REPORT NUMBER - FHWA-MD-EIS-97-02(F)
Federal Highway Administration Region III

US 113 PLANNING STUDY
from south of Snow Hill, Maryland to the Delaware State Line
Worcester County, Maryland

ADMINISTRATIVE ACTION

FINAL ENVIRONMENTAL IMPACT STATEMENT

Submitted Pursuant to 42 U.S.C. 4332 (2)(c) and CEQ Regulations (40 CFR 1500 et seq.)

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
REGION III, MARYLAND DIVISION

and

MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

Cooperating Agencies: U.S. ARMY CORPS OF ENGINEERS
U.S. ENVIRONMENTAL PROTECTION AGENCY

David C. Lawton — 2-12-98

FEDERAL HIGHWAY ADMINISTRATION
Director, Office of Planning and Program Development — Date

Neil J. Pedersen — 2/6/98

STATE HIGHWAY ADMINISTRATION
Director, Office of Planning and Preliminary Engineering — Date

The following persons may be contacted for additional information concerning this Final EIS document:

Ms. Renee Sigel
Planning, Research and
Environmental Team Leader
Federal Highway Administration
The Rotunda - Suite 220
711 West 40th Street
Baltimore, MD 21211
PHONE: (410) 962-4342 Ext. 116
HOURS: 7:30 a.m. - 4:30 p.m.

Mr. Louis H. Ege, Jr.
Deputy Director
Office of Planning and Preliminary Engineering
State Highway Administration
707 North Calvert Street
Mailstop C-301
Baltimore, MD 21202
PHONE: (410) 545-8500 or 1-800-548-5026
HOURS: 7:30 a.m. - 4:30 p.m.

The **Preferred Alternatives** would upgrade the remaining two-lane sections of US 113 within Maryland, thereby improving safety and traffic operations along this critical 23.8 mile transportation link on the Delmarva peninsula. Alternatives presented in the Draft Environmental Impact Statement/Section 4(f) Evaluation (dated May 1997) and at the Combined Location/ Design Public Hearing (held June 17, 1997) included the No-Build (Alternatives 1S and 1N); Transportation System Management (Alternatives 2S and 2N) primarily consisting of local intersection improvements; provision of a 20-foot wide median with guardrail plus passing lanes and turning lanes along existing 2-lane US 113 in the southern portion of the study area (Alternative 2S - 20' Median); dualization along existing US 113 in the southern (Alternative 3S) and northern (Alternative 3N) portions of the study area; and a four-lane dual highway on new location in the northern portion of the study area (Alternative 4N Modified). A combination of portions of Alternatives 3N and 4N Modified was also presented.

The **Southern Preferred Alternative** from south of Snow Hill, Maryland to south of Berlin, Maryland (16.3 miles) is Alternative 3S - 34' Median, consisting of dualization along existing US 113. The 34' wide grassed median would be narrowed to minimize wetland impacts at six (6) sensitive crossings. The **Northern Preferred Alternative** from north of Berlin, Maryland to the Delaware state line (7.3 miles) is Combination Alternative 3N/4N Modified - 34' Median, consisting of construction of a new four-lane divided highway in new location between US 113 and Shingle Landing Road and dualization along existing US 113 to the Delaware state line. The 34' wide grassed median would be narrowed to minimize wetland impacts at two (2) sensitive crossings. Environmental impacts associated with the Draft EIS Alternatives, as well as the **Preferred Alternatives**, are summarized in Table S-1 and include residential and business displacements, right-of-way acquisitions, effects upon woodlands, wetlands and Waters of the U.S., 100-year floodplain encroachment, noise impacts, and impacts to a cultural resource.

SUMMARY

US 113 Planning Study
Snow Hill, Maryland to Delaware State Line

Office of Planning and Preliminary Engineering
Maryland State Highway Administration

SUMMARY

1. Administrative Action

Federal Highway Administration:

( ) Environmental Assessment
( ) Draft Environmental Impact Statement
(X) **Final Environmental Impact Statement**
( ) Findings of No Significant Impact
( ) Section 4(f) Evaluation

2. Informational Contacts

The following persons may be contacted for additional information concerning this document:

Ms. Renee Sigel
Planning, Research and
Environmental Team Leader
Federal Highway Administration
The Rotunda - Suite 220
711 West 40th Street
Baltimore, MD 21211
PHONE: (410) 962-4342 ext. 116
HOURS: 7:30 a.m. - 4:30 p.m.

