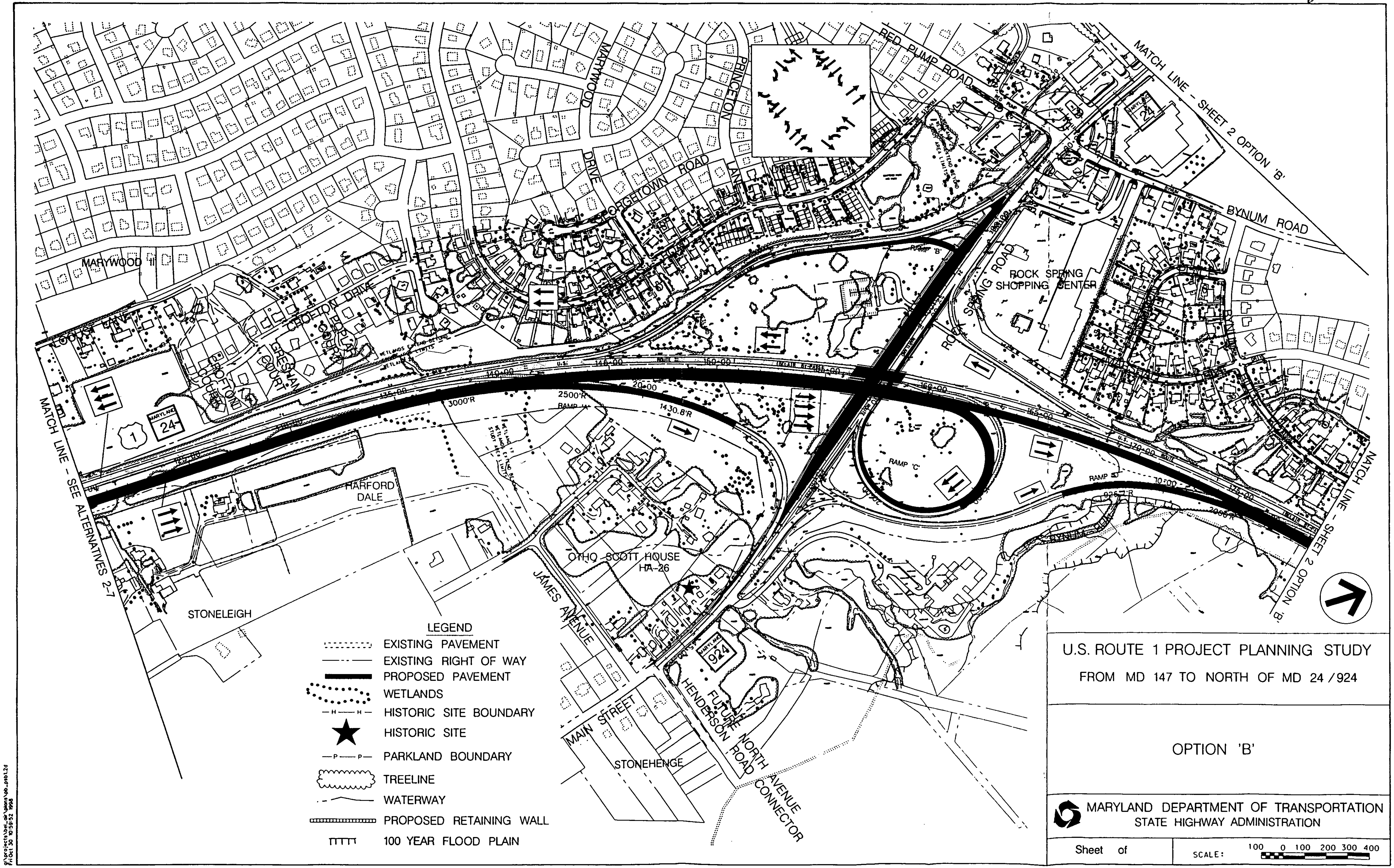

MATCH LINE - SHEET 2 OPTION 'B'
MATCH LINE - SEE ALTERNATIVES 2-7
RED PUMP ROAD
MARYWOOD DRIVE
PRINCETON LANE
GEORGETOWN ROAD
BYNUM ROAD
ROCK SPRING ROAD
ROCK SPRING SHOPPING CENTER
MARYWOOD II
CROFTON DRIVE
POPLAR COURT
GRESHAM COURT
CROFTON COURT
HARFORD DALE
STONELEIGH
OTHO SCOTT HOUSE HA-26
JAMES AVENUE
MAIN STREET
STONEHENGE
FUTURE HENDERSON ROAD
NORTH AVENUE CONNECTOR
RAMP 'B'
RAMP 'C'
RAMP 'A'
RAMP 'D'
LEGEND
EXISTING PAVEMENT
EXISTING RIGHT OF WAY
PROPOSED PAVEMENT
WETLANDS
HISTORIC SITE BOUNDARY
HISTORIC SITE
PARKLAND BOUNDARY
TREELINE
WATERWAY
PROPOSED RETAINING WALL
100 YEAR FLOOD PLAIN
U.S. ROUTE 1 PROJECT PLANNING STUDY
FROM MD 147 TO NORTH OF MD 24 / 924
OPTION 'B'
MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
Sheet of
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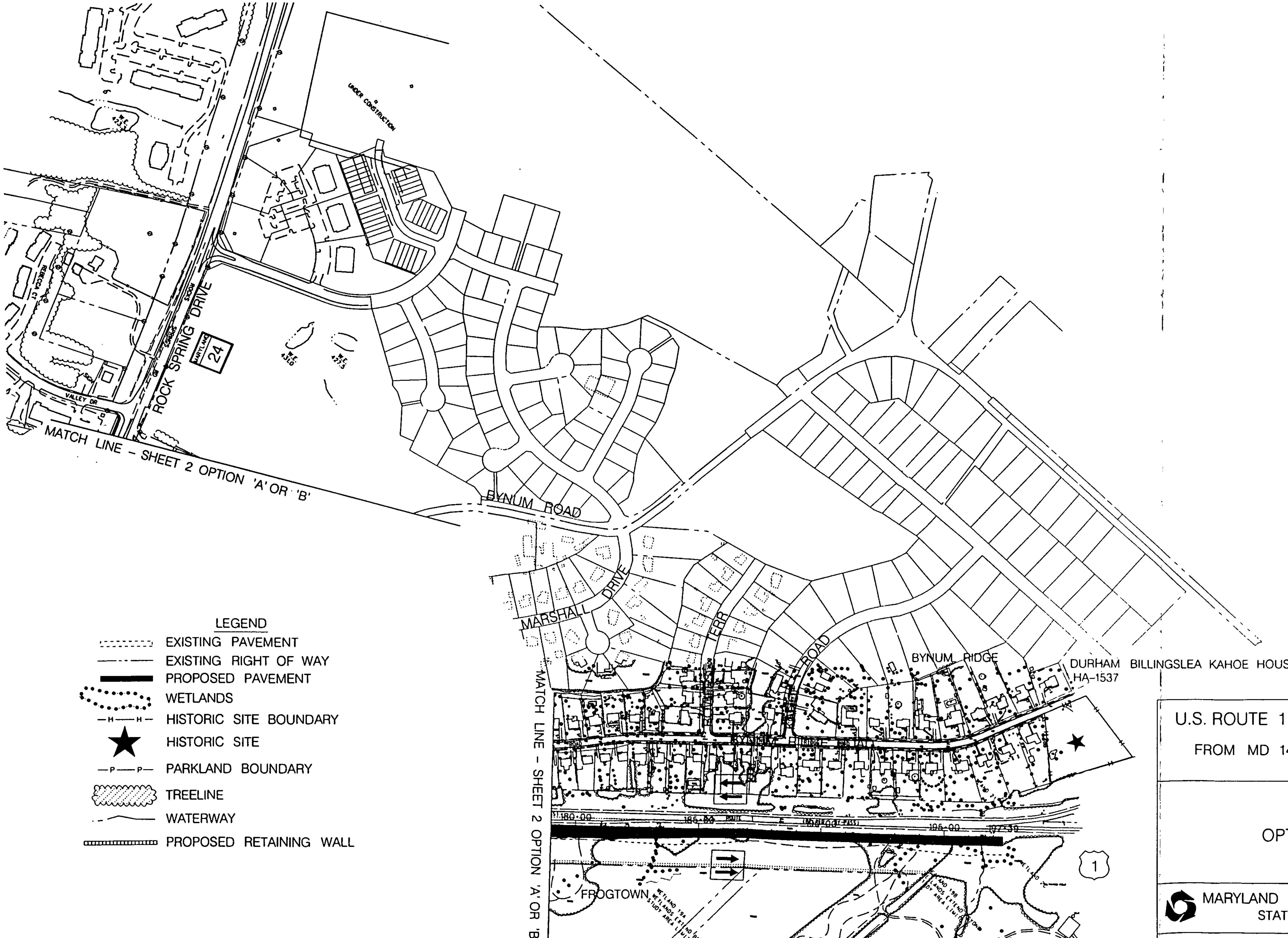

LEGEND

- EXISTING PAVEMENT
- EXISTING RIGHT OF WAY
- PROPOSED PAVEMENT
- WETLANDS
- —H—H— HISTORIC SITE BOUNDARY
- ★ HISTORIC SITE
- —P—P— PARKLAND BOUNDARY
- TREELINE
- WATERWAY
- PROPOSED RETAINING WALL

U.S. ROUTE 1 PROJECT PLANNING STUDY

FROM MD 147 TO NORTH OF MD 24 / 924

OPTION 'A' OR 'B'

MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

Sheet of

SCALE: 100 0 100 200 300 400

5.0 ENVIRONMENTAL CONSEQUENCES

5.1 Social

5.1.1 Displacements

The build alternates will not result in any residential or business displacements or relocations. Right-of-way acquisition will be required from three residential properties on Bynum Road at the north end of the study area. The total area to be acquired from these properties is 0.1 acres. These takes are narrow strips of frontage on house lots and should have a minimal effect to property owners. The homes are set approximately 35 - 50 feet away from the road.

The No-Build Alternate will not result in any residential or business displacements or relocations. Nor will it require the acquisition of any additional right-of-way.

5.1.2 Environmental Justice

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, religion, physical or mental handicap in all State Highway Administration program projects funded in whole or in part by the Federal Highway Administration. The State Highway Administration will not discriminate in highway planning, highway design, highway 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 in order 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 Office of Equal Opportunity of the Maryland State Highway Administration for investigation.

Based on the low percentages of minority and low income populations in the study area, as reflected in the income and race data taken from the 1990 census, there is no evidence that minority, elderly, or handicapped populations will be disproportionately affected by any of the build alternates being considered for the US 1 Bel Air Bypass.

5.1.3 Disruption of Neighborhoods and Communities

The US 1 Bel Air Bypass is an existing facility that traverses between established neighborhoods. The widening of the roadway will take place almost entirely within existing right-of-way. The right-of-way which is required from residential property in the study area will be strip right-of-way along the roadway and will not divide any neighborhoods. Therefore, no change in neighborhood cohesion will result. Adjacent communities will be affected, to some extent, by construction noise and fugitive dust and loss of some land within required right-of-way. The US 1 Bel Air Bypass does not currently have pedestrian and bicycle amenities and pedestrians and bicyclists are currently prohibited from using US 1. Therefore, no adverse effect to pedestrians or bicyclists are anticipated.

Traffic patterns for the area residents will be changed by all build alternates through the introduction of mainline medians. The addition of mainline median would not affect access because there are no points of access along the mainline except for the interchanges at MD 24 and MD 24/924. Improvements to the MD 24/924 interchange under Option B, which would result in a four-lane divided highway in the vicinity of the interchange, would change the traffic pattern in such a way that some vehicles may be required to execute U-turns to access points on the opposite side of the road. While there would be an initial adjustment to these changed traffic patterns, the long term benefits of improved traffic flow and reduced accident rates would outweigh any adverse impacts.

The No-Build Alternate does not address the need for additional capacity and as such will add to traffic congestion and the lengthening of peak hours, thereby worsening travel time and safety for local and through commuters to and from US 1. Additionally, commuters may seek alternate routes through residential neighborhoods in an effort to avoid delays.

5.1.4 Effects on Parks and Recreation Facilities

The No Build Alternate will not impact parks or recreational facilities in the study area. In addition, no parks or recreational facilities will be directly affected by the build alternates. Despite the proximity of the alignment to the Tollgate Landfill and other parklands south of the US 1/MD 24 interchange, all project work will occur within existing right-of-way. The MA and PA Heritage Trail will be constructed in such a way as to pass underneath of US 1. The trail will also parallel a portion of US 1 at the northern end of the study area and will cross under the roadway a second time. However, the second crossing occurs beyond the limits of the study area for this project.

5.1.5 Effects on Access to Community Services and Facilities

Access to community facilities in the study area would be generally improved because the roadway capacity of the US 1 Bel Air Bypass would be increased and delay decreased. Access on MD 24/924 would also be generally improved because of increased capacity and decreased delay. However, Option B introduces minor increases in travel distance because motorists are required to execute "U" turns at median breaks which are generally provided at every cross street or driveway into a major business establishment at a minimum spacing of 750 feet. The minor increase in travel distance would likely be offset by improvements to safety recognized by minimizing and controlling conflict points.

The positive impacts of the build alternates on accessibility to services and facilities include improved levels of service, decreased congestion, new turning lanes and a general improvement in the traffic operations of the US 1 Bel Air Bypass.

The selection of any alternate will not impede existing pedestrian mobility, and the use of a median will provide a refuge for crossing pedestrians. All build alternates will also provide for sidewalks along MD 24/924 to enhance pedestrian safety.

The No-Build Alternate does not address the existing or projected traffic congestion or safety problems along the US 1 Bel Air Bypass. As a result, peak hours would lengthen, access would become inhibited and commuters may seek alternate routes through neighborhoods in an effort to avoid delays.

5.1.6 Effects on Access for Emergency Vehicles

Response time may increase with any alternate that includes a median. However, this increase is expected to be offset by improved levels of service associated with dualization of US 1. The addition of lanes to increase the capacity of the roadway would allow traffic to flow more freely and provide more room for emergency vehicles to pass. The No-Build Alternate would not result in a divided highway with a median and, therefore, would not increase response time of emergency vehicles in that manner. However, by not adding lanes to increase the capacity of the roadway, traffic will move less freely and there will be less room for emergency vehicles to pass.

5.2 Economic Impacts

5.2.1 Effects on Local Business

The No-Build Alternate will not require the relocation or displacement of any businesses along the US 1 study corridor. However, this alternate will result in increased congestion, traffic conflicts, and increased travel time for customer access to and from local businesses. This may create a shift in travel demand to other roadways which could entice customers to patronize businesses located closer to those roadways instead of those within the study area.

Although Alternates 3, 4, and 5 do not require additional right-of-way, a small amount of commercial property from six businesses will be affected by Options A and B. Commercial right-of-way to be acquired for the project is a very narrow strip along the frontage of these businesses and totals 0.7 acres for both Options. Table 5-1 below shows the amount of land (in square feet) which will be taken from individual businesses. The acquisition of this right-of-way will present no adverse effect to the operation of these enterprises with the exception of a slight loss of available parking at two sites. The first site is the 7-11 convenience store located on Bynum Road near the Rock Spring Shopping Center. A total of two parking spaces (out of approximately a dozen spaces) could be lost from this lot. Due to the size of the lot, replacement would likely be difficult. The second site is North Park Center which is located at the corner of MD 924 and North Road near the Haford County Detention Center. A total of 32 parking spaces (out of 226 parking spaces) could be lost from this lot. On-site replacement of this parking is a possibility at North Park Center.

TABLE 5-1
AFFECTED COMMERCIAL BUSINESSES

Property/Business	Affected area (s.f.)
Rock Spring Center	16,120
Mobil Station	5,580
7-11	1,630
Shell Station/C-Mart	2,090
Brandon Sq.Medical Offices (future site)	620
North Park Center	4,880
Total	**30,920(0.7ac.)**

Source: *Parsons Brinckerhoff*

The benefits associated with all build alternates include the increase in mainline level of service inducing commuters to remain on US 1 rather than changing their traffic patterns and commercial activity. The proposed improvements to US 1 will relieve traffic congestion and conflicts, thus improving access to businesses and services throughout the project area, particularly to the established and developing commercial areas along US 1. The relief provided by the build alternates will allow improved access for local and connecting traffic transporting goods and services destined for Baltimore and Washington, or points north. Access to workplaces in and around the project area will also be improved.

5.2.2 Effects on Regional Business

The No-Build Alternate will not address the growing needs of the County, and, in particular, the study area. This alternate is anticipated to have a negative impact on the County's businesses, as additional traffic congestion and reduced safety will deter additional residential and business activity. Businesses attracted to the region will select locations where access is or will be available.

All build alternates provide relief to traffic congestion, improve mainline levels of service, address the growth needs of the County, and effect regional business activities in a positive way. These alternates will alleviate congestion on US 1 thereby reducing travel time to and from the study area business districts. They will also provide increased traffic capacity which will accommodate planned commercial growth.

5.2.3 Effects on the Tax Base

None of the build alternates require business displacements and only a small amount of strip right of way totalling 0.7 acres will be required for this project. Therefore, any immediate impacts on the local or regional tax base or economy will be minimal. The removal of strips of right of way will somewhat decrease the assessed value of the affected properties. The result of this will be a loss of approximately $6,500 in annual property taxes. This is extremely minimal when compared to the $121 million of revenue generated by property taxes in the County in 1996.

The No-Build Alternate would not impact the local or regional tax base.