Mr. Louis H. Ege, Jr.
Deputy Director
Office of Planning and Preliminary Engineering
State Highway Administration
707 North Calvert Street
Mailstop C-301
Baltimore, MD 21202
PHONE: (410) 545-8500 or 1-800-548-5026
HOURS: 7:30 a.m. - 4:30 p.m.

3. Introduction

This final document presents the results of studies conducted for the Draft Environmental Impact Statement/Section 4(f) Evaluation (dated May 1997) as well as refinements for the **Preferred Alternatives** completed to address both National Environmental Policy Act (NEPA) and US Army Corps of Engineers Section 404 Permit requirements. NEPA focuses on environmental analyses of alternatives, whereas the Corps Section 404 permit addresses specific impacts to wetlands and Waters of the U.S. in accordance with the Clean Water Act. Although some of the alternatives presented in the Draft EIS/Section 4(f) Evaluation required the use of property from cultural resources protected under Section 4(f) of the U.S. Department of Transportation Act, the **Preferred Alternatives** have no Section 4(f) impacts.

4. Description of Proposed Action/Purpose and Need

US 113 departs from US 13 near Pocomoke City, Maryland and extends north 40 miles in Maryland and 60 miles in Delaware, rejoining US 13 in Dover, Delaware. US 113 provides a critical connection on the Delmarva Peninsula for through and local traffic, including recreation trips. The proposed action would improve the remaining two-lane sections (23.8 miles in total length) of US 113 (Worcester Highway) within Maryland, thereby improving safety conditions and traffic operations.

The project area, located in Worcester County and shown in Figure S-1, consists of two study areas:

- The **southern study area** extends along US 113 from south of Snow Hill, Maryland to south of Berlin, Maryland (approximately 16.3 miles, from latitude N 38°08'30"/longitude W 75°24'45" to latitude N 38°17'45"/longitude W 75°13'30").

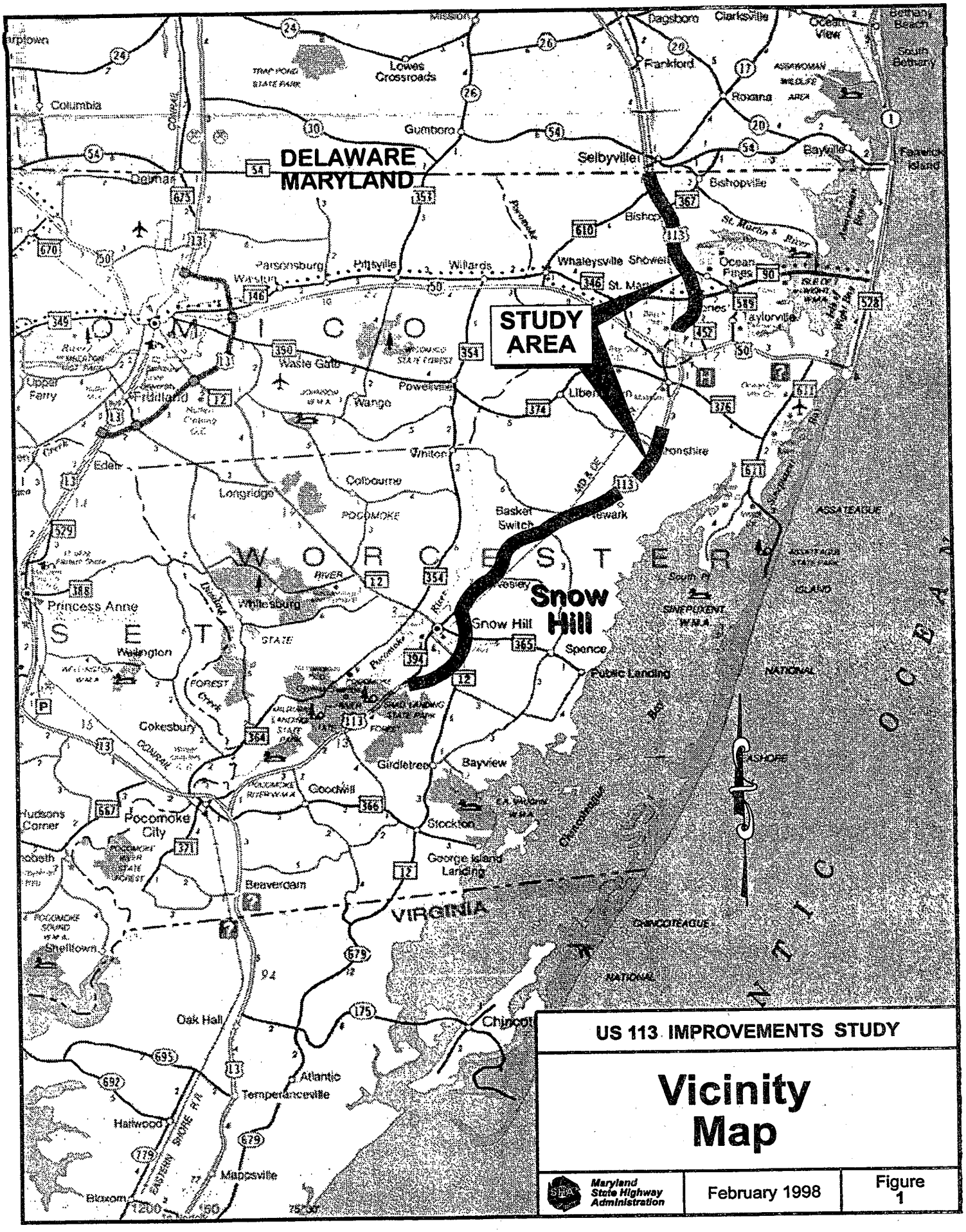
- The **northern study area** extends from north of Berlin, Maryland to the Delaware state line (approximately 7.5 miles, from latitude N 38°21'15"/longitude W 75°12'45" to latitude N 38°27'00"/ longitude W 75°14'00").