5.3 Land Use Impacts

There are no anticipated changes in land use resulting from any of the alternates being considered. Should a build alternate be chosen, the roadway widening would take place entirely within existing right-of-way, except for the acquisition of several strips of new right-of-way in the vicinity of the intersection of US 1 and MD 24/924. As this project would be constructed in order to accommodate the already high peak-hour volumes of traffic along this segment of US 1, no changes to existing land uses are anticipated.

Future land use plans are not expected to change as a direct result of this project. As this portion of US 1 is included within Harford County's Development Envelope, planned changes in land use may still occur in the vicinity of the project. These changes are expected to be consistent with the Harford County master plan and are not dependent upon this project.

The Smart Growth Areas Act went into effect in October, 1997. The intent of this legislation is to direct state funding for growth-related projects to areas designated by local jurisdictions as Priority Funding Areas (PFA's). PFA's are existing communities and other locally designated areas as determined by local jurisdictions in accordance with "smart growth" guidelines. The Act is intended to direct development to existing towns, neighborhoods, and business areas by directing State infrastructure improvements to those places.

PFA boundaries for Harford County have been submitted and are being reviewed in response to comments from the Maryland Office of Planning. Once finalized, a determination will be made regarding how this project will be affected.

5.4 Effects on Historic and Archaeological Resources

None of the alternates associated with this project will have impacts on significant standing historic structures in this project's area of potential effect (APE). The proposed roadway widening will take place almost entirely within existing right-of way. Where construction will occur outside of existng right-of-way, no National Register or National Register eligible resources will be impacted.

Phase I/II archaeological investigation recorded no National Register eligible archaeological sites in the project's APE, and therefore indicated that none of the alternates associated with the project would impact significant archaeological resources. Based on these findings, the SHA requested the concurrence of the Maryland Historical Trust (MHT) in a determination of no effect.

The MHT concurred with this determination on January 3, 1997 and again on March 3, 1998 (see coordination from SHA dated November 8, 1996 and February 20, 1998 in Chapter 6.0).

5.5 Natural Environment

5.5.1 Effects on Geology, Topography, Soils, and Climate

The effects on geology, topography, soils, and climate of the study area by proposed improvements to US 1 would be minimal. The No-build Alternate will not have any adverse effects on the geology, topography, soils, or climate of the area. Some cutting and filling would be required by all build alternates to construct new road bed and/or widen the existing road way. The effects upon the geology and climate of the study area would be insubstantial. Several streams within the study area would require crossings involving culvert extensions or new span construction. Such crossings would alter the topography of the existing study area minimally and be typical of those normally encountered during highway operations. All build alternates involve adding a second roadway parallel to the existing US 1, therefore a comparison of the alternates/options impacts to topography would not reveal meaningful data. The most significant impacts to topography would occur in the vicinity of the southern US 1/MD 24 interchange. US 1 northbound will be constructed adjacent to existing US 1. For the most part, this area has already been graded. Significant grading will be required for ramps A, B, C, and D of the US 1/MD 24 interchange for each alternate.

Prime farmland soils impacted by the project are within existing right-of-way and are therefore not lands protected by the Farmland Protection Policy Act of 1981.

5.5.2 Water Resources

Surface Water - Surface water impacts for this project would result from the bridging and culverting of streams. Stream bottom habitat would be lost in construction. Changes in velocity would occur with the straightening of channels, resulting in potential impacts on erosion and sedimentation rates. A Soil Erosion and Sedimentation Control Plan, approved by the Harford County Conservation District, will be implemented to reduce possiible effects. Water quality may be affected by the introduction of additional roadway to the area. There will be no stream relocation as a result of the build alternates. Retaining walls would be used to avoid stream relocation at Heavenly Waters Run

Potential impacts to perennial streams are shown on Table 5-2. Each of the three build alternates would involve bridging Winters Run and adding or extending culverts for Heavenly Waters Run and its tributaries. Both Options A and B would involve only minor construction in the vicinity of Bynum Run, having no permanent impacts to the stream. Alternate 3 (in combination with either Option A or B) would have the least impact on surface waters, while Alternate 4 (with either Option) would have the largest impact on surface waters.

TABLE 5-4
PERRENIAL STREAM IMPACTS SUMMARY TABLE

	Winters Run	Heavenly Waters Run	Tributary to Heavenly Waters Run (at Route 24 Interchange)	Tributary to Heavenly Waters Run (south of Vale Road)	Bynum Run
Alternate 3 w/ Option A or B	1 bridge crossing over approx. 30 feet of stream	No Significant Impact	1 culvert of approx. 100 feet	1 culvert extension of approx. 20 feet	No Significant Impact
Alternate 4 w/ Option A or B	1 bridge crossing over approx. 30 feet of stream	1 culvert extension of approx. 50 feet	1 culvert of approx. 200 feet	1 culvert extension of approx. 20 feet	No Significant Impact
Alternate 5 w/ Option A or B	1 bridge crossing over approx. 30 feet of stream	1 culvert extension of approx. 50 feet	1 culvert of approx. 150 feet	1 culvert extension of approx. 20 feet	No Significant Impact

Source: *State Highway Administration, 1997*

Waterway Construction permits for this project have been applied for but not yet issued. Any construction in waterways would comply with Best Management Practices specified in those permits. This project will also comply with the Maryland Department of the Environment's (MDE) Stormwater Management Guidelines.

Water quality impacts from the project are also related to the amount of impervious cover, and consequently the oils, grease, and road salt washing from the proposed roadway as well as the runoff temperature. Since all of the build altenates will result in a four-lane highway, there will be only slight variances in the amount of impervious cover, though they will result in significantly more than the No-Build Alternate. In general, the effects of pollutant and temperature impacts are greatest in the headwaters of a stream, where the drainage area is small compared to the

road surface area. This situation may already occur in the tributaries to Heavenly Waters Run, since their drainage areas are both under 100 acres. The discharge of pollutants and the temperature increase of runoff can be controlled through the use of stormwater management practices. Stormwater Basins or special construction materials which promote infiltration have been very effective in providing a high level of pollutant removal and for controlling runoff temperature.

No bridging or culverting of streams; no construction; no straightening of channels; and no increase in impervious surfaces will occur under the No-Build Alternate. Therefore this alternate will have no impact on surface water quality beyond that of higher amounts of pollutants in runoff associated with higher volumes of traffic.

Groundwater - The No-Build Alternate will not result in any impacts to groundwater resources or groundwater quality within the study area.

Potential groundwater impacts from the project may include adverse effects upon groundwater recharge, availability (well yield), and water quality. However, preliminary studies indicate that none of the build alternates appear to pose a substantial threat to groundwater resources. The following is a discussion of groundwater values and potential concerns for roadway design and construction and is the same for each of the build alternates.

The primary source of recharge for most aquifers is infiltration of precipitation. In general, construction activities may affect this process by reducing the area available for infiltration and/or increasing run-off. However, construction of this project will have very little to no effect on the recharge of groundwater, because the additional impervious area to be created is small in comparison to the total watershed area contributing to recharge (approximately 17,830 acres).

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. Static groundwater elevation data in the vicinity of the road varies from 1 foot to 60 feet (Nutter and Smigaj, 1975). A comparison of the proposed road inverts to the current topography suggests that there are several places where road cuts in excess of 5 feet will be made. This will be safe in most parts, however based on records and visual inspection of the site, at least 67 homes with private wells within 2,000 feet of the road could potentially be affected. It is recommended that these home wells be field located, and the elevation of the water table relative to the road invert be studied and understood before the road design is completed. In the event of any uncertainty

about the effects of the construction on any well, geotechnical and hydrogeologic studies should be performed to quantify those effects before the construction phase of the project.

Groundwater quality can be impaired by contaminants in run-off from roadways. Pollutants can be channeled to groundwater by the same mechanisms that result in recharge. The entire road will be located in the Baltimore Gabbro of the Piedmont, which contains fractures. It is recommended that stormwater run-off management ponds be used to collect and treat runoff from the roadway to minimize groundwater pollution from roadway contamination.

5.5.3 Floodplains

The 100 year floodplains were delineated for the two major stream crossings using Federal Emergency Management Administration (FEMA) floodplain mapping. Streams documented with FEMA mapping include Winters Run, at the south end of the project, and Bynum Run, at the north. Alternates 3, 4, and 5 all propose equivalent floodplain impacts associated with Winters Run (approximately 2.6 acres). Options A and B would have no impacts to the floodplains of Bynum Run. The No-Build Alternate would have no impacts to either the Winters Run or Bynum Run 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.

Transverse crossings, such as this project would incur, are considered to have a significant effect on floodplain values if one of the following is involved:

1. If there is a significant effect on the natural and beneficial floodplain values in the area: This would entail effects on natural moderation of floods, groundwater recharge, maintenance of water quality, and fish and plant maintenance. These have to do with the aerial extent of the crossing and the volume of roadway fill in the floodplain. For this project, the area of impervious road surfaces, and the change in capacity resulting from cut and fills associated with the Winters Run floodplain crossing is not significant compared to the aerial extent of the watershed and the total storage capacity of the floodplain.

2. If there is an increased risk associated with flooding, such as property loss or threat to human life: The filling in or increasing of the capacity of a floodplain must be done with a

thorough understanding of the hydrology of the system to insure against flood risk. This is achieved by conducting a detailed and thorough hydrologic study of the floodplain to identify the extent of filling to be conducted and determine the impact of the loss of conveyance and/or storage capacity and their effects on the flood flows. Flooding can also cause damage to existing road crossings, residential and commercial properties. There are two areas along the alignment of the road where the construction of the road crossing could impact the floodplain, and subsequently adjacent properties and/or facilities. The Winters Run crossing is immediately upstream of the Atkisson Reservoir (shown on Figure 1-2), and the effects of construction may result in reduced and/or increased downstream discharges, thereby effecting the use of the reservoir. Since construction will not impact the Bynum Run floodplain, downstream discharges for this waterway will not be affected.

3. If there is a significant potential for the interruption or termination of community's sole evacuation route: Due to the high level of development and the geographic setting of the region, there is no sole evacuation route. Therefore, this item is not relevant to the project.

In designing stream crossings, all possible measures must 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/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 of impacts, and preserving the hydraulic characteristics of the stream.

Since the existing crossing of Winters Run encroaches on the floodplain, the hydraulic characteristics of this waterway have already been impacted. A proposed downstream crossing design for this location should focus on minimizing additional encroachment to the floodplain. It should also provide for hydraulic characteristics which are compatible with the existing structure.

5.5.4 Effects on Hazardous Materials/Waste Sites

Alternates 3, 4, and 5 and the No-Build Alternate will not impact any known hazardous materials/waste sites. Options A and B each require right-of-way acquisition from two service stations considered to be potential hazardous materials/waste sites. 2,090 square feet of strip right-of-way along MD 24 will be taken from the Shell Service Station located in the northeast corner of the intersection of MD 24 (Rock Spring Road) and Bynum Run Road. 4,880 square feet

of right-of-way along MD 24 and 700 square feet along Bynum Run Road will be acquired from the Mobil Service Station located on the southeast corner of the same intersection. A field investigation was conducted to determine the locations of the underground storage tanks (UST's) at these sites and it was determined that the required acquisitions will not effect the UST's in any way.

5.6 Ecological Conditions

5.6.1 Wetlands

All impacts to wetlands would occur within palustrine nontidal areas. Detailed descriptions of each potentially impacted wetland were previously provided in section 3.6.1 of this report. Approximate wetland acreages (including permanent and temporary impacts), affected by the project alternates are given in Table 5-3. There are slight impacts resulting from culvert extensions however, most of the impacts are a result of fill slopes. Side slopes have been reduced to 2:1 to minimize wetland impacts. Combined with either Option, Alternate 3 would have the least impact on wetlands (1.67 acres), whereas Alternate 4, combined with Option A or B, would have the greatest impact on wetlands (1.90 acres). Alternate 5, in conjunction with either Options A or B, would impact 1.76 acres of wetlands. Options A and B incur identical wetland impacts of 0.72 acres each.

TABLE 5-3
WETLAND IMPACT SUMMARY TABLE

	Alternate	Option A or B	Total
Alternate 3	0.95 acres	0.72 acres	**1.67 acres**
Alternate 4	1.18 acres	0.72 acres	**1.90 acres**
Alternate 5	1.04 acres	0.72 acres	**1.76 acres**

Source: *State Highway Administration, 1997*

By implementing either of 22-foot median options for the segment of US 1 from south of Winters Run to the MD 24 interchange, wetland impacts would decrease slightly for Alternates 3, 4, and 5. Reducing the median size to 22-feet would result in wetland impacts of 0.25 acres for Alternate 3, 0.42 acres for Alternate 4, and 0.32 acres for Alternate 5. Using a 22-foot median as

well as a bifurcated roadway would result in wetland impacts of 0.08 acres for Alternate 3, 0.11 acres for Alternate 4, and 0.13 acres for Alternate 5.

Table 5-4 graphically represents the wetlands that would be impacted by each alternate/option combination. Alternate 3, combined with Option A or B, would impact (either permanently or temporarily) the following wetland communities: 6A, Heavenly Waters Run (6B-12D), 16/25/26, 17/24 and 19A. Alternate 4, with either option, would impact the following wetland communities: 6A, Heavenly Waters Run, 13, 15, 16/25/26, 17/24 and 19A. Alternate 5, with either option, would impact the following wetland communities: 6A, Heavenly Waters Run, 13, and 16/25/26, 17/24 and 19A.

TABLE 5-4
ALTERNATE/OPTION IMPACTED WETLANDS TABLE

Alternate/ Options	6A	Heavenly Waters Run (6B-12D)	13	15	16/ 25/26	17/ 24	18	19A	23	27	28
Alternate 3 w/ Option A or B	YES	YES	NO	NO	YES	YES	NO	YES	NO	NO	NO
Alternate 4 w/ Option A or B	YES	YES	YES	YES	YES	YES	NO	YES	NO	NO	NO
Alternate 5 w/ Option A or B	YES	YES	YES	NO	YES	YES	NO	YES	NO	NO	NO

Source: State Highway Administration, 1997

Avoidance and minimization of wetland impacts could be accomplished by alignment shifts, bridging, retaining walls, or other design options. The two 22-foot median options (discussed in Section 4.4.5) are examples of design options which would minimize wetland impacts.

The process of determining potential wetland mitigation sites is currently underway. Several sites have already been located in the Bynum Run watershed and more are expected to be located in the Winters Run watershed.

5.6.2 Wildlife, Terrestrial and Aquatic Habitats

Wildlife - The most substantial impact on wildlife within the study area would be the removal and alteration of vegetative habitat. This would have the greatest continuing effect on the area's

wildlife. However, the initial impact due to construction may have the largest overall impact on wildlife. Impacts would result in an increase of certain species which easily adapt to man-dominated habitat and a decrease of species that are sensitive to the activities of man.

The No-Build Alternate will not have any impacts on the wildlife of the study area. All of the build alternates involve the construction of additional roadway and, therefore, would result in both construction impact as well as long-term impacts from the removal of vegetative habitat. The impacts associated with the removal of habitat are quantified in the following section, Terrestrial Habitat.

Terrestrial Habitat - Impacts to habitat types might involve permanent loss of habitat type, via conversion to man-dominated land-use, or temporary construction impacts. Lost habitat would be replaced by road surface and associated permanently maintained landscaping. The No-Build Alternate will not have any impact on the terrestrial habitat of the study area. However, each of the build alternates will result in the conversion of some forest, wetland, scrub-shrub, and old field habitat to man dominated habitat. Table 5-5 shows the amount of each type of habitat affected by each combination of alternates and options.

A combination of Alternate 3 and Option B would have the largest impact, converting 23.95 acres of terrestrial habitat to man-dominated land. The combination of Alternate 5 and Option A would have the smallest impact on terrestrial habitats within the study area with 19.30 acres being converted to man-dominated land.

TABLE 5-5
TERRESTRIAL HABITAT IMPACT AREA SUMMARY TABLE

	Habitat Type	Alternate Only	Option A	Option B	Alt. w/ Option A	Alt. W/ Option B
Alternate 3	Forest	11.31 ac.	3.34 ac.	3.52 ac.	14.65 ac.	14.83 ac.
	Wetland	0.95 ac.	0.72 ac.	0.72 ac.	1.67 ac.	1.67 ac.
	Scrub-Shrub	0.78 ac.	4.02 ac.	5.25 ac.	4.80 ac.	6.03 ac.
	Old Field	0	1.06 ac.	1.42 ac.	1.06 ac.	1.42 ac.
	Total	13.04 ac.	9.14 ac.	10.91 ac.	**22.18 ac.**	**23.95 ac.**
Alternate 4	Forest	11.02 ac.	3.34 ac.	3.52 ac.	14.36 ac.	14.52 ac.
	Wetland	1.18 ac.	0.72 ac.	0.72 ac.	1.90 ac.	1.90 ac.
	Scrub-Shrub	0.78 ac.	4.02 ac.	5.25 ac.	4.80 ac.	6.03 ac.
	Old Field	0	1.06 ac.	1.42 ac.	1.06 ac.	1.42 ac.
	Total	12.98 ac.	9.14 ac.	10.91 ac.	**22.12 ac.**	**23.89 ac.**
Alternate 5	Forest	8.34 ac.	3.34 ac.	3.52 ac.	11.68 ac.	11.86 ac.
	Wetland	1.04 ac.	0.72 ac.	0.72 ac.	1.76 ac.	1.76 ac.
	Scrub-Shrub	0.78 ac.	4.02 ac.	5.25 ac.	4.80 ac.	6.03 ac.
	Old Field	0	1.06 ac.	1.42 ac.	1.06 ac.	1.42 ac.
	Total	10.16 ac.	9.14 ac.	10.91 ac.	**19.30 ac.**	**21.07 ac.**

Source: State Highway Administration, 1997

Aquatic Habitat - Impacts to aquatic habitat will occur when streams in the study area are affected by the project. Erosion, sedimentation, loss of stream bottom, loss of stream length, and changes in water velocity and water temperature, could all cause a degradation of the macroinvertebrate and fish populations in the study area. The No-Build Alternate will not impact aquatic habitat in the study area. All of the build alternate impact streams to some extent (see section 5.5.2) and, therefore potentially impact aquatic habitat as well. As was shown previously in Table 5-2, Alternate 4, in combination with either Option A or B, will have the largest degree of impact to streams in the study area. Alternate 3, in combination with either Option A or B, will impact study area streams the least.