US 113 directly links Pocomoke City, Snow Hill (the Worcester County seat) and Berlin, and indirectly serves Ocean City (the second most populated city in Maryland during the summer season). US 113 dates from the late 1600's; it was an earth and shell road until 1906, when portions of it were paved. The last segment near the Delaware state line was paved in 1921.

The purpose of this study is to improve safety conditions and traffic operations along the two-lane portions of US 113 from south of Snow Hill to the Delaware state line. The need for this project is demonstrated by the number of fatal accidents which have occurred along the two-lane portions of US 113 over the past 17+ years at a rate which exceeds the statewide average for similar two-lane rural highways in Maryland. In addition, the Level of Service (LOS) for the northern study area will decline from its current LOS 'D' rating during the summer months, to an expected LOS 'F' by the design year 2020. The Purpose and Need for improvements along the two-lane portions of US 113, which are fully described in Chapter I of this document, are summarized as follows:

- **Existing Roadway Conditions**: US 113, combined with US 13 and US 50, form the backbone of the transportation system for the lower Eastern Shore of Maryland. US 113 is a four-lane divided roadway south of Snow Hill, through the Berlin area, and north of the Delaware state line. Figure S-1 shows the southern and northern study areas addressing the remaining two-lane portions of US 113. Figures S-2A through S-2D present these study areas in more detail, further defining the extent of divided and undivided roadways. The southern study area, from immediately south of Snow Hill to just south of Berlin (16.3 miles), consists of a two-lane undivided roadway with two 12-foot lanes and 10-foot shoulders. A four-lane divided highway was constructed in the late 1960's/early 1970's around the east side of Berlin. The northern study area, from north of Berlin to the Delaware state line (7.5 miles), consists of a two-lane undivided roadway with two 11-foot lanes and 8-foot shoulders. Within the northern study area, horizontal curves along US 113 at MD 452, Pitts Road, and Jarvis Road are less than desirable (see Figures S-2A through S-2D for locations of traffic signals/flashing signals).

- **Traffic Volumes and Levels of Service**: Average daily traffic (ADT) volumes range from 3,500 to 7,500 vehicles per day for the southern study area and 6,400 to 12,200 vehicles per day for the northern study area. The existing summer ADT (defined to be Saturdays between Memorial Day and Labor Day) ranges from 4,900 to 8,900 vehicles per day for the southern study area and 8,300 to 18,500 vehicles per day for the northern study area. Trucks currently make up about 14 percent of the ADT volumes on US 113 (for rural highways on the Delmarva Peninsula, 14 percent is a relatively high percentage for trucks). Approximately one third of these trucks are "light and medium duty" two to three axle trucks, with the balance being "heavy



US 113 IMPROVEMENTS STUDY

Vicinity Map

Maryland State Highway Administration

February 1998

Figure 1

duty" trucks, including tractor trailer vehicles. Historical analyses of truck operations indicate that divided highways provide a safer and therefore more preferred highway than two-lane highways. Design year 2020 traffic volumes in the southern study area are predicted to increase over these existing volumes by approximately 44 percent for both the average day and summer weekend day.