5.6.3 Rare, Threatened and Endangered Species

According to the USFWS there are no known threatened, endangered, or rare species presently inhabiting the study area. However, according to the USFWS the Bog turtle may be present in certain wetlands within the project area. Data on the bog turtle habitat suitability of wetlands within the study area was provided on Table 3-15. That table indicated that wetlands 12C, 16, and 25 have a moderate potential to provide bog turtle habitat. In addition, Table 5-4, above, provides data on the wetlands that would be impacted by each alternate/option. All of the alternate/option combinations have the potential to directly, or indirectly, impact these wetlands. The No-Build Alternate will not have any impacts on rare, threatened, and endangered species in the study area.

Potential impacts to bog turtle habitat can be minimized by using appropriate sediment and erosion control measures. Avoidance of activities that alter the hydrology or vegetation of these wetlands is recommended. Additionally, the survey of wetlands which potentially represent critical habitat could be undertaken to determine if bog turtles exist in these wetlands within the study corridor.

5.7 Noise Impacts

5.7.1 FHWA Noise Abatement Criteria and SHA Noise Policy

Noise abatement criteria for various land uses have been established by the Federal Highway Administration (FHWA) in 23 CFR, Part 772. The noise abatement criterion for land uses occurring in this project study area, (Category B), is 67 dB(A) Leq (see Table 5-6). 2020 noise levels for the project area were predicted using the Federal Highway Administration traffic noise Prediction Model (FHWA-RD-77-108). The Stamina 2.0/Optima barrier Cost Reduction Procedure version of the model was used.

TABLE 5-6
FHWA NOISE ABATEMENT CRITERIA

Activity Category	Description of Activity Category	Leq(h)
A	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.	57 (Exterior)
B	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.	67 (Exterior)
C	Developed lands, properties, or activities not included in Categories A or B above.	72 (Exterior)
D	Undeveloped lands.	N/A
E	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals and auditoriums.	52 (Interior)

N/A = No standard for this Activity Category, therefore not applicable.

Source: *Code of Federal Regulations, Title 23, Part 772.*

According to the procedures described in 23 CFR, Part 772, noise impacts occur when predicted traffic noise levels for the design year approach or exceed the noise abatement criterion prescribed for a particular land use category, or when the predicted noise levels are substantially higher than the existing ambient noise levels. The Maryland State Highway Administration and FHWA define approach as 66 dB(A) and uses a 10 dB(A) increase to define a substantial increase. This analysis was completed in accordance with federal procedures and evaluated with State Highway Administration's Noise Policy dated May 11, 1998.

Under the current SHA Noise Policy, several factors are evaluated to determine whether noise abatement is feasible and reasonable.

According to the SHA Noise Policy, feasibility deals with engineering, acoustical and physical considerations such as:

- Can a noise reduction of at least 3 dB(A) be achieved at the location(s) warranting abatement? The noise reduction goal for receptors with the highest levels (first row receivers is 7 - 10 decibels.
- Will placement of a noise wall/barrier restrict access to vehicular or pedestrian travel?
- Will construction of a noise wall result in any utility impacts?

- Will construction of a noise wall have an impact upon existing drainage?
- Will impacts occur to Section 4(f) properties?
- Are there other non-highway noise sources in the area that would reduce the effectiveness of a noise barrier?

Reasonableness is based on a number of factors, including:

- Acceptability of proposed abatement to the impacted and benefited residences?
- A 3 dB(A) or greater change in design year build noise levels over design year no-build noise levels will result from the proposed highway improvements.
  or
  If the cumulative increase in design year build noise levels at noise sensitive receivers that existed when prior improvements were made is equal to or greater than 3 decibels, then noise abatement could be considered reasonable.
- Costs do not exceed $50,000 per benefited residence.
- The relative size and appearance (aesthetics) of the proposed noise barrier to the receptors protected.
- The control of new noise sensitive development adjacent to state highways in high noise zones at the local level.
- Special circumstances, such as historical significance and/or cultural value.

An effective barrier should, in general, extend in both directions to four times the distance between the receiver and the roadway (source). In addition, an effective barrier should provide a 7-10 dB(A) reduction in the noise level as a preliminary design goal for "first row" residences. However, any impacted noise receptor which will receive a 3 dB(A) or greater reduction is considered when determining the cost reasonableness of a barrier. SHA will also include all receptors that are not impacted but will receive a 5 dB(A) or greater reduction from a noise barrier.

Cost effectiveness is determined by dividing the total number of impacted receptors in a specified noise sensitive area that will receive a 3 dB(A) or greater reduction of noise levels and the non-impacted receptors receiving a 5 dB(A) or greater reduction, into the total cost of the noise

mitigation. A total cost of $16.54 per square foot is assumed to estimate total barrier cost. This cost figure is based upon current costs of panels, footings, drainage, landscaping, and overhead. The State Highway Administration has established $50,000 per residence protected as being the maximum cost for a barrier to be considered reasonable.

5.7.2 Noise Prediction Methodology and Results

The procedure used to predict future noise levels in this study was the Noise Barrier Cost Reduction (BCR) Procedure, STAMINA 2.0 and OPTIMA (revised March, 1983). The BCR procedure is based upon the FHWA Highway Traffic Noise Prediction Model (FHWA-RD-77-108). The BCR traffic noise prediction model uses the number and type of vehicles on the planned roadway; their speeds; the physical characteristics of the road (curves, hills, depressed, elevated, etc.); receptor location and height; and, if applicable, barrier type, barrier ground elevation, and barrier top elevation.

Maximum noise level generally occurs when traffic volume reaches Level-of-Service (LOS) C. LOS C volume, along with a vehicle speed of 50 MPH (which represented the average LOS C traffic flow condition on the US 1 Bel Air Bypass), was used for predicting the future No-Build and build noise levels for the project corridor. Because the roadway configuration is the same for the existing and No-Build scenarios, the noise levels for these two conditions are identical. The noise prediction results are shown below in Table 5-7.

TABLE 5-7
SUMMARY OF NOISE IMPACT MODELING RESULTS

Noise Sensitive Area	Noise Modeling Site	Existing and No-Build	Alt. 3	Alt. 4	Alt. 5	Option A	Option B	Difference between Build and No-Build Levels
A	1	60	65	65	65	N/A	N/A	5
B	2	57	61	61	61	N/A	N/A	4
C	3	63	66	66	66	N/A	N/A	3
D	4	64	70	76	75	N/A	N/A	6,12,11
	5	60	65	65	65	N/A	N/A	5
E	6	69	N/A	N/A	N/A	72	72	3
	8	68	N/A	N/A	N/A	72	72	4
	9	69	N/A	N/A	N/A	73	72	4,3
	11	66	N/A	N/A	N/A	70	70	4
F	7	63	N/A	N/A	N/A	70	70	7
	10	66	N/A	N/A	N/A	69	69	3
	12	73	N/A	N/A	N/A	79	79	6
G	13	67	N/A	N/A	N/A	70	70	3
	15	59	N/A	N/A	N/A	62	62	3
H	14	61	N/A	N/A	N/A	64	64	3

All values are in Leq (1-hour A-weighted equivalent noise level) in dB(A)

5.7.3 Impact Analysis and Feasibility of Noise Mitigation

Fifteen receptor sites represented the eight Noise Sensitive Areas (NSA's) which were identified by the SHA. The worst-case noise levels for the sensitive receptors adjacent to the proposed roadway improvements were analyzed to determine the noise impact. Detailed descriptions of the modeling results for each NSA are available in the *Technical Noise Analysis Report - US 1 Bypass: MD 147 to North of MD 24/924, Harford County.* The following is a summary of those results.

The eight NSA's were identified with the letters A - H (see Figure 3-10). Noise impacts occurred at five of the eight NSAs including C, D, E, F, and G. At NSAs A, B, and H, noise levels were not sufficient to approach or exceed the FHWA NAC; nor were they sufficient to be considered a substantial increase in the State of Maryland.

Of the eight NSA's, all had results that were identical for each alternate/option combination, with the exception of NSA D. NSA D is not located close enough to the MD 24/924 interchange to experience noise impacts from Option A or B, therefore, the results only vary between Alternates 3, 4, and 5. Alternate 3 would have noise impacts on 26 residences in NSA D while Alternates 4 and 5 would have impacts on 31 and 29 residences, respectively.

NSA D was also the only area to incur substantial increases (10 dB(A) or more) in noise levels. For Alternate 4, 7 of the 31 impacted residences would have substantial increases and for Alternate 5, 5 of the 29 impacted residences would have substantial increases.

The need for consideration of mitigation measures was identified based upon comparisons with the FHWA Noise Abatement Criteria and guidelines provided by SHA. Evaluation methods for minimizing noise impacts were warranted in those areas where noise levels from the roadway would not comply with the NAC, or where noise levels would substantially increase over existing ambient noise levels.

The most common type of designed mitigation is the construction of physical barriers, typically in the form of earth berms or noise walls, between the roadway (noise source) and the receiver locations. For this project, other types of noise mitigation, such as highway alignment selection and traffic management, were deemed inappropriate. Therefore, only an analysis of physical barriers was conducted, and due to the limited right-of-way along the corridor, the earth berm option was not considered feasible and was not analyzed. Noise abatement wall alternates outside the right-of-way and/or outside the project limits were also not analyzed. All proposed wall alternates were placed within the legal right-of-way line. Other factors such as safety, community aesthetics and cohesion, visual impact of the control measure, engineering constraints on height, and drainage considerations were also considered. A detailed description of the noise barrier analysis can be found in the *Technical Noise Analysis Report - US 1 Bypass: MD 147 to North of MD 24/924, Harford County.* The following is a summary of the results.

Noise barrier analysis was conducted for NSAs D, E, F, and G. Because noise impacts for NSA D varied by alternate, the barrier analysis was conducted separately for each alternate. Feasibility and reasonableness were determined according to specific criteria listed in the above mentioned technical noise report. These criteria are also shown by Noise Sensitive Area in Tables 5-8, 5-9, 5-10, 5-11. Table 5-12 shows the number of residences which would benefit form these noise barriers.

TABLE 5-8
NOISE ABATEMENT TABLE – NSA D

	Feasibility Criteria	Yes	No
1.	Noise levels can be reduced by 7 dBA or more at impacted receptors	X	
2.	Placement of a barrier will restrict pedestrian or vehicular access		X
3.	Construction of a barrier will cause safety or maintenance problems		X
4.	Noise barrier can be constructed given topography, drainage, utilities, etc.	X	
5.	Noise barrier will have significant adverse impact on Section 4(f) resource		X
6.	There are non-highway noise sources that would reduce barrier effectiveness		X
	Reasonableness Criteria		
1.	Majority of impacted receptors will receive a 7 dBA or greater noise reduction	X	
2.	75% or more of impacted and benefited residents approve of the proposed noise abatement	N/A	
3.	A 3 dBA or greater change in design year build noise levels over design year no-build noise levels is expected to result from the proposed action, or the cumulative effects of highway improvements in the design year build noise levels at receptors that existed when prior improvements were made is equal to or greater than 3 dBA	X	
3a.	Noise levels equal or exceed 72 dBA at impacted receptors	X	
4.	Noise barriers will have significant negative visual impact at impacted receptors		X
5.	The cost of noise abatement is equal to or less than $50,000 per residence, impacted and benefited	X	
6.	There are special circumstances, i.e., historical/cultural significance at this NSA	X	

TABLE 5-9
NOISE ABATEMENT TABLE – NSA E

	Feasibility Criteria	Yes	No
1.	Noise levels can be reduced by 7 dBA or more at impacted receptors	X	
2.	Placement of a barrier will restrict pedestrian or vehicular access		X
3.	Construction of a barrier will cause safety or maintenance problems		X
4.	Noise barrier can be constructed given topography, drainage, utilities, etc.	X	
5.	Noise barrier will have significant adverse impact on Section 4(f) resource		X
6.	There are non-highway noise sources that would reduce barrier effectiveness		X
	Reasonableness Criteria		
1.	Majority of impacted receptors will receive a 7 dBA or greater noise reduction	X	
2.	75% or more of impacted and benefited residents approve of the proposed noise abatement	N/A	
3.	A 3 dBA or greater change in design year build noise levels over design year no-build noise levels is expected to result from the proposed action, or the cumulative effects of highway improvements in the design year build noise levels at receptors that existed when prior improvements were made is equal to or greater than 3 dBA	X	
3a.	Noise levels equal or exceed 72 dBA at impacted receptors	X	
4.	Noise barriers will have significant negative visual impact at impacted receptors		X
5.	The cost of noise abatement is equal to or less than $50,000 per residence, impacted and benefited	X	
6.	There are special circumstances, i.e., historical/cultural significance at this NSA		X

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TABLE 5-10
NOISE ABATEMENT TABLE - NSA F

	Feasibility Criteria	Yes	No
1.	Noise levels can be reduced by 7 dBA or more at impacted receptors	X	
2.	Placement of a barrier will restrict pedestrian or vehicular access		X
3.	Construction of a barrier will cause safety or maintenance problems		X
4.	Noise barrier can be constructed given topography, drainage, utilities, etc.	X	
5.	Noise barrier will have significant adverse impact on Section 4(f) resource		X
6.	There are non-highway noise sources that would reduce barrier effectiveness		X
	Reasonableness Criteria		
1.	Majority of impacted receptors will receive a 7 dBA or greater noise reduction	X	
2.	75% or more of impacted and benefited residents approve of the proposed noise abatement	N/A	
3.	A 3 dBA or greater change in design year build noise levels over design year no-build noise levels is expected to result from the proposed action, or the cumulative effects of highway improvements in the design year build noise levels at receptors that existed when prior improvements were made is equal to or greater than 3 dBA	X	
3a.	Noise levels equal or exceed 72 dBA at impacted receptors	X	
4.	Noise barriers will have significant negative visual impact at impacted receptors		X
5.	The cost of noise abatement is equal to or less than $50,000 per residence, impacted and benefited		X
6.	There are special circumstances, i.e., historical/cultural significance at this NSA		X

TABLE 5-11
NOISE ABATEMENT TABLE - NSA G

	Feasibility Criteria	Yes	No
1.	Noise levels can be reduced by 7 dBA or more at impacted receptors	X	
2.	Placement of a barrier will restrict pedestrian or vehicular access		X
3.	Construction of a barrier will cause safety or maintenance problems		X
4.	Noise barrier can be constructed given topography, drainage, utilities, etc.	X	
5.	Noise barrier will have significant adverse impact on Section 4(f) resource		X
6.	There are non-highway noise sources that would reduce barrier effectiveness		X
	Reasonableness Criteria		
1.	Majority of impacted receptors will receive a 7 dBA or greater noise reduction	X	
2.	75% or more of impacted and benefited residents approve of the proposed noise abatement	N/A	
3.	A 3 dBA or greater change in design year build noise levels over design year no-build noise levels is expected to result from the proposed action, or the cumulative effects of highway improvements in the design year build noise levels at receptors that existed when prior improvements were made is equal to or greater than 3 dBA	X	
3a.	Noise levels equal or exceed 72 dBA at impacted receptors		X
4.	Noise barriers will have significant negative visual impact at impacted receptors		X
5.	The cost of noise abatement is equal to or less than $50,000 per residence, impacted and benefited	X	
6.	There are special circumstances, i.e., historical/cultural significance at this NSA		X

TABLE 5-12
SUMMARY OF RESIDENCES BENEFITTING FROM NOISE BARRIERS

Noise Barrier Analyzed (By NSA)	Impacted Residences Receiving Reduction of 3 dB(A)	Non-ImpactedResidences Receiving Reduction of 5 dB(A)	Total Residences Benefited
NSA D - Alt. 3	26	14	40
NSA D - Alt. 4	31	56	87
NSA D - Alt. 5	31	48	79
NSA E	71	78	149
NSA F	4	7	11
NSA G	40	33	73

The noise barriers analyzed for NSA D vary by alternate. For Alternate 3, a total of 26 receptors are impacted. A barrier 3,430 feet long with an average height of 14.6 feet would provide a minimum 3 dB(A) noise reduction for a 26 impacted receptors. In addition, 14 other non-impacted residences will receive a minimum 5 dB(A) noise reduction bringing the total number of benefited receptors to 40. The total cost and cost-per-residence for this barrier are $825,650 and $20,640, respectively. A barrier for this alternate would be reasonable and feasible, and will be considered further during the design phase of this project.

For NSA D Alternate 4, a total of 31 receptors would be impacted. A barrier 3,430 feet long with and average height of 15.4 feet would provide the minimum 3 dB(A) noise reduction to each of these impacted receptors. In addition, 56 other non-impacted residences would receive at least a 5 dB(A) noise reduction from this barrier. The total cost and cost-per-residence for this barrier are $869,175 and $9,900, respectively. This barrier would be reasonable and feasible, and will be considered further during the design phase of this project.