Design year 2020 traffic volumes in the northern study area are predicted to increase over these existing volumes by approximately 64 percent for both the average day and summer weekend day. Existing and projected ADT volumes are presented in Table I-1.

Drivers in rural areas typically expect less traffic congestion than do drivers in urban and suburban areas. Existing levels of traffic service (LOS) along US 113 are acceptable during an average day, however, in the summer months, the road operates at LOS 'D' in the northern study area. In 2020, US 113 is expected to operate at LOS 'C' and 'D' in the southern study area including summer weekends, but is expected to operate at LOS 'D' on weekdays all year in the northern study area, and LOS 'F' between MD 589 and the Delaware state line on summer weekends.

- **Safety:** Fatalities have been occurring along US 113 at an alarming rate. Improvements to the two-lane portions of US 113 from south of Snow Hill to the Delaware state line are needed in order to address the safety problems occurring along the corridor. A local citizen's organization, County Residents Action for Safer Highways (CRASH), has been very vocal in their support for safety improvements to address the accidents on the two-lane portions of US 113. As a direct consequence of the efforts of CRASH, the Governor and study area elected officials (senators, delegates, and mayors) requested that SHA study the characteristics of US 113 and develop solutions that will create a safer roadway. A primary goal of this project is to identify safety solutions, thereby minimizing future fatal accidents.

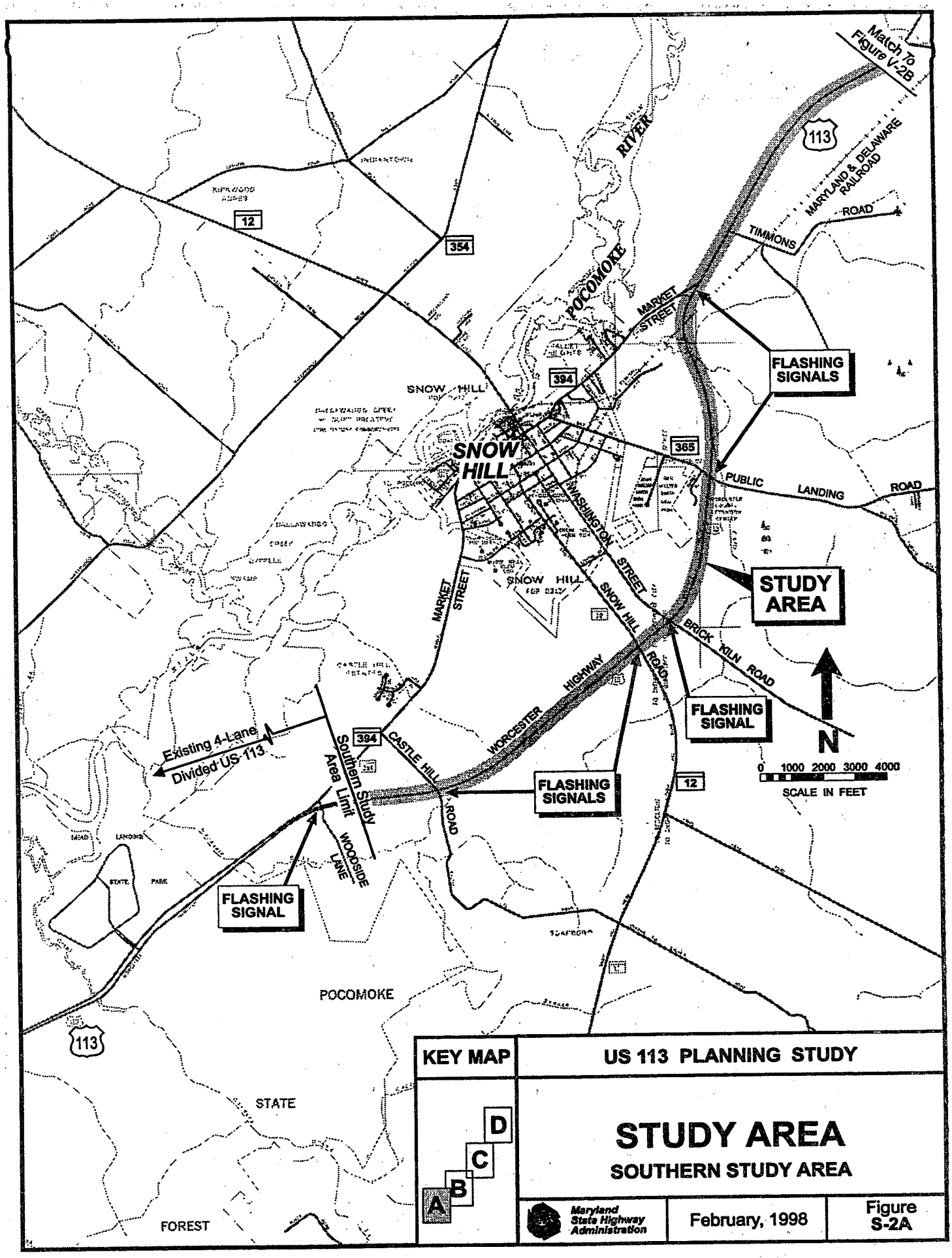
  Table I-2 presents a detailed analysis for the accidents which occurred along the two-lane portions of US 113 for the 7-year period from 1990 through 1996. The following observations may be drawn from these 7-years of accident data:

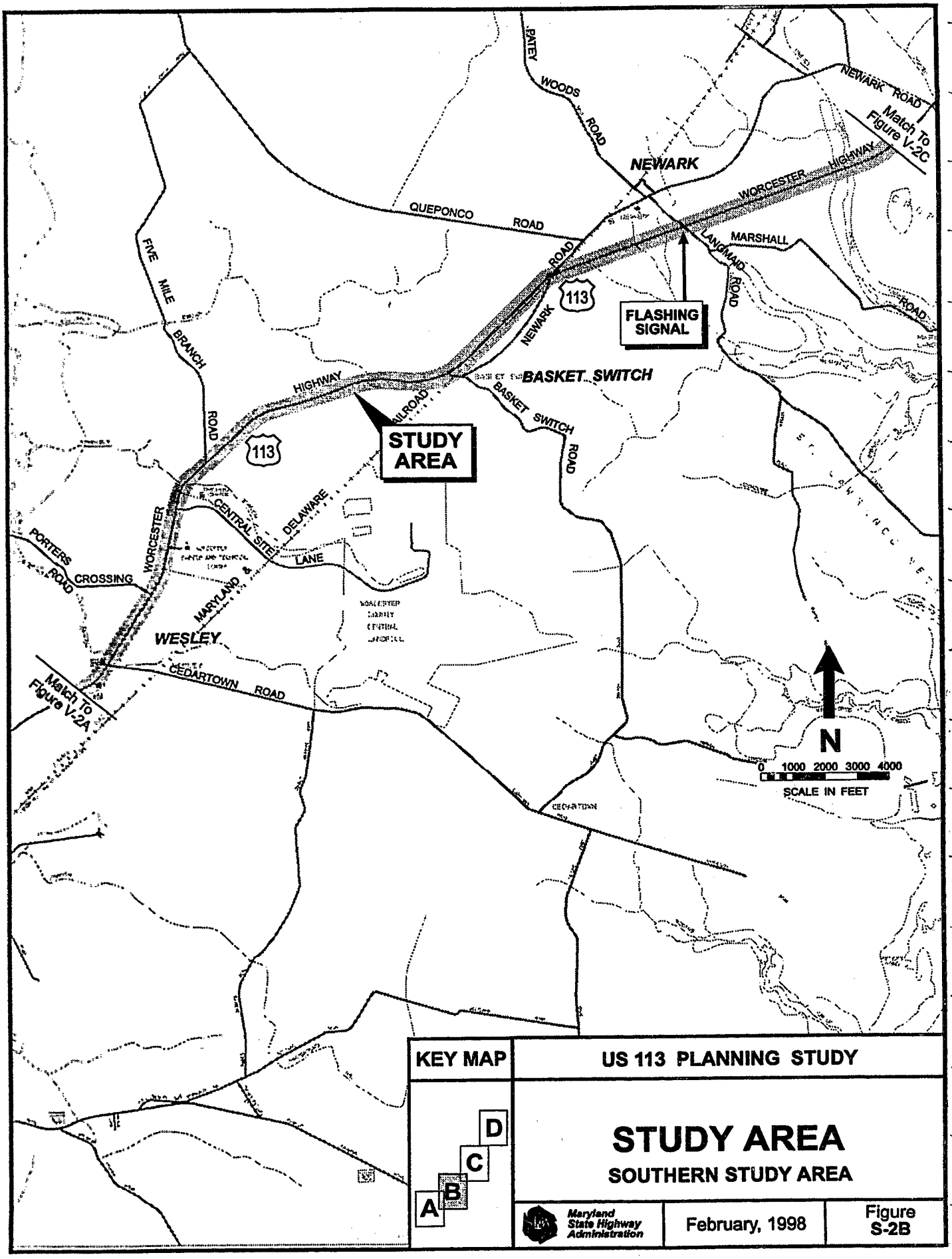
  - the statistically determined fatal accident rate is equal to or higher than the statewide average rate for **both study areas** and **significantly** greater in the **northern study area.**