For NSA D Alternate 5, a total of 31 receptors would be impacted. A barrier 3,430 feet long with an average height of 14.8 feet would provide a minimum 3 dB(A) noise reduction to each of the 31 impacted receptors, and a 5 dB(A) noise reduction to 48 other non-impacted receptors. The total cost and cost-per-residence for this barrier is $838,940 and $10,900, respectively. A barrier for this alternate would be reasonable and feasible, and will be considered further during the design phase of this project.

NSA E contains 71 impacted receptors comprised of 46 single-family homes and 25 units within multi-family structures. A barrier approximately 4,800 feet long with an average height of 17.8 feet would provide a minimum 3 dB(A) noise reduction to all 71 impacted receptors. In addition, 78 other non-impacted residences will receive at least a 5 dB(A) noise reduction from this barrier

bringing the total number of benefited residences to 149. The total cost and cost-per-residence for this barrier are $1,412,200 and $9,480, respectively. A barrier for this alternate would be reasonable and feasible, and will be considered further during the design phase of this project.

NSA F contains 10 impacted residences, 7 of which front MD 24/924. A barrier 3,320 feet long with an average height of 19.6 feet would provide a minimum 3 dB(A) noise reduction to 4 of the 10 impacted residences. The 6 residences which do not receive the minimum 3 dB(A) noise reduction are adjacent to MD 24/924 and have direct access to this facility. It was not possible to provide a barrier between these residences and MD 24/924 without eliminating their only access. In addition 7 non-impacted other residences would receive a 5 dB(A) noise reduction from this barrier. The total cost and cost-per-residence for this barrier are $1,071,000 and $97,400 respectively. This barrier would not be cost-effective as it would exceed the $50,000 cost-per-residence allowable limit and therefore would not be considered reasonable.

NSA G contains a total of 40 impacted residences. A barrier 4,000 feet long with an average height of 21.9 feet would benefit each of these impacted receptors. In addition, there are 33 non-impacted residences which would receive a minimum 5 dB(A) noise reduction from this abatement structure. The total cost and cost-per-residence are $1,442,100 and $19,800, respectively A barrier for this alternate would be reasonable and feasible, and will be considered further during the design phase of this project.

In summary, noise barriers are reasonable and feasible at NSA's D, E, and G and will be considered further during the design phase of this project.

5.7.4 Construction Noise

The major construction elements of this project are expected to be earth removal, hauling, grading, and paving. General construction noise impacts, such as temporary speech interference, usually limited to daylight hours (8:00 a.m. to 5:00 p.m.), differs from normal vehicular traffic noise, which is continuous throughout the daytime and nighttime hours. Effective control of highway construction noise can be achieved by separating several noisy operations over time, limiting the times of certain construction activities, using less noisy equipment, setting up temporary barriers around working areas, and community awareness.

5.8 Air Quality

5.8.1 Objectives and Type of Analysis

This air quality analysis has been prepared in accordance with the U.S. Environmental Protection Agency (EPA), Federal Highway Administration (FHWA), and State Highway Administration (MDSHA) guidelines. Carbon monoxide (CO) impacts were analyzed as the accepted indicator of vehicle-generated air pollution. The years of analysis were 2000 and 2020.

The EPA's CAL3QHC dispersion model was used to predict carbon monoxide (CO) concentrations at air quality sensitive receptors. These detailed analyses predict air quality impacts from carbon monoxide vehicular emissions for both the No-Build and build alternates for each analysis year. Modeled 1-hour and 8-hour average CO concentrations were added to background CO concentrations for comparison to the State and National Ambient Air Quality Standards (S/NAAQS).

The US 1 Bel Air Bypass project is located in Harford County, which is a severe ozone non-attainment area. However, the County is not a non-attainment area for carbon monoxide. Since the project is located in an ozone non-attainment area, conformity to the State Implementation Plans (SIPs) 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.

5.8.2 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 Air Management and Radiation Administration of the Maryland Department of the Environment was consulted to determine the adequacy of the "Specification" in terms of satisfying the requirements of the "Regulations Governing the Control of Air Pollution in the State of Maryland". The Air Management and Radiation 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 10.18.06.03 D) would be incorporated .

to minimize the impact of the proposed transportation improvements on the air quality of the area.

5.8.3 Receptor Sites

Thirteen (13) air quality receptor locations were selected to represent air quality sensitive locations within the study area. In addition, two signalized intersections were also analyzed for CO Impacts. Most receptor sites chosen are single family residences; however, the edge of right-of-way was used if no receptor sites were nearby. For the intersection analysis, a receptor was placed near the center of the intersection along the right-of-way. Additional receptors were placed at 175-foot intervals along the right-of-way. This was repeated for both sides of the road and for each roadway in the intersection where a queue length will form. The locations of the air quality sensitive sites, presented on Table 5-13, were verified by a site visit on April 30, 1997.

TABLE 5-13
LOCATION OF AIR RECEPTORS

Receptor	Location	Description
INTA	US 1/MD 24 Intersection (No-Build & Alternate 3 Only)	22 receptors (No-Build), 15 receptors (Alternate 3)
INTB	US 1/MD 24/MD 924 Interchange (Option A Only)	38 receptors
AQ-1	321 Bynum Ridge Road	brick ranch residence
AQ-2	111 Marshall Drive	brick ranch residence
AQ-3	1337 St. Francis Road	two story end-of-group townhouse
AQ-4	400 Crofton Court	two story gray frame residence
AQ-5	Hazen Dell Farm (Historic Site)	1 1/2 story white frame residence
AQ-6	Liriodendron Mansion - Kelly House (Historic Site)	two story mansion
AQ-7	1010 James Street	1 1/2 story white stucco residence
AQ-8	Sta. 185+00 Right	edge of right-of-way
AQ-9	Churchill Road	three-story condominium building
AQ-10	Heavenly Waters Park Equestrian Center	park
AQ-11	Hillandale Herb Flower Farm	1 1/2 story white frame residence
AQ-12	Sta. 11+00 Right (Park/Historic Site)	edge of right-of-way
AQ-13	Sta. 82+00 Left	edge of right-of-way

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5.8.4 Results of Microscale Analysis

The results of the calculations of CO concentrations at each of the sensitive receptor sites for the No-Build and build alternates for the year 2000 are shown on Table 5-14 and for the year 2020 are shown on Table 5-15. The values shown consist of predicted CO concentrations attributable to traffic on various roadway links plus projected background levels. The CO concentrations listed for receptors INTA and INTB are the maximum CO level obtained in the signalized intersection analysis. For the 1-hour case, maximum a.m. or p.m. concentrations are shown. A comparison of these values with the S/NAAQS shows that no violations would occur for the No-Build or build alternates in 2000 or 2020 for the 1-hour or 8-hour concentrations of CO.

TABLE 5-14
CARBON MONOXIDE (CO) CONCENTRATIONS (PPM) - 2000

	No-Build		Alternate 3		Alternate 4		Alternate 5		Option A		Option B	
Receptor	1-Hr.	8-Hr.	1-Hr.	8-Hr.	1-Hr.	8-Hr.	1-Hr.	8-Hr.	1-Hr.	8-Hr.	1-Hr.	8-Hr.
INTA	13.0	7.0	8.8	4.5	-	-	-	-	-		-	-
INTB	-	-	-	-	-	-	-	-	11.3	6.3	-	-
AQ-1	5.9	2.9	-	-	-	-	-	-	5.9	2.9	5.8	2.9
AQ-2	6.6	3.2	-	-	-	-	-	-	6.2	2.9	6.3	3.1
AQ-3	6.1	3.0	-	-	-	-	-	-	6.0	2.9	6.0	2.9
AQ-4	7.7	3.6	-	-	-	-	-	-	6.7	3.3	6.6	3.3
AQ-5	6.6	3.1	6.3	3.1	6.3	3.2	6.3	3.1	-	-	-	-
AQ-6	6.8	3.1	6.2	3.0	6.2	3.0	6.0	3.0	-	-	-	-
AQ-7	6.1	3.0	-	-	-	-	-	-	5.8	3.0-	6.1	3.0
AQ-8	5.6	2.8	-	-	-	-	-	-	5.8	2.8	5.7	2.8
AQ-9	6.7	3.1	6.1	2.9	6.0	2.9	6.0	2.9	-	-	-	-
AQ-10	6.1	3.0	6.0	2.9	6.0	2.9	6.0	2.9	-	-	-	-
AQ-11	6.6	3.1	6.5	3.1	6.5	3.1	6.5	3.1	-	-	-	-
AQ-12	6.0	3.0	6.3	3.1	6.3	3.1	6.3	3.1	-	-	-	-
AQ-13	8.3	4.0	6.8	3.1	6.6	3.2	6.9	3.0	-	-	-	-

Notes: *One-hour CO concentrations include a 5.2 ppm background concentration. Worst case (a.m. or p.m.) shown. Eight-hour CO concentrations include a 2.6 ppm background concentration. The S/NAAQS for the one-hour average is 35.0 ppm. The S/NAAQS for the eight-hour average is 9.0 ppm. PPM = Parts per million*

TABLE 5-15
CARBON MONOXIDE (CO) CONCENTRATIONS (PPM) - 2020

	No-Build		Alternate 3		Alternate 4		Alternate 5		Option A		Option B	
Receptor	1-Hr.	8-Hr.	1-Hr.	8-Hr.	1-Hr.	8-Hr.	1-Hr.	8-Hr.	1-Hr.	8-Hr.	1-Hr.	8-Hr.
INTA	19.4	7.8	9.6	4.8	-	-	-	-	-		-	-
INTB	-	-	-	-	-	-	-	-	10.9	6.0	-	-
AQ-1	6.0	3.0	-	-	-	-	-	-	6.1	2.9	5.8	2.9
AQ-2	7.1	3.4	-	-	-	-	-	-	6.2	3.0	6.4	3.1
AQ-3	6.6	3.1	-	-	-	-	-	-	6.2	2.9	6.0	2.9
AQ-4	8.3	3.8	-	-	-	-	-	-	6.7	3.3	6.6	3.3
AQ-5	7.3	3.4	6.3	3.1	6.3	3.2	6.3	3.1	-	-	-	-
AQ-6	7.0	3.6	6.5	3.1	6.4	3.2	6.2	3.0	-	-	-	-
AQ-7	6.3	3.1	-	-	-	-	-	-	6.1	3.0-	6.1	3.0
AQ-8	5.9	2.8	-	-	-	-	-	-	5.8	2.9	5.6	2.8
AQ-9	10.7	4.2	6.4	3.0	6.1	3.0	6.2	3.0	-	-	-	-
AQ-10	7.1	3.4	6.1	3.0	6.1	3.0	6.1	3.0	-	-	-	-
AQ-11	8.1	3.6	6.5	3.1	6.5	3.2	6.5	3.2	-	-	-	-
AQ-12	7.5	3.4	6.4	3.2	6.4	3.2	6.4	3.2	-	-	-	-
AQ-13	9.9	4.5	7.1	3.2	6.9	3.3	7.0	3.1	-	-	-	-

Notes: One-hour CO concentrations include a 5.2 ppm background concentration. Worst case (a.m. or p.m.) shown. Eight-hour CO concentrations include a 2.6 ppm background concentration. The S/NAAQS for the one-hour average is 35.0 ppm. The S/NAAQS for the eight-hour average is 9.0 ppm. PPM = Parts per million

The air quality analysis indicates that carbon monoxide impacts resulting from the implementation of the No-Build or build alternates would not result in a violation of the 1-hour or 8-hour S/NAAQS or 35 ppm and 9 ppm, respectively, at any receptor location. Relative comparison of impacts for the No-Build versus the build alternates indicate that implementation of the proposed alternates would result in a slight decrease or increase in CO concentration depending on alternate alignment, traffic volume and speed, and the location of the specific receptor.

5.8.5 Analyses Inputs

a. Traffic Data

The traffic data used for this Air Quality Analysis included average daily traffic volumes (ADT's), hourly a.m. and p.m. peak hour volumes, percent daily distributions (diurnal traffic curves), and peak and off peak vehicle speeds. Traffic data was provided by the MDSHA for the US 1 project for the years 2000 and 2020. Vehicle speeds were assumed to be the posted speed limits. This data was compiled for each alternate and each year of study.

MD 24 at US 1 was the only signalized intersection analyzed in the No-Build Alternate, and this signal was also analyzed for Alternate 3. Option A has two other signalized intersections that were analyzed, MD 24/924 at the US 1 northbound ramps and MD 24/924 at the US 1 southbound ramps. These locations might require signals for Option B also, but since the analysis for these signals is not included in this project, these locations were assumed to not have traffic signals present. Signal timing was assumed to be optimized based on current and future traffic.

b. Vehicular Emissions

Mobile source emission factors were obtained for use in the CO prediction models using the latest version of the EPA's Mobile Source Emission Factors Model, MOBILE5a. The emission rates of individual vehicles are influenced by factors such as ambient air temperature, operating 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.

Vehicle CO emission rates increase with decreasing ambient air temperatures. An ambient air temperature of 20°F was used to determine peak hour impacts, while an average temperature of 35°F was selected to represent the composite hours that make up the 8-hour average impact. Engine operating temperature is included in the emission rate calculation as that fraction of vehicles operating in the cold or hot start modes. For this analysis, Federal Test Procedure (FTP) starts were assumed. The FTP assumes 20.6 percent of vehicles are non-catalytic cold start vehicles, 27.3 percent are catalytic hot start vehicles, and 20.6 percent are catalytic cold start vehicles. Vehicle maintenance is included in the emission rate calculation as the rate of compliance with the Maryland Vehicle Emissions Inspection Program (VEIP). The vehicle fleet mix and age also influence the average fleet emission rates. The vehicle mix for US 1 was provided by MDSHA. The vehicle mix for the other roads was assumed to be the same as for US 1. Regional average vehicle ages were assumed.

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 which would result in the maximum one-hour concentrations are (1) conditions of very light wind speeds (1.0 m/sec) and (2) very stable atmospheric conditions (F Stability). The wind direction which results in the maximum receptor concentration is dependent upon roadway/receptor geometrics. In general, for

receptors near a limited access or free flow roadway, wind angles nearly parallel to the roadway yield the highest CO concentrations. For receptors near a signalized intersection, wind angles which yield the highest CO concentrations are dependent upon the interaction of moving and idling vehicles, e.g. level of service, signal cycle length, approach link red time, and average speed. The interaction of multiple variables at signalized intersections results in a complex condition which may result in worst case wind angles varying from those nearly parallel to the roadway to those nearly perpendicular to the roadway.

The worst case 1-hour average analyses conducted for this study were performed using the highest on-hour traffic volumes, Stability Class F, and a 1.0 m/sec. wind speed. Both a.m. and p.m. peak hours were analyzed. Wind angles were varied on five degree increments through a full 360 degrees. "the maximum on-hour CO impact was obtained for each air quality sensitive receptor by adding the background concentration to the one-hour CO receptor specific concentration. The maximum CO impacts for each receptor was then compared to the S/NAAQS to determine if any violations of the standards would occur.

To estimate the maximum eight-hour CO concentration, the daily traffic distributions were analyzed to determine which consecutive eight-hour period resulted in the highest average traffic volume combined with the worst case meteorological conditions. Each hour within the eight hour period was analyzed. The CO impacts were arranged into a spreadsheet matrix as a function of time, and a maximum average hourly CO concentration identified for each receptor/year/scenario combination. Maximum eight-hour averages were calculated in the spreadsheet

d. CAL3QHC Analysis

The mathematical model used to estimate future air quality concentrations is the current version of the EPA's CAL3QHC dispersion model. The CAL3QHC dispersion model is a microcomputer-based modeling methodology developed to predict the level of CO or other inert pollutant concentrations from motor vehicles traveling near roadway intersections. CAL3QHC is a consolidation of the 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 than CALINE3 alone for predicting CO concentrations near signalized intersections where idling vehicles interact with moving vehicles in complex

configurations. Predictions of free flow traffic volumes using either CALINE3 or CAL3QHC would yield equivalent results.

The CAL3QHC CO dispersion model requires that each highway network be broken down into individual roadway links. A link is defined for any change in the traffic volume speed (emission factor), or geometry. The information provided to the model includes the link and point coordinates, the link types (at grade, depressed, on fill, or structures), the link width for free flow lanes, link width for queue lanes, the average height of the emission release, the average rate of running and idling emissions, average vehicle volume per link, signal cycle length, and cycle red time. Other input required by the model include receptor coordinates, averaging time, surface roughness, settling velocity, deposition velocity, and a metric conversion scale factor. Variables held constant throughout the analysis are presented as follows:

TABLE 5-16
CAL3QHC INPUTS HELD CONSTANT
FOR THE US 1 BEL AIR BYPASS

Variable	Value
Average Time	60 Minutes
Surface Roughness	108 cm
Settling Velocity	0.0 cm/second
Deposition Velocity	0.0 cm/second
Scale Factor	0.3048 meters/foot
Source Height	0.0 feet

In order to calculate the total concentration of CO which occurs at a particular receptor site during worst case meteorological conditions, the background levels are considered in addition to the levels directly attributable to the facility under consideration. The background levels were derived from the application of rollback methodology to on-site monitoring conducted by the Maryland Air Management Administration at their Essex Monitoring Site in Baltimore County during the period of 1995.