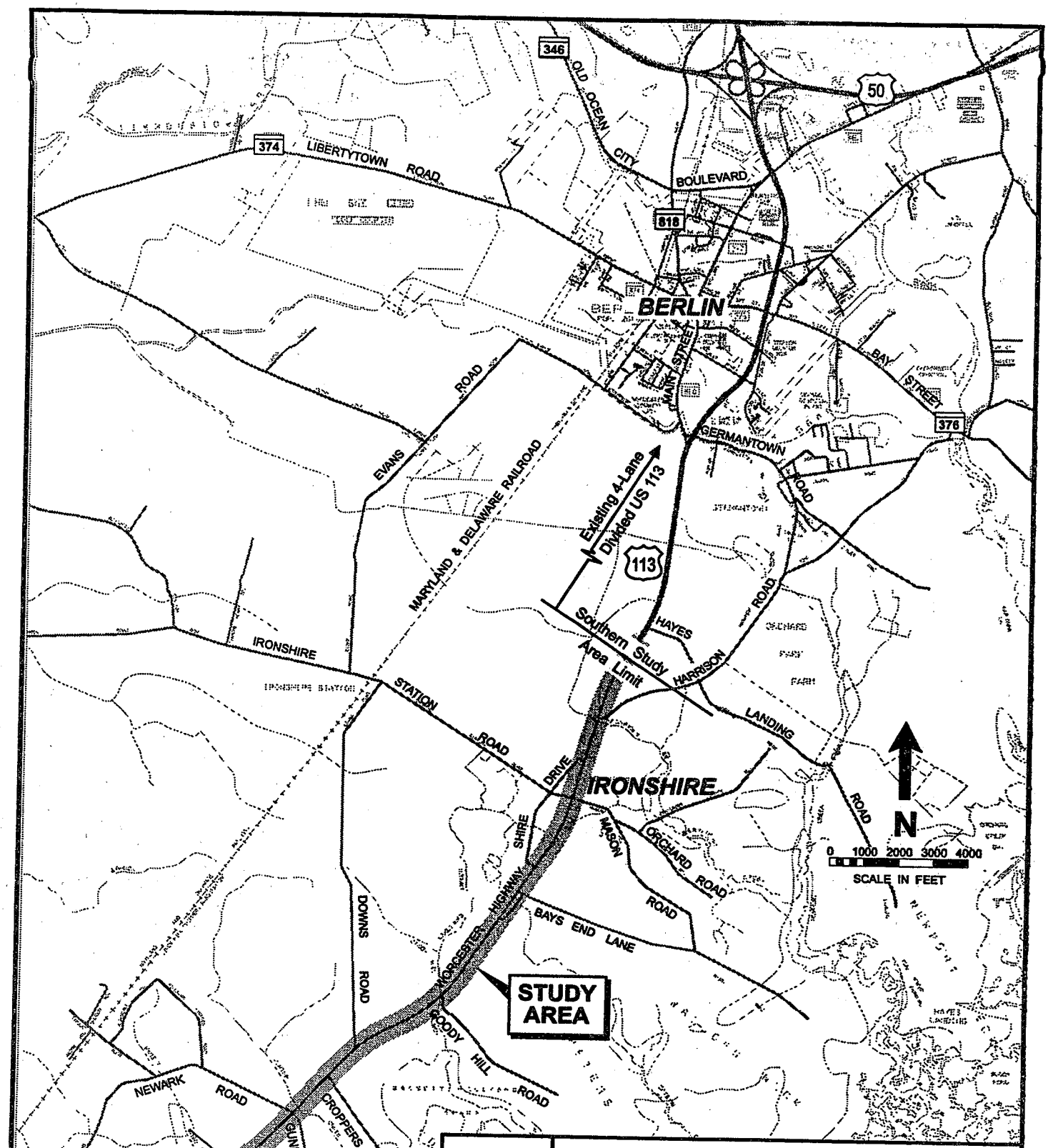
  - the injury accident rate and the overall accident rate in the **northern study area** are both greater than the respective statewide average rates for each category.

  - the accident rates in the **northern study area** for angle collisions, fixed object and left turn accidents are greater than the statewide average, and **significantly** greater statistically for angle collisions.

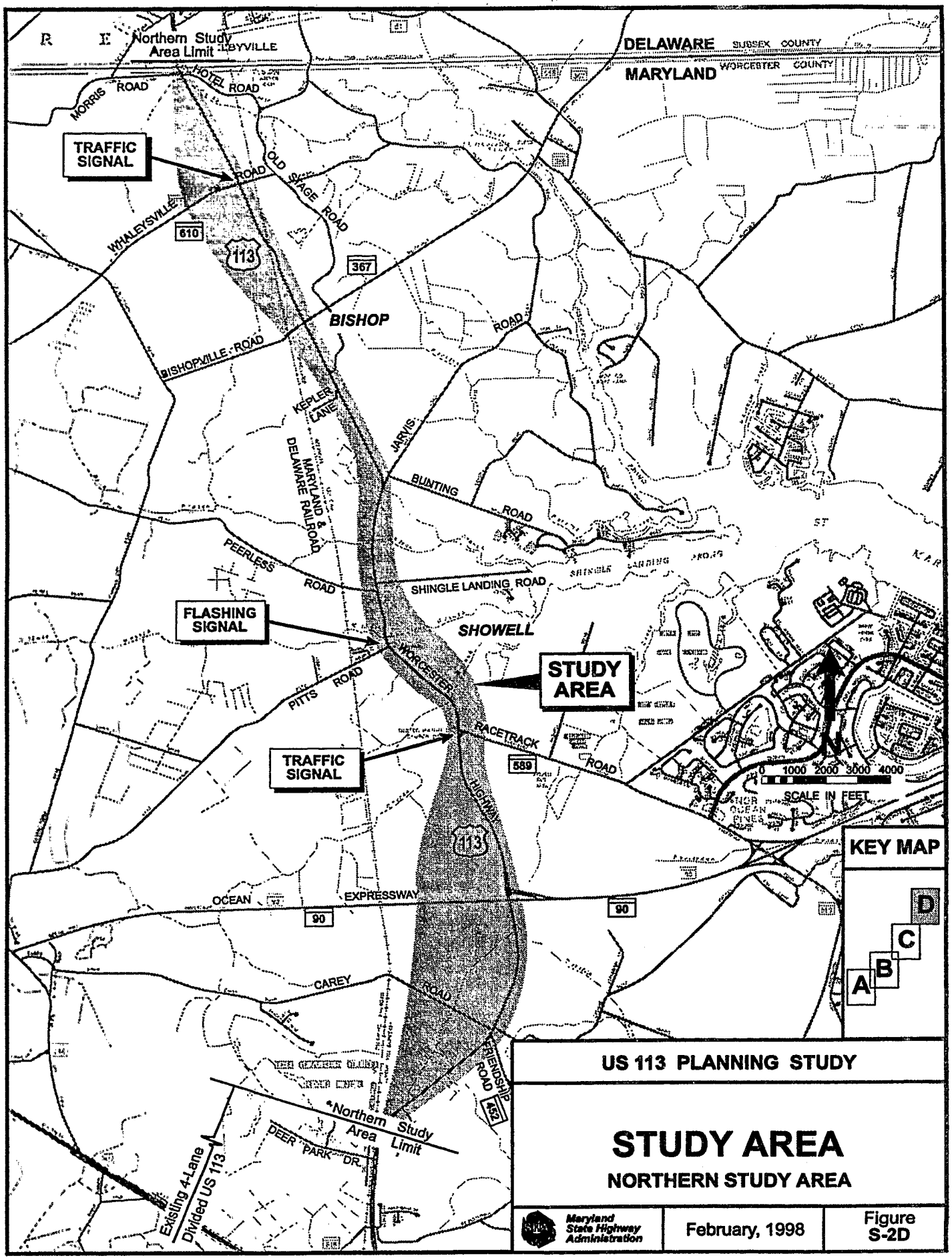
  - furthermore, in the **northern study area,** the wet surface related accident rate and alcohol related accident rate are **significantly** greater statistically than the statewide average rate.