TABLE 5-17
BACKGROUND CO - PPM

	1-Hour	8-Hour
2000	5.2	2.6
2020	5.2	2.6

5.9 Secondary and Cumulative Effects Analysis

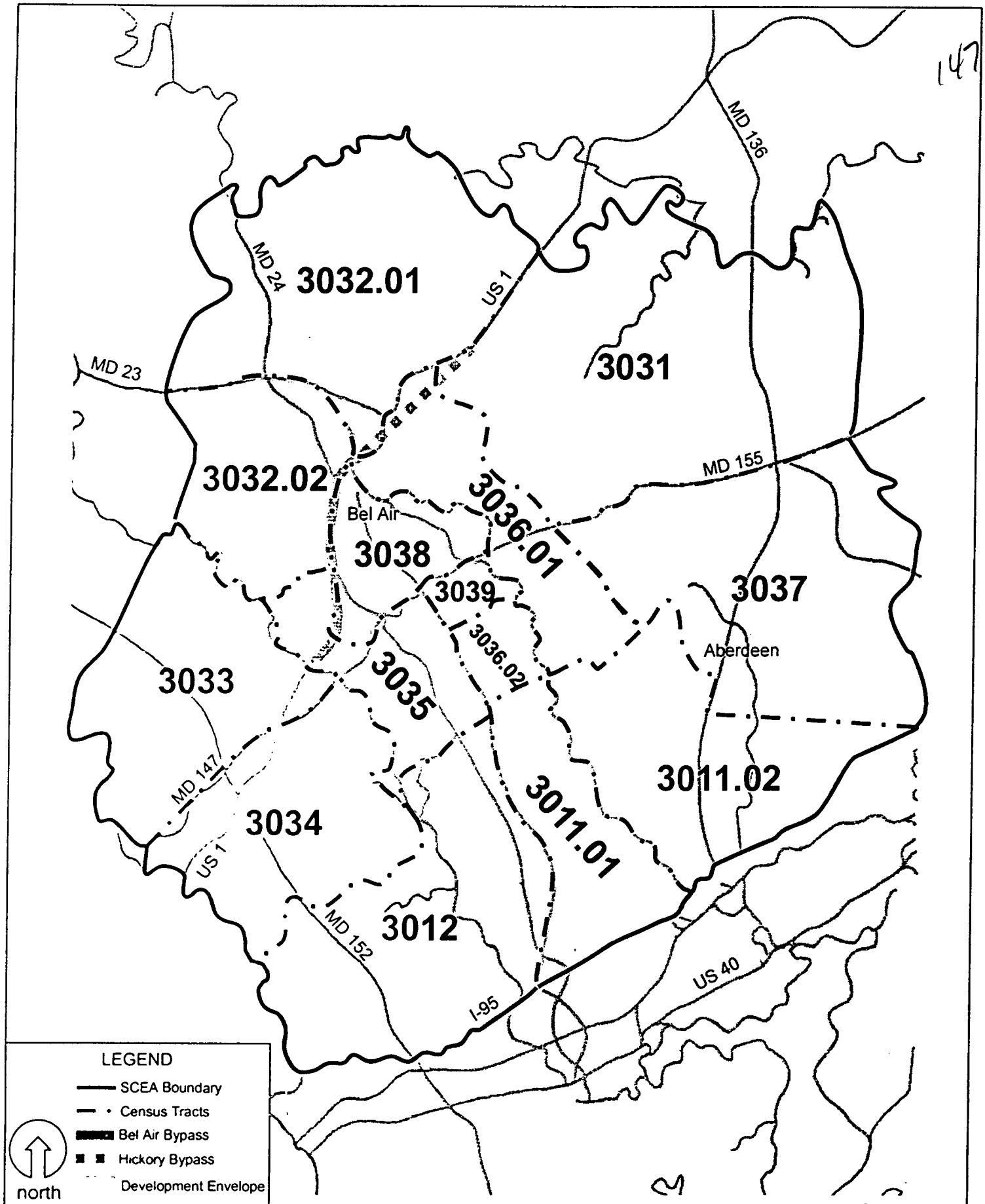
This section discusses the potential secondary and cumulative effects on environmental resources due to the proposed US 1 Bel Air Bypass project. The time period for assessing cumulative and secondary impacts is 1980 to 2020. Over such an extended time frame, transportation projects can have cumulative and secondary effects on natural resources in a number of different ways. The three most substantial of these include:

- Adding direct effects to ecosystems which have already been incrementally degraded by historical development;
- Increasing development pressure and potential impacts to natural resources in and around the study area by improving mobility and access to job centers; and
- Encouraging future transportation plans to support new development which would have both direct and secondary/cumulative impacts of their own.

5.9.1 Secondary & Cumulative Effects Analysis Boundary & Time Frame

By definition, secondary and cumulative effects are broader in scope, both spatially and temporally, than the direct impacts of the project. Therefore, for this analysis, it was necessary to establish new limits of both a geographic and temporal nature. The geographic limits are referred to in this report as the Secondary and Cumulative Effects Analysis (SCEA) boundary. The SCEA boundary varies for different resources due to both the nature of the resource and the availability of data. The SCEA boundary for socioeconomic resources was chosen based on census tracts because much of the data required to analyze these resources was available at this level and because the area contained within the census tracts includes all of the Bel Air Bypass build alternatives and adjacent portions of all major roadways that this project may influence. In addition, a significant portion of Harford County's Development Envelope is also present within the SCEA boundary. The Development Envelope was established in the County's 1977 master plan and is designated as the only part of the county to have public water and sewer services. Thus, it is also the only part of the county which can support development levels requiring public water and sewer facilities. Figure 5-1a shows the SCEA boundary for socioeconomic resources based on census tracts.

The SCEA boundary for natural resources was chosen based on subwatershed boundaries for many of the same reasons that census tracts were used for socioeconomic resources. Data for natural resources was available at this level and the subwatersheds which represent the SCEA boundary also include the Bel Air Bypass build alternatives, adjacent roadways influenced by the



U.S. 1 from MD 147 to North of MD 24/924

STATE HIGHWAY ADMINISTRATION

Figure 5-1a

SCEA Boundary for Socioeconomic Resources (Census Tracts)

project, and part of Harford County's Development Envelope. The subwatersheds which form the SCEA boundary for natural resources are shown on Figure 5-1b.

The time frame for the SCEA was set as the period between 1980 and the year 2020. The decision to set a 1980 starting point was made based on a number of different reasons. These include the lifting of the building moratorium in Harford County in 1976, the establishment of the Development Envelope in 1977, the initiation of comprehensive zoning in 1982, and the opening of MD 24 in 1986. These were all factors in the general "building boom" which occurred in the County during the 1980's.

The future limit of 2020 was chosen based on several reasons as well. Most importantly, 2020 is the design year for the US 1 Bel Air Bypass project. However, 2020 was also appropriate because traffic data and travel demand forecasts were available for this year.

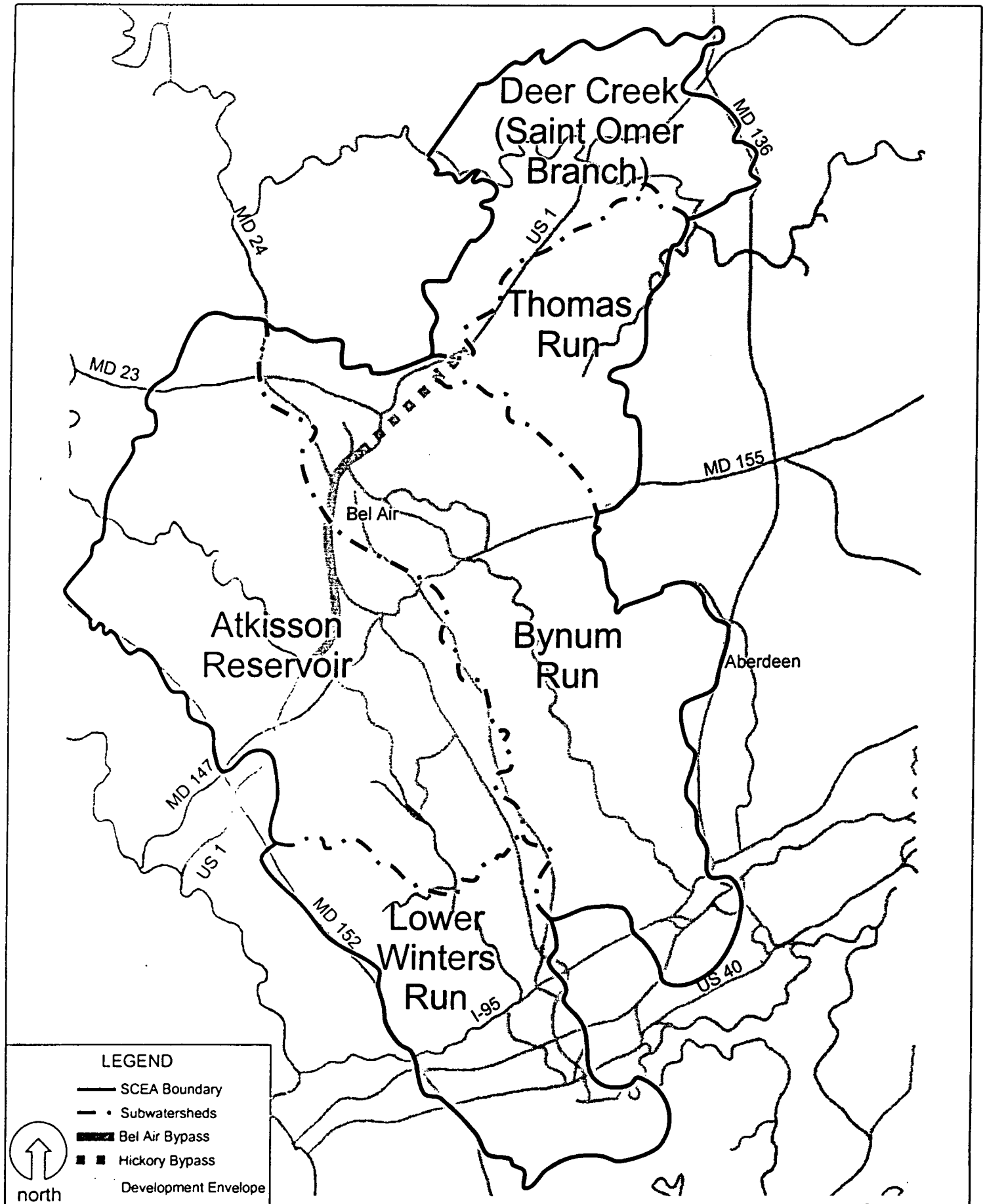
These boundaries were presented to the agencies at the Interagency Review on March 18, 1998. At this meeting it was stated that these boundaries were not absolute. Rather, they presented as general guidelines within which data for each resource would be gathered.

5.9.2 Methodology

The methodology for determining the secondary and cumulative effects of the Bel Air Bypass was based mainly on the effect of future land use changes on environmental resources. The environmental resources evaluated for secondary and cumulative effects were divided into two major categories: socioeconomic and natural. Socioeconomic resources include parks, communities, community facilities, and cultural resources. Natural resources include geology, topography, and soils; groundwater; surface water; floodplains; wetlands; wildlife and rare, threatened, and endangered species; forests; and aquatic resources.

The first step in determining secondary and cumulative effects was to describe the past and present environment and identify development trends within the SCEA boundary. Reasonably foreseeable future development was also described and future trends were identified. These development trends showed how the land use has changed since 1980 and how it is expected to change in the future. As land use is the agent which acts upon environmental resources, changes in land use were used to denote possible secondary or cumulative impacts.

Each resource was evaluated using readily available data. In some cases, data were not readily available. This was documented and the analysis proceeded no further. If sufficient, readily



U.S. 1 from MD 147 to North of MD 24/924

STATE HIGHWAY ADMINISTRATION

Figure 5-1b

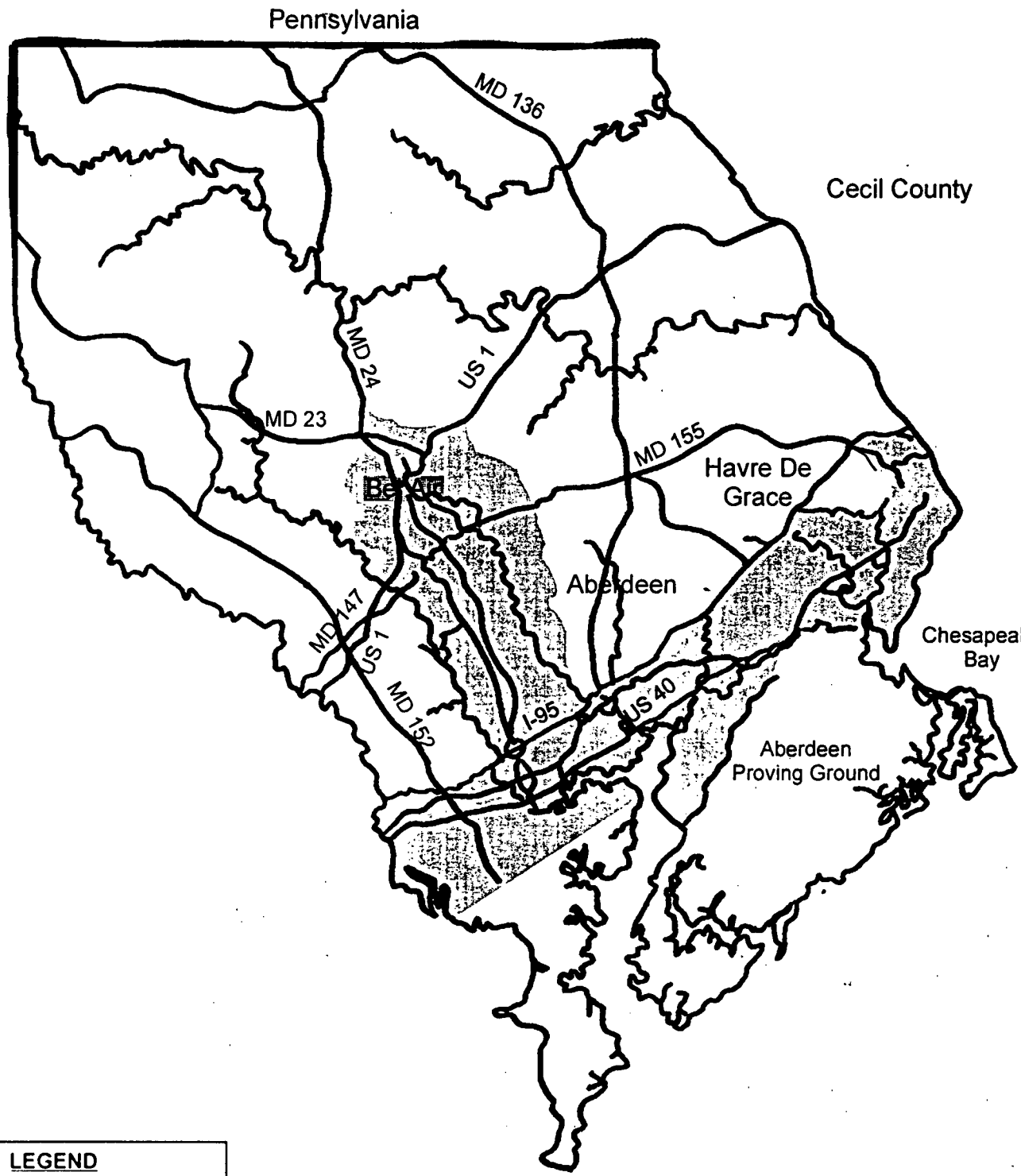
SCEA Boundary for Natural Resources (Subwatersheds)

available data was acquired, a preliminary examination of the data was conducted in order to determine if there was the potential for the build alternatives to have secondary or cumulative effects on the resource. If it was determined that the potential for secondary and cumulative effects did not exist, this was documented and the analysis did not proceed further. Detailed analyses were conducted for only those resources for which there was both sufficient, readily available data and the potential for secondary and cumulative effects to result from the build alternates of this project. The methodology was presented at the Interagency Review on May 20, 1998

5.9.3 Past, Present and Future Conditions & Land Use

Harford County, as a part of the Baltimore Metropolitan region, is located in the northeastern part of Maryland at the confluence of the Susquehanna River and the Chesapeake Bay. Harford County was part of Baltimore County from 1659 until 1773. It was separated from Baltimore County in 1773 by Act of Assembly, and its boundaries have not changed substantially since then. The County has a land area of 440 square miles or 281,601 acres.

The Harford County Master Plan directs the growth, pattern and intensity of land use and development, as well as the preservation of natural resources, within the identified Development Envelope. Harford County established the concept of the Development Envelope in its *1977 Harford County Master Plan* (Figure 5-2). The Development Envelope defined a geographic area in which the County planned to direct more intense development into a specific areas, such as those bounded by I-95/MD 40 and the MD 24 corridor north to Bel Air. The rate of future growth within the Development Envelope is dependent upon the availability of public water and sewer facilities, schools and roads. The *1996 Harford County Master Plan and Land Use Element Plan* estimated capacity of approximately 26,900 dwelling units in the Development Envelope and states that, at the anticipated rate of build-out, there is sufficient residential land capacity within the boundaries of the Development Envelope to last approximately 18 years.



U.S. 1 from MD 147 to North of MD 24/924

STATE HIGHWAY ADMINISTRATION

Figure 5-2

Harford County Development Envelope

1980 to 1995

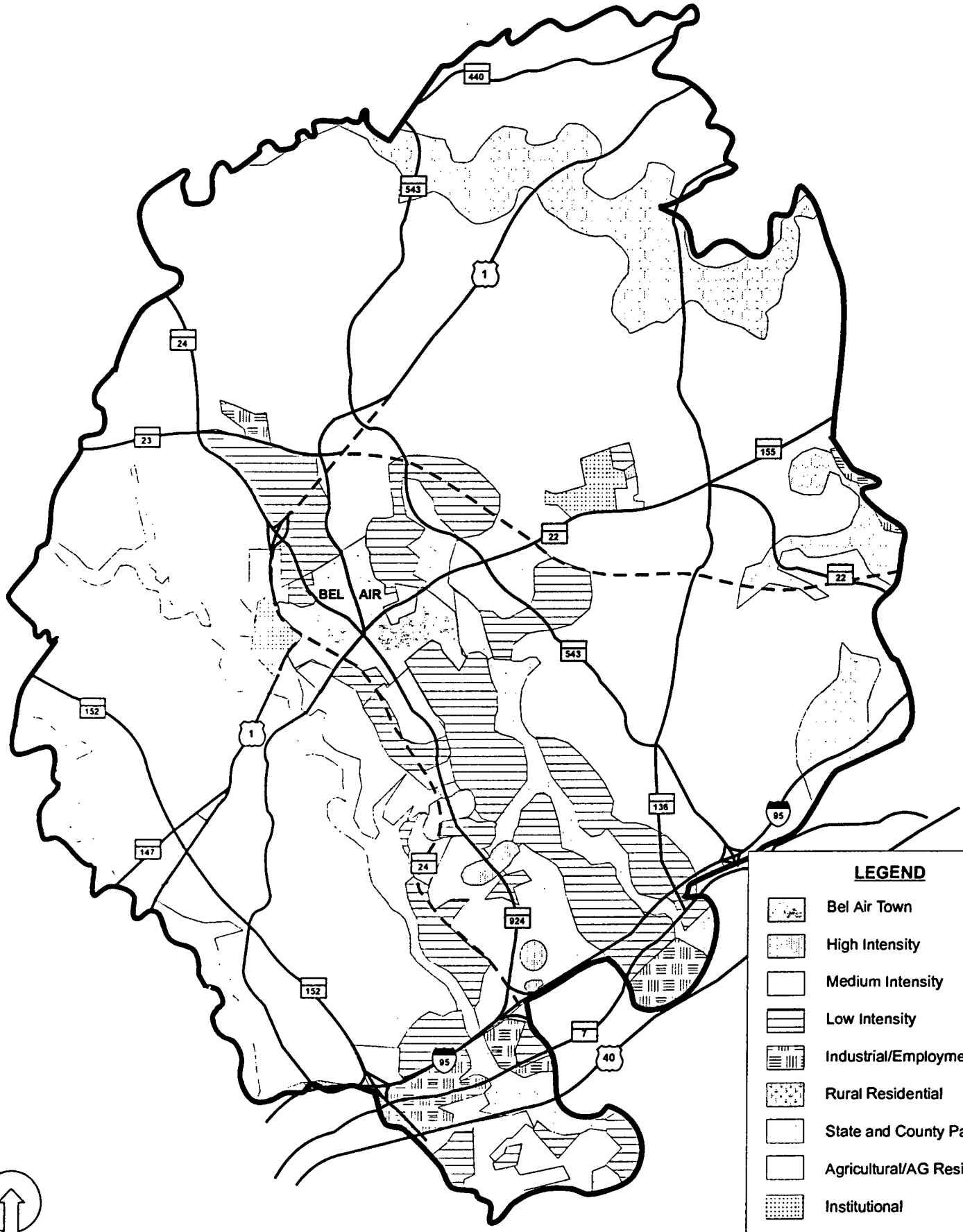
As mentioned previously, 1980 was chosen as the starting point of this analysis for a number of reasons. Events such as the lifting of the building moratorium in 1976, the establishment of the Harford County Development Envelope in 1977, and the initiation of comprehensive zoning in 1982 are all factors which were very significant in shaping the development patterns that Harford County experienced during the 1980's and early 1990's.

Harford County, in general, experienced a great deal of population growth during the 1980's and early 1990's, increasing by 43% between 1980 and 1995. This compares to a 77% increase within the SCEA boundary. The number of households inside the SCEA boundary also grew by 92% during this time period.

A significant amount of development also accompanied the County's booming population. The concept of the Development Envelope helped to control this development pattern by eliminating scattered and uncoordinated development and focusing new growth within the envelope. The first decade of its existence saw the reversal of the trend to develop land outside of the Development Envelope. Between 1980 and 1988, the envelope captured over 73% of all building permits issued in the County and, by 1995, it had captured 83% of all residential building permits issued since 1980. As shown on Figures 5-1a and 5-1b, the SCEA boundaries for this project encompass a large portion of the Development Envelope. Because most of the County's development since 1980 has occurred within the Development Envelope, the majority of the changes in land use are located inside as well.

Harford County historically has been a rural county with agriculture providing the primary basis of the economy. The agricultural industry in Harford County has changed over the years with industries such as timber production and canning operations being replaced by the production of field corn, soybeans, hay, and milk. The County has adopted strategies and principles designed to protect and preserve the rural character of the County and promote the continued viability of agriculture as the primary economic enterprise in rural areas.

Figures 5-3, 5-4, and 5-5 show areas of land use as depicted in the 1977, 1988 and 1996 Harford County Land Use Plans, respectively. Areas of low intensity development increased during each time period between 1977 and 1996, however, settlement patterns have consistently evolved along the major transportation corridors such as MD 24, MD 924, I-95, US 1 and US 40. Major growth areas are located west of I-95 along MD 24 and MD 543, and US 40 north of MD 24 where much of the future development is expected to continue.



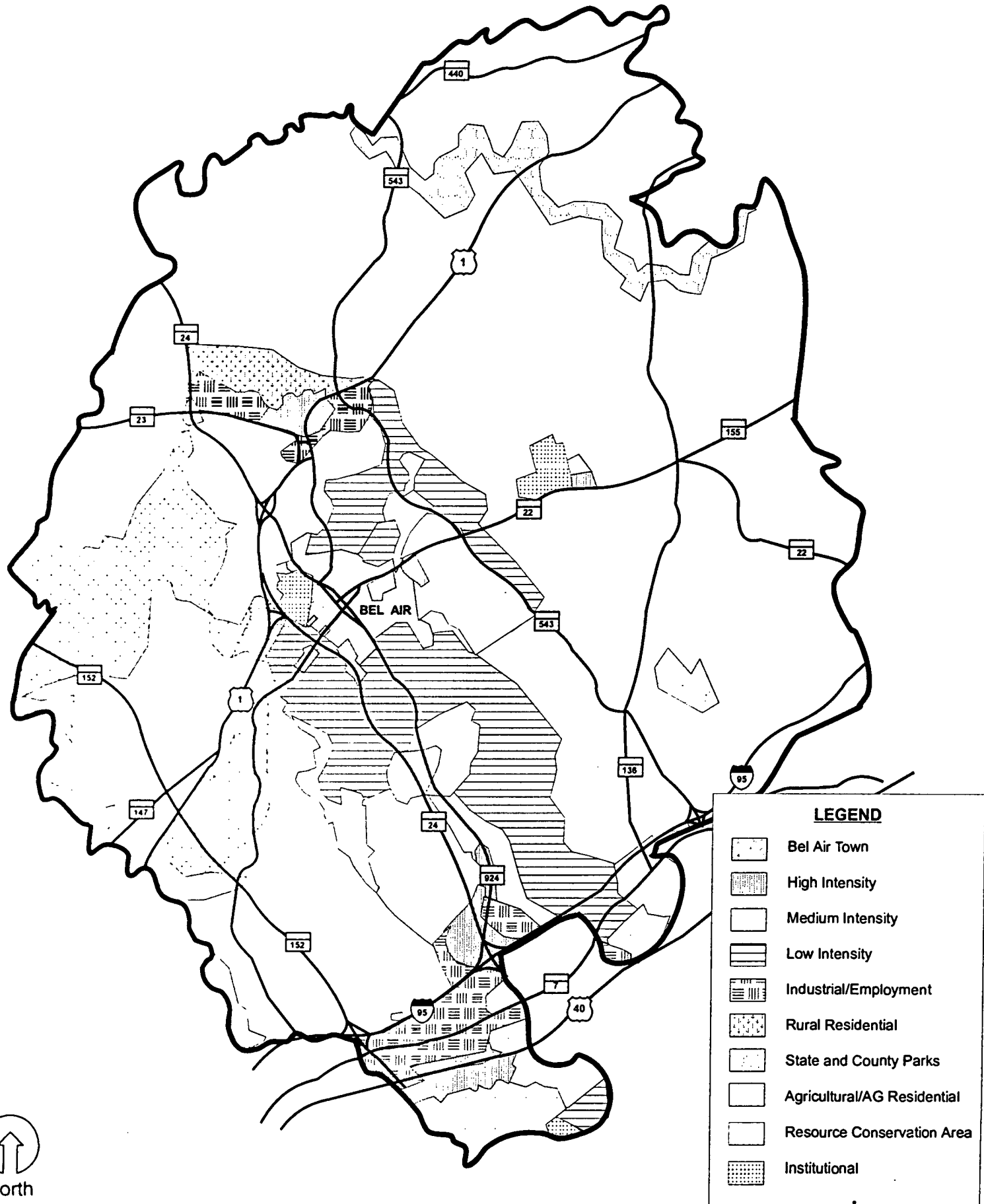
U.S. 1 from MD 147 to North of MD 24/924

STATE HIGHWAY ADMINISTRATION

Figure 5-3

Land Use within the SCEA Boundary - 1977

Note: The SCEA boundary shown is a combination of the SCEA boundary for socioeconomic and natural resources



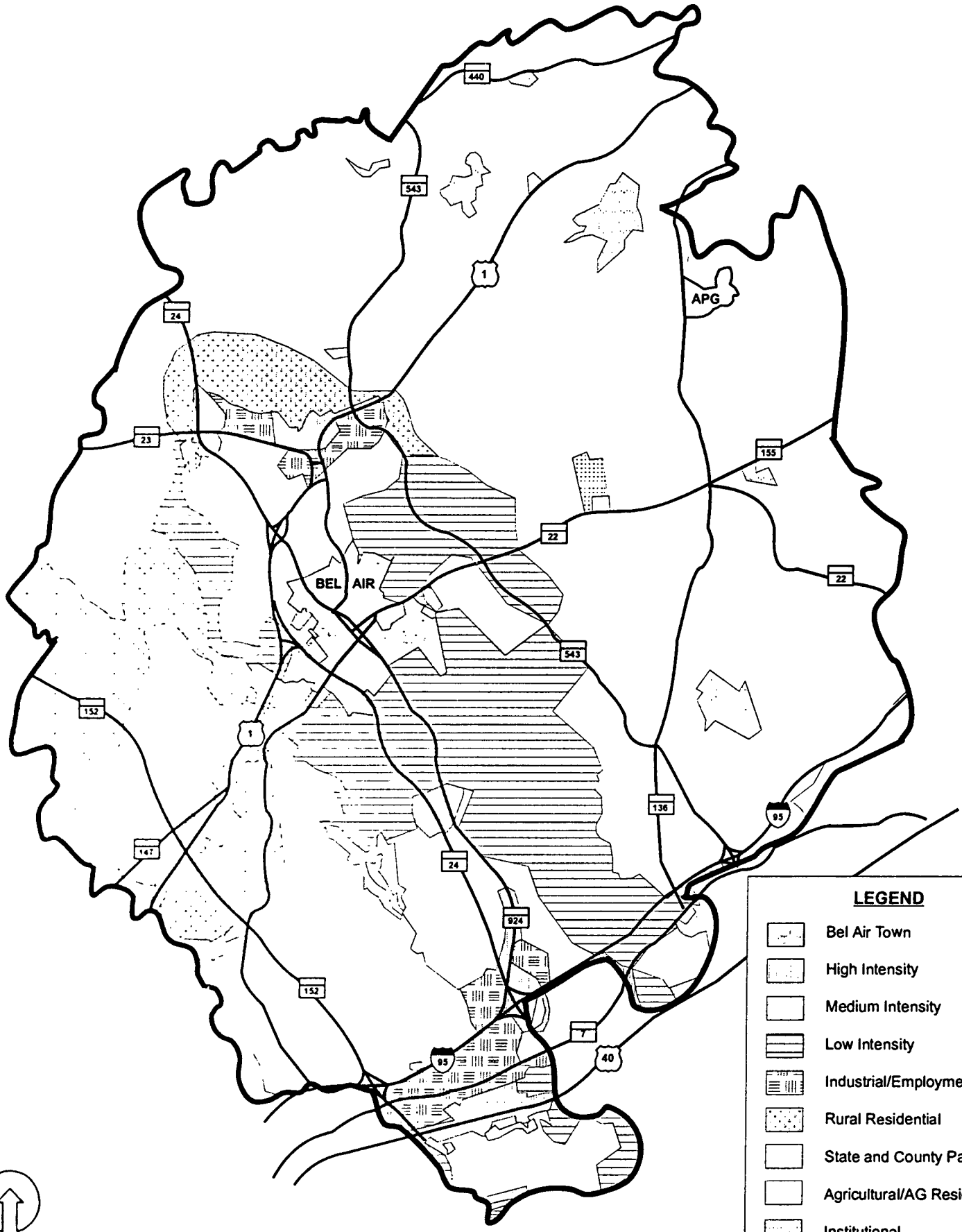
U.S. 1 from MD 147 to North of MD 24/924

STATE HIGHWAY ADMINISTRATION

Figure 5-4

Land Use within the SCEA Boundary - 1988

Note: The SCEA boundary shown is a combination of the SCEA boundary for socioeconomic and natural resources



LEGEND

- Bel Air Town
- High Intensity
- Medium Intensity
- Low Intensity
- Industrial/Employment
- Rural Residential
- State and County Parks
- Agricultural/AG Residential
- Institutional

U.S. 1 from MD 147 to North of MD 24/924

STATE HIGHWAY ADMINISTRATION

Figure 5-5

Land Use within the SCEA Boundary - 1996

Note: The SCEA boundary shown is a combination of the SCEA boundary for socioeconomic and natural resources

The corridor between I-95 and US 40 contains the majority of the County's industrial uses. Additional development of high intensity residential, commercial and industrial uses are appropriate in this area given the access to major transportation corridors such as I-95, US 40, and the Amtrak/Conrail rail lines.

A comparison of Harford County Land Use Maps contained within the 1977, 1988 and 1996 Master Plans illustrate the changes in land uses over time. The Land Use Plans and Maps indicate general areas of planned land use patterns and intensities as well the level and location of development for the time period up to the year 2000. The following are general observations based on the 1977, 1988 and 1996 Master Plans and Land Use Maps:

- The 1977 Land Use Map contained large linear areas designated for protection of natural resources. The extension of MD 24 to I-95, which occurred in 1986, substantially decreased the amount of land designated as natural resources protection areas in the 1988 and 1996 Land Use Maps.

- The 1988 Land Use map introduced new rural residential areas which replaced the natural resources protection areas and agricultural areas generally located west of MD 24 and north of MD 23.

- The 1988 Land Use Map showed an increase in industrial areas between I-95 and US 40.

- The 1988 Map indicates the beginning of more high intensity developed areas along MD 24 and MD 924.

- The 1977 Land Use Map depicts an extension of MD 23 to the eastern boundary of the SCEA. This proposed extension does not appear on the 1988 or 1996 Land Use Maps.

1995 to 2020

Since 1990, an average of 82% of new residential development has occurred within the Development Envelope. If this pattern continues, a total of 11,849 new households will be located within the Development Envelope by the year 2005. The remainder of the households, approximately 20 percent, will be located outside of the Development Envelope. The rate of current and future growth is largely a reflection of both the national economy and local market conditions.

It is anticipated that future growth in Harford County will not be as dramatic as the past several decades, but that it will still be significant. The population of the County is expected to increase by 27% between 1995 and 2020, while the population within the SCEA boundary is projected to

increase by 29% during the same time period. The number of households inside the SCEA boundary is expected to rise 43% by 2020.

New development necessary to accommodate the anticipated growth in Harford County will continue to be guided into the Development Envelope. The potential for future development should be incorporated within the context of the Development Envelope's overall capacity for future development. Most of the undeveloped land in the Development Envelope is zoned for residential development.

Table 5-18 shows the residential projects in the 1998 Harford County "development pipeline" (i.e.: having approved preliminary plans). The bulk of the future development already in the "pipeline" is located west of I-95 along MD 24 and MD 543, and US 40 north of MD 24. More important than the "pipeline" however, is the net available capacity of land for development that remains after accounting for the pipeline development. The capacity of the southeastern portion of the Development Envelope contains the most potential for future development.

TABLE 5-18
MAJOR SUBDIVISION ACTIVITY IN THE DEVELOPMENT ENVELOPE

SUBDIVISION	UNITS PLANNED				UNITS REMAINING				TOTAL PERMITS ISSUED
	SF/ DET	TH	APT/ CONDO	TOTAL	SF/ DET	TH	APT/ CONDO	TOTAL	
Amyclae East	181	0	0	181	75	0	0	75	106
Barrington	0	129	0	129	0	49	0	49	80
Brierhill Estates	136	0	0	136	84	0	0	84	52
Bright oaks	0	212	168	380	0	38	0	38	342
Castle Blaney	103	0	0	103	22	0	0	22	81
Cedarday	362	0	0	362	321	0	0	321	41
Constant Friendship	227	2,170	752	3,149	0	667	357	1,024	2,125
Country Walk	225	374	364	963	7	60	204	271	692
Deerspring	0	137	0	137	0	137	0	137	0
Durham Manor	116	78	390	584	2	0	37	39	545
East and West Valley Oaks	153	0	0	153	153	0	0	153	0
Evergreen Farms	0	0	462	462	0	0	462	462	0
Fairwind Farms	283	0	0	283	13	0	0	13	270
Forest Glen	48	0	0	48	48	0	0	48	0
Forest Lake	197	120	0	317	33	2	0	35	282
Francic Court	0	27	0	27	0	27	0	27	0
Glenangus	271	0	0	271	144	0	0	144	127
Greenbrier Hills	364	238	2,232	2,834	203	84	1,091	1,378	1,456
Greenridge II	212	0	0	212	33	0	0	33	179
Gunpowder	324	0	0	324	324	0	0	324	0
Hampton Glen	24	0	0	24	24	0	0	24	0
Harborside III	0	0	84	84	0	0	84	84	0
Harford Town	150	355	0	505	112	205	0	317	188
Henderson Manor	26	0	0	26	12	0	0	12	14
Hickory Overlook	131	127	0	258	93	58	0	151	107
Hidden Streams,H S North	92	0	0	92	52	0	0	52	40
Hollywoods	0	169	0	169	0	169	0	169	0
Hunter's Run	387	148	0	533	38	76	0	114	419
Irwins Choice	95	263	180	538	76	155	0	231	307
Joppa Crossing	164	0	0	164	14	0	0	14	150
Joppa Woods	17	102	0	119	0	65	0	65	54
Laurel Forest	0	0	156	156	0	0	17	17	139
Lohr's Orchard	74	139	168	381	24	92	132	248	133
Long Bar Harbor	205	0	0	205	114	0	0	114	91
Lucky Inc	32	0	0	32	31	0	0	31	1
Magnolia Farms	75	0	0	75	8	0	0	8	67
Monmouth Meadows	70	248	0	318	70	248	0	318	0
North Forest	82	0	0	82	65	0	0	65	17
Otter Creek Landing	237	0	0	237	120	0	0	120	117
Overview Manor	174	0	0	174	5	0	0	5	169
Park Farm Beach	50	0	0	50	37	0	0	37	13
Plumtree Estates	36	0	0	36	1	0	0	1	35
Riverside	377	594	1,138	2,109	0	0	86	86	2,023
Riverside South	0	271	0	271	0	271	0	271	0
Spencecola Farms	141	327	304	772	110	79	220	409	363
Taylors Pointe	15	0	0	15	15	0	0	15	0
Trails at Gleneagles	100	0	0	100	71	0	0	71	29
Tuchahoe Farms	149	0	0	149	144	0	0	144	5
Village of Bynum Run Est	101	0	0	101	55	0	0	55	46
Village of Bynum Run (I & II)	382	0	0	382	50	0	0	50	332
Village of Gray's Run	350	0	0	350	350	0	0	350	0
Vineyard Oak	197	0	0	197	38	0	0	38	159
Waters Edge	0	67	0	67	0	67	0	67	0
West Gate	204	0	0	204	138	0	0	138	66
Winters Run Manor	6	250	0	256	1	152	0	153	103
Woodland Run	178	0	0	178	27	0	0	27	151
TOTALS	7,523	6,543	6,398	20,464	3,357	2,701	2,690	8,748	11,716

SF DET = Single Family Detached, TH = Town Homes, APT/CONDO = Apartment/Condominium

Source: Harford County Planning and Zoning, 1998.

The 1996 Harford County Master Plan envisions that future growth trends in the SCEA will hinge on the area's status as an attractive suburban residential destination within the Baltimore region in contrast to a growth area based on employment opportunities within the area. The focal point is the Town of Bel Air and what is referred to as the Greater Bel Air community which includes the Bel Air Bypass project area. Therefore, the Master Plan strives to build continuity between the Town of Bel Air and the surrounding community in terms of residential and commercial uses, while maintaining neighborhood identity and scale.

The remaining development potential within the SCEA boundary is expected to be reserved for low intensity residential uses that will be paced with the provision of adequate public facilities and services. Commercial growth will be directed toward Bel Air and away from the transportation corridors of MD 543 between Bel Air and Fountain Green and MD 24 between Bel Air and Forest Hill. The intersection of Red Pump Road/Bynum Road/MD 24 was designated as a Community Center in the 1988 Land Use Plan in order to direct new commercial uses to this existing commercial area.

The Bel Air Bypass will directly result in the conversion of some currently undeveloped land to a highway use. The new facility is proposed to have full control of access which means that adjacent land uses along the mainline should not be altered by new development. If new or accelerated development does occur it is expected to be in the vicinity of the project's interchanges. However, the Bel Air Bypass project is meant to accommodate traffic from existing and planned development in the area and is not expected to cause new development to occur.

5.9.4 Secondary and Cumulative Effects Analysis

Since the implementation of Harford County's Development Envelope in 1977, the County has greatly increased its ability to control development. A large percentage of all of the County's development is now occurring within the Development Envelope and this trend is expected to continue through the year 2020. How this development will effect socioeconomic resources is described below.

Parks and Recreational Facilities – Data on parklands within the SCEA boundary was not available for study in this report. Therefore trends were established on a countywide basis. In general, the amount of parkland available throughout the county has been increasing since the mid 1980's. In 1986 there were 1,784 acres of parkland throughout the county. By 1998, the amount of parkland had increased by 113% to 3,801 acres. There are currently 84 park sites in the county. Harford County falls short of the National Parks and Recreation Association's policy

(which was also adopted by the State of Maryland and the Maryland Department of Natural Resources) of providing 30 acres of parkland for every 1,000 people in the county. Harford County currently is providing only 26.05 acres/1,000 population. The County expects to continue to acquire parkland in the future in order to conform to the National Park and Recreation Association's policy.

The areas in the vicinity of Bel Air and Hickory are considered critical areas for the acquisition of parkland. These areas have a higher level of development than most other areas of the county and parkland is more scarce. Currently, there is only parkland in the amount of 25.36 acres/1,000 population in the Bel Air area and 11.55 acres/1,000 population in the Hickory area. This is well below the standard of 30 acres/1,000 population and it is expected to decrease by the year 2010 to 23.41 acres/1,000 population and 9.22 acres/1,000 population, respectively, due to population growth. No secondary effects area expected to occur as a result of this project. Possible cumulative effects could result from the loss of developable land due to planned growth in this area because competition for land would increase in the area making new parklands more difficult to acquire.

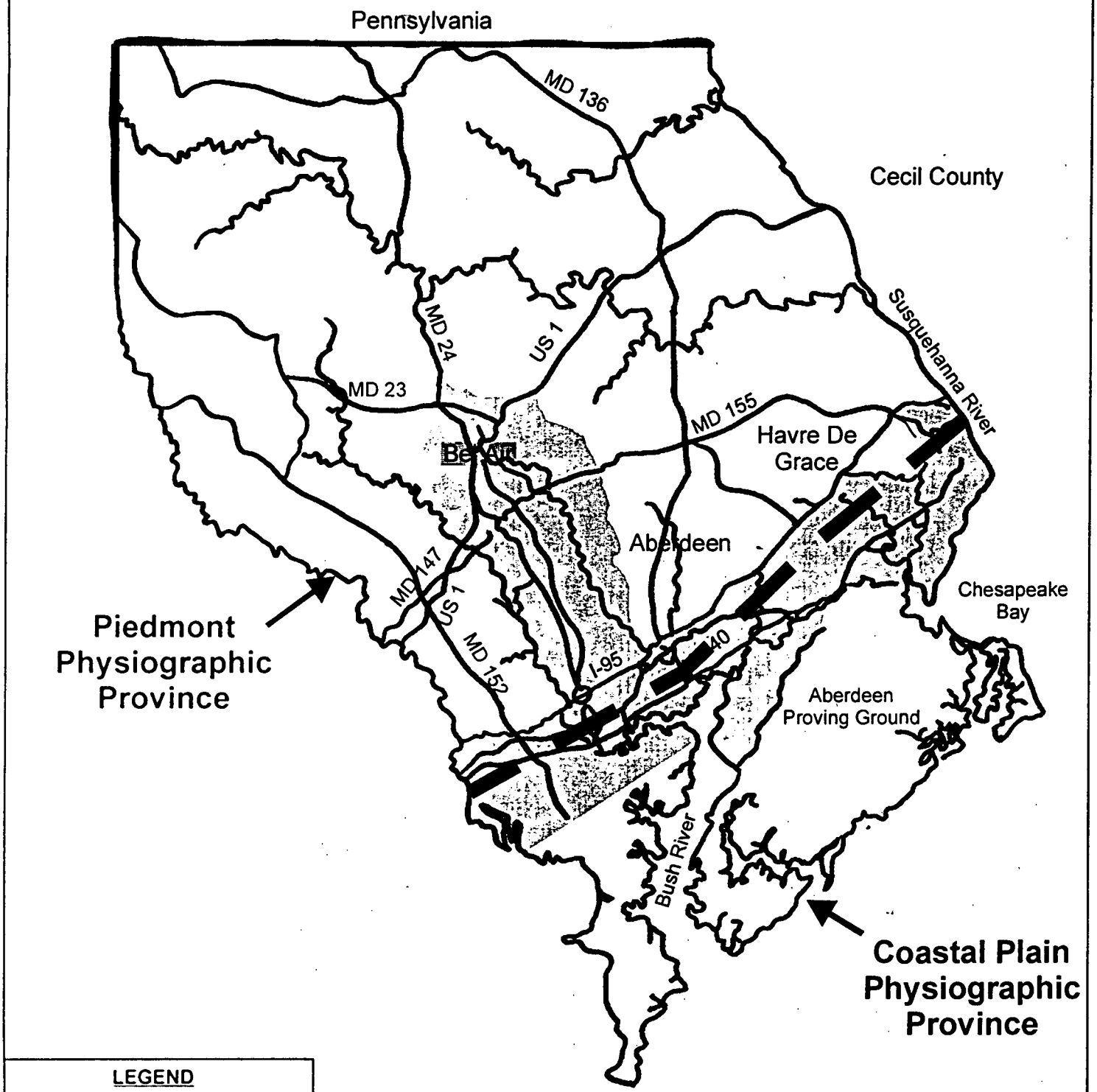
Communities - Since its inception, the Development Envelope has successfully culled much of the development outside of the envelope. Because of this, communities within the SCEA boundary but outside of the development envelope will be much less likely to suffer from secondary or cumulative effects. Since the Bel Air Bypass is proposed to be constructed within the Development Envelope, the potential for there to be secondary and cumulative effects is greater. However, because the Bel Air Bypass is proposed to be built almost entirely within existing right-of-way, it is not expected to have secondary effects on communities within the SCEA boundary. It is reasonably foreseeable that cumulative effects such as increased traffic as a result of planned growth in the vicinity of the project's interchanges will detract from the quality of life that is currently available within the SCEA boundary.

Community Facilities - The Bel Air Bypass has no direct impacts to community facilities within the SCEA boundary. Most of the local public facilities, including the post office, courthouse, library, police and fire facilities are located in and around the town of Bel Air. Schools are interspersed throughout the SCEA boundary, however the largest concentration is also in and around the Town of Bel Air. As this project is meant to accommodate existing and planned development rather than facilitate new development, it is unlikely that the Bel Air Bypass will result in secondary effects to these resources. As the Development Envelope continues to capture large amounts of the County's development, the cumulative effect will be greater demand for these community facilities. However, this project will not contribute significantly to this effect.

Geology, Topography, and Soils – The majority of the SCEA boundary is within the Piedmont Physiographic Province, although the eastern portion of the SCEA boundary is within the Coastal Plain Physiographic Province (see Figure 5-6). The underlying geology within the SCEA boundary comprises 16 of the 22 geologic formations identified in Harford County, ranging in age from the Quaternary period to the Paleozoic age. The formations within the SCEA boundary comprise the majority of the county's underlying geology with the exception of slate along the Peach Bottom syncline, schist in the northwestern area of the county, and gneiss and marble along the Phoenix Dome in the western area of the county. The primary mineral resources of Harford County are stone, crushed stone, sand, gravel, and clay. The majority of these natural deposits are located along the Fall Line that separates the two physiographic provinces. Lands identified by the Maryland Geological Survey as having the potential for sand and gravel mining are located in the area traversed by Interstate 95 and are within the planned development envelope. Because direct impacts to the underlying geology from the Bel Air Bypass are not foreseen, secondary and cumulative effects to geological resources within the SCEA boundary are not anticipated.

Topography within the Piedmont portion of the SCEA boundary is composed of rolling valleys and ridges created by the weathering and erosion of the underlying rock formations. The highest elevations occur near Lancaster Corner (elevation 580) in the western portion of the SCEA boundary, and the lowest elevations are near Norris Corner (elevation 200). The valleys and ridges become less prominent from west to east, corresponding with the transition from the Piedmont to the Coastal Plain. Coastal Plain topography is much more gradual than Piedmont topography, and ranges from high points between elevation 200 and 300, to near sea level at Otter Point Creek and the Bush River. Although changes in topography to accommodate stream crossings and cuts through ridgetops from the Bel Air Bypass are proposed, these changes are not anticipated to contribute significantly to cumulative changes in topography in the SCEA boundary. Secondary impacts resulting from these changes in topography are not anticipated to be significant.

According to the Soil Survey of Harford County Area, Maryland (United States Department of Agriculture, 1975), lands within the Piedmont portions of the SCEA boundary are underlain by soils of the Manor-Glenelg, Chester-Glenelg-Manor, Glenelg-Manor, Neshaminy-Aldino-Watchung, Montalto-Neshaminy-Aldino, and Legore-Neshaminy-Aldino soil associations. Lands within the Coastal Plain portions of the SCEA boundary are underlain by soils of the Beltsville-Loamy and Clayey land-Sassafras soil association. Soils of floodplains and low terraces within the SCEA boundary include the Elsinboro-Delanco soil association and the Codorus-Hatboro-



U.S. 1 from MD 147 to North of MD 24/924

STATE HIGHWAY ADMINISTRATION

Figure 5-6

Harford County Physiographic Provinces

Alluvial land association. Within the SCEA boundary, the past trends of the development of vacant lands to developed lands can lead to the increased potential of soil erosion and sediment runoff during the construction period. Since 1970, erosion and sediment control practices have been required by the Maryland Department of the Environment (MDE) to minimize the effects of soil erosion from land development activities on the landscape and receiving water bodies. The development of the US 1 Bel Air Bypass will require the clearing and grading of land for construction of the roadways. However, it is anticipated that with sediment and erosion control Best Management Practices (BMP's) soil erosion will be minimized and will not lead to significant cumulative effects to soil resources in the SCEA boundary. Additionally, although an increased potential exists for runoff from the construction areas to add sediment loads to receiving streams, it is foreseen that the use of BMP's during construction will minimize this potential and not lead to secondary effects to soils from erosion.

Groundwater Resources – Groundwater is used for most public water supplies within the SCEA boundary, with the exception of portions of the Town of Bel Air which obtains public water from the Maryland-American Water Company located on Winters Run at Bel Air Road. Groundwater well yields in the SCEA boundary vary greatly between the Piedmont and the Coastal Plain. Aquifers of the Coastal Plain include the Potomac Group and the Talbot Group. These aquifers tend to have higher yields than those of the Piedmont, because groundwater occupies the numerous interstitial spaces of these unconsolidated sediments. The Piedmont aquifers of the SCEA boundary tend to have lower yields than those of the Coastal Plain because groundwater occupies the relatively smaller joints, faults, and fractures of the crystalline rock.

According to the Maryland Geological Survey, the water quality of groundwater in Harford County is good. Groundwater in Harford County is a soft to moderately hard calcium magnesium bicarbonate type, with low dissolved solids and is nearly neutral to slightly acidic. The State of Maryland classifies aquifers as Type I, Type II, or Type III Aquifers. For Type I Aquifers, the constituents of waters may not exceed primary or secondary drinking water standards established in Code of Maryland Regulations (COMAR) 26.04.01. (COMAR regulations on groundwater quality and drinking water have been requested from MDE, but were not received for inclusion in this document.)

For Type II Aquifers, the constituents within water after treatment by household softening systems may not exceed primary or secondary drinking water standards, except for total dissolved solids. For Type III Aquifers, the constituents of water do not need to meet the standards of Type I or Type II Aquifers.

According to Water Resources Data reports, and discussions with the United States Geological Survey (USGS), water quality data for the only monitoring well within the SCEA boundary has been collected since 1988. Therefore, to accommodate the SCEA time frame, water quality records for a groundwater well located elsewhere in Harford County were reviewed to gain insight on groundwater quality trends in the Harford County area for the SCEA time frame. Water quality records for well HA Ca 23, located in Gunpowder State Park near the village of Hess, were reviewed for the years 1974, 1990, and 1997 and are presented in Table 5-19.

TABLE 5-19
GROUNDWATER QUALITY MONITORING DATA FOR
WELL HA CA 23 AT GUNPOWDER STATE PARK

	1974	1990	1997
pH	nr	6.1	6.0
Dissolved Silica (MG/L)	22	23	23
Total Iron (UG/L)	70	2800	1500
Total Manganese (UG/L)	20	<10	<13
Dissolved Calcium (MG/L)	4.9	7.4	8.0
Dissolved Magnesium (MG/L)	3.0	3.9	4.3
Dissolved Sodium (MG/L)	6.3	7.1	6.4
Dissolved Potassium (MG/L)	1.8	2.1	2.1
Dissolved Chloride (MG/L)	4.2	7.5	9.5
Dissolved Fluoride (MG/L)	0.2	<0.1	<0.1
Dissolved Solids (MG/L)	73	81	95

nr = Not recorded.

Because the COMAR regulations were not yet received for inclusion in this document, it is unknown whether the recorded levels of water quality constituents for groundwater well HA Ca 23 meet the State of Maryland drinking water quality standards for Type I Aquifers. Because direct impacts to the groundwater resources from the US 1 Bel Air Bypass are not foreseen, secondary and cumulative effects to groundwater resources within the SCEA boundary are not anticipated.

Surface Water Resources – Surface waters within the SCEA boundary include those within the Bynum Run, Thomas Run, Lower Winters Run, Atkisson Reservoir, Deer Creek, and Saint Omer Branch watersheds. Lower Winters Run and the upstream portions of Atkisson Reservoir to Bel Air Road are classified as a Use I-P (Water Contact Recreation and Protection of Aquatic Life)

streams according to the use classifications set forth in COMAR 26.08.02. Bynum Run is classified as Use III (Natural Trout) waters. The portion of Winters Run upstream of Bel Air Road, Deer Creek, Thomas Run, and Saint Omer Branch are classified as Use IV-P (Recreational Trout) waters. The "P" abbreviation identifies streams that are used for public water supply. The Deer Creek Scenic River District surrounding the corridor of Deer Creek is identified as a Scenic River and its natural values are protected through this designation by the State of Maryland and the National Wild and Scenic Rivers Program. Water quality standards for the use classifications outlined in COMAR 26.08.02 are listed in Table 5-20.

TABLE 5-20
STATE OF MARYLAND SURFACE WATER QUALITY STANDARDS

	Class I (P)	Class III (P)	Class IV (P)
Bacteriological Agents	No sources of pathogenic or harmful organisms of quantities that constitute a health hazard.	Same as Use I	Same as Use I
Dissolved Oxygen	5 milligrams per liter (minimum)	5 milligrams per liter (minimum) 6 milligrams per liter (minimum daily average)	Same as Use I
Temperature	32 degrees celsius (maximum)	20 degrees celsius (maximum)	23.9 degrees celsius (maximum)
pH	6.5 (minimum) 8.5 (maximum)	Same as Use I	Same as Use I
Turbidity	150 NTU (maximum) 50 NTU (maximum monthly average)	Same as Use I	Same as Use I
Total Residual Chlorine	Not Applicable	Chlorine use prohibited for use in wastewater discharge to Use III and Use III-P waters	Not Applicable
Toxic Substances	All toxic substance criteria to protect: a.) Fresh water organisms, Estuarine organisms, The wholesomeness of fish for human consumption, and For I-P waters, public water supplies.	Same as Use I	Same as Use I

According to the Maryland Water Quality Inventory, 1993-1995 (Maryland Department of Natural Resources, 1996), most of Maryland's 17,000 miles of free-flowing rivers and streams met the

requirements of their use classifications during the 1993-1995 reporting period. Sources of water quality impairment in Maryland are primarily non-point sources, including agricultural runoff, construction, mining, dams, atmospheric deposition, and channelization. Water quality in the Upper Western Shore basin (where the SCEA boundary is located) ranges from poor in urbanizing areas to good and excellent in less developed portions of the basin. Water quality in the Deer Creek watershed is described as good, although high nitrogen and phosphorus levels have been identified in the lower portions of the watershed due to agricultural runoff and upstream sources. The report describes the water quality in the Lower Winters Run, Atkisson Reservoir, and Bynum Run watersheds, as likely being good based on land use patterns in adjacent watersheds.

Water quality records for locations within the SCEA boundary were not available from the USGS. The Harford County Department of Public Works is transmitting the results of benthic macroinvertebrate sampling conducted by a consultant at three locations in the Bynum Run watershed and monitoring data for Brentwood Park on a tributary of Winters Run. This data was not received for inclusion in this document. Stan Kollar of the Harford County Community College has been contacted to obtain a copy of his 1988 report on water quality in the Bush River watershed. However, this information was also not received for inclusion in this document. Also, Niles Primrose of the Maryland Department of Natural Resources (DNR) was contacted to identify sources of water quality and aquatic resource data. He stated that Ellen Friedman of DNR has conducted long-term benthic macroinvertebrate sampling in the Deer Creek and Bush River watersheds, however, a response from her was not received for inclusion in this document. John Grace of MDE has expressed concerns that secondary effects from the construction of the US 1 Bel Air Bypass may occur to the drinking water quality at Winters Run due to the potential for increased sediment loads to the stream. However, based on available data, an assessment of secondary and cumulative effects on water quality from the US 1 Bel Air Bypasss can not feasibly be conducted at this time.

Floodplains - The 100-year floodplains within the SCEA boundary include those associated with the major watercourses that drain the central and eastern portions of Harford County. These include the floodplains adjacent to Bynum Run, Winters Run, Thomas Run, Deer Creek, Saint Omer Branch, and many of their tributaries. Data describing losses of 100-year floodplain area in the county were not available from the Harford County Department of Planning and Zoning. However, Harford County does have a floodplain ordinance in place that restricts construction within the 100-year floodplain.

Although development of the US 1 Bel Air Bypass will entail the construction of roadway crossings at Winters Run and Bynum Run, the potential effects to flood hazards will be minimized. Therefore, secondary effects to the landscape are not anticipated from the development of the US 1 Bel Air Bypass. Additionally, the area of floodplain impacts proposed for the US 1 Bel Air Bypass is not of a magnitude to contribute to cumulative effects to 100-year floodplains within the SCEA boundary.

Wetlands – Wetlands are primarily forested, nontidal wetlands associated with the streams that are located within the SCEA boundary. To a lesser extent, emergent and scrub/shrub wetlands and wetlands associated with ponds located in the headwaters are present along these streams within the SCEA boundary. According to the Maryland Office of Planning (MOP), 30 acres of wetlands in Harford County were converted to other land cover from 1973 to 1990, representing a 0.4% loss in wetland acreage during that period. The result of this analysis indicates that an average of approximately 1.76 acres of wetlands per year were converted to other land cover during the period 1973 to 1990. The United States Fish and Wildlife Service reported that for selected areas in Maryland's wetlands along the Fall Line, 16.11 acres of wetlands were converted to upland between 1981 and 1988. This represents a loss of approximately 9.5% of the total wetland area within the study area. The primary causes of wetland losses were from housing development (53.2%) and road construction (41.90%). MDE's Nontidal Wetlands and Waterways Division has been contacted to obtain wetland trends information, but was unable to provide trends data by watershed for inclusion is this document. Additionally, the US Army – Corps of Engineers, Baltimore District (USACE) have been contacted to review the permit files for projects within the SCEA boundary, but the USACE did not have the permit files available for review for inclusion in this document.

Wetland impacts proposed as a result of the US 1 Bel Air Bypass range from 0.80 acres to 1.90 acres. The acreage of wetland conversion proposed for the US 1 Bel Air Bypass is significant when compared to the average annual wetland losses described above. Therefore, it is likely that the proposed wetland impacts would be of significant acreage to contribute to cumulative losses of wetlands in the SCEA boundary. Additionally, the proposed wetland losses, in comparison with the wetland loss trends described above, would be great enough to generate secondary impacts through the loss of wetland functions such as wildlife habitat, groundwater interaction, floodflow alteration, nutrient removal/retention/transformation, and sediment/toxicant retention. However, mitigation to offset these impacts in the form of wetland creation, restoration, or enhancement within the watersheds where the impacts are located may minimize the secondary and cumulative effects of wetland conversion proposed by this project.

Wildlife and Rare, Threatened, and Endangered Species – With the expansion of urbanized areas, suitable habitat for species requiring large areas of undeveloped land often declines, while habitat for urban and edge species (such as deer, squirrel, and rabbits) is often times increased. According to the MOP, 17,361 acres of land in Harford County were converted to developed land from 1973 to 1990, representing a 43.4% loss in undeveloped land during that period. The result of this analysis indicates that an average of approximately 1,021 acres of land per year were converted to developed land during the period 1973 to 1990. Based on this trend, it is predicted that Harford County will continue to experience similar losses in undeveloped land. Accordingly, it is foreseen that suitable habitat for urban edge species will be enhanced while habitat for species requiring large undeveloped land will decline.

Although the loss of undeveloped land for construction of the US 1 Bel Air Bypass is anticipated, the majority of this land is already contained within the right of way dedicated for the construction of the existing two-lane roadway. Because the undeveloped land to be impacted is comprised of a narrow strip of natural area, cumulative impacts to the loss of large tracts of undeveloped land is not anticipated. Additionally, secondary impacts on the visual aesthetics of the adjacent land uses may occur through the removal of this habitat, but the use of landscaping and buffer plantings can be used to minimize these effects.

DNR and the US Fish and Wildlife Service (USFWS) were contacted to determine the potential presence of rare, threatened, or endangered species within the SCEA boundary. Also, correspondence with DNR and USFWS determined the losses of any critical habitat for these species or losses of individuals and populations of these species. A response from DNR's Wildlife and Heritage Division in Annapolis and FWS was not received for inclusion in this document.

According to Scott Smith of DNR's Wildlife and Heritage Division in Wye Mills, habitat for the Federally and state threatened bog turtle (*Clemmys muhlenbergii*) is present within the SCEA boundary. In Maryland, bog turtles are typically found in wetland depressions associated with spring-fed seeps and springs in the Piedmont physiographic province of Baltimore, Carroll, Harford, and Cecil counties. Cattle grazing often maintains emergent wetland meadows that are suitable habitats for bog turtles, and the loss of habitat can be affected by the conversion of agricultural lands to suburban development. Other threats to the populations of these animals include illegal specimen sale and trade, predation by raccoons and other animals, exotic plant invasion, changes in hydrologic regimes, vegetation cover changes, agricultural practices, vehicle strikes, and filling of wetland areas.

DNR reported that a total of 66 historic bog turtle habitat sites were known to exist in Harford County in 1976. A DNR study in 1992 determined that bog turtle populations at 26 sites were eliminated and the status of nine sites was unknown. The data from these studies illustrates a 40-percent reduction in bog turtle population sites in Harford County during that period. This reduction in population sites can primarily be attributed to changes in hydrologic regimes from the increase in urbanization in Harford County in the 1980's.

DNR has recommended that field surveys be conducted for the presence of bog turtles in the Spring of 1999 at three wetland sites within the US 1 Bel Air Bypass project area. If it is determined that the project may result in potential impacts to bog turtle habitat, then the loss of this habitat would contribute to the cumulative losses of bog turtle habitat in Harford County. If bog turtles are found in wetlands adjacent to the disturbance area of the US 1 Bel Air Bypass, potential secondary impacts to bog turtle habitat may occur from changes in hydrologic characteristics and water quality from highway runoff. Also, the potential for automobile strikes may increase due to an increase in the width of the roadway and the corresponding longer travel distance for turtles crossing the highway.

Forests - Forest areas within the SCEA boundary are primarily of the Tulip Poplar Association, with other areas of forest land classified as the Sycamore-Green Ash-Box Elder-Silver Maple, Bald Cypress, and River Birch-Sycamore Associations. According to the MOP, 5,534 acres of forests in Harford County were converted to other land cover from 1973 to 1990, representing a 5.2% loss in forested acreage during that period. The result of this analysis indicates that an average of approximately 325 acres of forests per year were converted to other land cover during the period 1973 to 1990. Although this data provides some information on forest loss trends, the data does not account for forest losses since enactment of the Maryland Forest Conservation Act of 1991. The Harford County Department of Planning and Zoning was contacted to obtain 1990's forest loss data, but only data for the years 1996 to 1997 and incomplete data from 1997 to 1998 were obtained. Data for the years 1993 to 1996 are available from Harford County, but was not received for inclusion in this document. The 1996 data indicates that 83 acres of forest land was cleared, and 148 acres of reforestation was conducted. This data indicates that reforestation activities in accordance with the Maryland Forest Conservation Act of 1991 are underway to mitigate for forest losses from land development in Harford County.

The construction of the US 1 Bel Air Bypass will require the removal of trees and forest land, however, reforestation to compensate for forest removal will be conducted. Based on the trends data available, it appears that reforestation for forest removal is providing a level of mitigation for impacts to forest lands in Harford County. Therefore, with reforestation for forest losses, it is

anticipated that forest removal for these projects will not contribute to cumulative impacts to forest lands in Harford County. Secondary impacts of forest removal to other resources may include increased runoff rates, loss of wildlife habitat, increases of sediment runoff, and elevated surface water temperatures due to loss of shade provided by trees. As described in other sections, mitigation for increased runoff rates and elevated surface water temperatures can be offset by the use of BMP's. Increases in sediment runoff during construction can be reduced through the use of sediment and erosion control practices. Therefore, with the use of mitigation measures, the cumulative and secondary effects of impacts to forest lands are not anticipated.

Aquatic Resources – Aquatic resources within the SCEA boundary include fish and aquatic insects (known as benthic macroinvertebrate organisms) that inhabit streams and watercourses. Some species of fish and benthic macroinvertebrates are more pollution-tolerant than others, and the abundance and diversity of these organisms can indicate water quality trends. According to the Maryland Water Quality Inventory, 1993-1995 (Maryland Department of Natural Resources, 1996) bioassessment monitoring conducted by DNR at three sites in Deer Creek in 1993 showed a moderately impacted biological community or moderately impaired habitat conditions. Bioassessment of one site in 1995 at Winters Run within the Atkisson Reservoir watershed by DNR revealed a moderately impaired biological community and habitat condition. Although Bynum Run is classified as a Use III (Natural Trout) waterbody, bioassessment by DNR in 1995 revealed a moderately impacted biological community and habitat, and water temperatures likely exceed the maximum temperature for a viable trout habitat. The report, "Bush River Basin Environmental Assessment of Stream Conditions" has been requested from DNR, but was not received for inclusion in this document. The Harford County Department of Public Works is transmitting the results of benthic macroinvertebrate sampling conducted by a consultant at three locations in the Bynum Run watershed and monitoring data for Brentwood Park on a tributary of Winters Run. This data was not received for inclusion in this document. Stan Kollar of the Harford County Community College has been contacted to obtain a copy of his 1988 report on water quality in the Bush River watershed. However, this information was also not received for inclusion in this document. Also, Niles Primrose of DNR was contacted to identify water quality and aquatic resource data. He stated that Ellen Friedman of DNR has conducted long term benthic macroinvertebrate sampling in the Deer Creek and Bush River watersheds, however, a response from her was not received for inclusion in this document. Based on available data, an assessment of secondary and cumulative effects on aquatic resources from the US 1 Bel Air Bypass can not feasibly be conducted at this time.

6.0 PUBLIC MEETINGS AND COORDINATION

An Alternates Public Meeting was held on June 22, 1989 at Bel Air High School in Bel Air, Maryland, shortly after the US 1 Bel Air Bypass project was added to the project planning studies of US 1 from MD 152 to MD 147 and US 1 Business from US 1 to MD 24. One build alternate and a trumpet interchange at the intersection of MD 24 were presented. Improvements at the MD 924 interchange, although not yet developed, were also considered to be a component of the alternate.

This project was discussed at several Interagency Review Meetings. On July 21, 1993, the Purpose and Need was presented to representatives from the U.S. Army Corps of Engineers (USACE), U.S. Environmental Protection Agency (EPA), and the Maryland Office of Planning (MOP). Concerns expressed by the agencies included: a.) reducing the cross section to an urban arterial or suburban type cross section to reduce wetland impacts; b.) the explanation for higher than state-wide average accident rate; and c.) whether or not MD 24 would be widened.

Alternates Retained for Detailed Study were presented to the agencies on February 21, 1996. By that time, and in response to citizen, agency, and study team comments following both the Alternates Public Meeting and an agency field review on November 17, 1995, the Bel Air Bypass project had been separated from the other segments of the US 1/US 1 Business study and the study team had developed additional preliminary alternates. In order to minimize environmental impacts associated with the 58-foot median and to remain consistent with the Hickory Bypass project (which meets this project north of the MD 24/924 interchange), a narrower, 34-foot median concept was developed. Alternate 2, as presented at the public meeting, was split into Alternates 2A and 2B with 58' and 34' median widths, respectively. Eight interchange options were developed for the MD 24 (relocated) interchange and two were developed for the MD 24/924 interchange. The agency concerns were reducing impact to wetlands and further reducing median width to minimize environmental impacts. Agencies were explained the constraints of bridge piers, needed shoulder widths, and steep grades necessary for bridge clearance, and were assured of further profile and alignment refinements to reduce wetland and parkland impacts. Other concerns included: a.) the park-and-ride lot, its capacity, potential relocation, and use by buses (MOP); b.) stream class, relocation, and impacts (U.S. Fish and Wildlife Service); c.) why the project is being designed as a freeway (USACE); d.) what would be the impacts of a 22' median; and e.) why a bow of the road to the west rather than to the east could not be achieved.

Alternates Retained for Detailed Study were again presented to the agencies on May 21, 1997. Concerns regarded: a.) the retaining wall that would preclude the need for stream rechannelization and its proximity to the stream (USACE); b.) the status and connection to the Hickory Bypass project (USF&W); c.) the permit package and the public notice; d.) the MA and PA Heritage Trail (DNR); e.) CMS study recommendations (MOP); f.) the park-and-ride conceptual plans and locations (USACE); and g.) the constructability review of Highway Design.

At two subsequent Interagnecy Review Meetings the Cumulative Effects Scoping Approach (March 18, 1998) and the Cumulative Effects Methodologies (May 20, 1998) were presented. The USACE requested copy of the Harford County Master Plan and stated that the USACE would not put out a public notice for the entire project; agencies were assured the flexibility of the boundaries as they are somewhat dependent on the availability of data.

Meetings were also held with property owners and, in November of 1989, SHA met with the Bel Air Acres Community Association.

The Maryland Historical Trust (MHT) concurred with a determination of no effect on January 3, 1997 (See following correspondence of November 8, 1996.). This was reconfirmed on March 3, 1998 (See correspondence of February 20, 1998.) after a point of clarification regarding strip right-of-way acquistion at the Otho Scott house, HA-26, which was determined not eligible for the National Register by MHT.

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