Match To Figure V-2B
113
MARYLAND & DELAWARE RAILROAD
TIMMONS ROAD
POCOMOKE RIVER
MARKET STREET
FLASHING SIGNALS
12
354
394
365
SNOW HILL
PUBLIC LANDING ROAD
WASHINGTON STREET
SNOW HILL ROAD
STUDY AREA
BRICK KILN ROAD
WORCESTER HIGHWAY
FLASHING SIGNAL
N
0 1000 2000 3000 4000
SCALE IN FEET
Existing 4-Lane Divided US 113
Southern Study Area Limit
CASTLE HILL ROAD
FLASHING SIGNALS
WOODSIDE LANE
FLASHING SIGNAL
STATE PARK
POCOMOKE
STATE
FOREST
KEY MAP
A
B
C
D
US 113 PLANNING STUDY
STUDY AREA
SOUTHERN STUDY AREA
Maryland State Highway Administration
February, 1998
Figure S-2A


PATEY
WOODS
ROAD
NEWARK ROAD
Match To Figure V-2C
NEWARK
WORCESTER
HIGHWAY
QUEPONCO
ROAD
MARSHALL
LANDMAID
ROAD
ROAD
FIVE
MILE
BRANCH
ROAD
113
FLASHING SIGNAL
NEWARK
BASKET SWITCH
HIGHWAY
BASKET
SWITCH
ROAD
STUDY AREA
113
CENTRAL
DELAWARE
LANE
PORTERS
ROAD
CROSSING
WORCESTER
MARYLAND &
WESLEY
CEDARTOWN
ROAD
Match To Figure V-2A
N
0 1000 2000 3000 4000
SCALE IN FEET
KEY MAP
A
B
C
D
US 113 PLANNING STUDY
STUDY AREA
SOUTHERN STUDY AREA
Maryland State Highway Administration
February, 1998
Figure S-2B



KEY MAP	US 113 PLANNING STUDY	
A B C D	**STUDY AREA** **SOUTHERN STUDY AREA**	
Maryland State Highway Administration	February, 1998	Figure S-2C



US 113 PLANNING STUDY

STUDY AREA

NORTHERN STUDY AREA

Maryland State Highway Administration | February, 1998 | Figure S-2D

- In the **southern study area**, the nighttime accident rate is greater than the statewide average rate.

The high number of fatal accidents is a primary purpose for conducting this study. Fall and summer have represented the seasons that experience the highest number of fatal accidents. Figures I-1A through 1D identifies the locations and provides a description of the 42 fatal accidents for the period January 1980 through September 1997 (17 years plus 9 months). **A total of 49 people have died as a result of vehicular accidents along the two-lane portions of US 113 during the January 1980 through September 1997 period. Additional details on these fatal accidents are presented in Table I-3.** Additional accident statistics on the characteristics of two-lane highways in Maryland are presented in Appendix D of this document.

5. Alternatives Considered

This study has identified transportation alternatives that address the project need while minimizing impacts to the social, cultural, and natural environment. Following a Public Alternates Meeting held in November 1995 and based on citizen and environmental agency comments, all reasonable alternatives were presented in the Draft EIS/Section 4(f) Evaluation and at the Combined Location/Design Public Hearing, as follows:

- **No-Build Alternatives (Alternatives 1S and 1N)**

The No-Build Alternatives provided no significant improvements to the existing roadways; minor improvements would have occurred as part of normal maintenance and safety operations. The routine maintenance operations would have not measurably reduced the accident rate or affect roadway capacity. Although the No-Build Alternatives would not have met the project need, they were used as the baseline for comparison with the other alternatives.

- **Transportation Systems Management Alternatives (Alternatives 2S and 2N)**

The Transportation Systems Management (TSM) Alternatives provided improvements to 41 of the 45 existing intersections along US 113 and a full length pavement overlay in order to enhance safety and reduce traffic congestion without major alteration to the existing two-lane highway. The improvements would have been part of an integrated plan of phased safety and capacity improvements. The TSM Alternatives included short-term spot improvements such as signing and marking, street lighting, warning flashers, traffic signals and intersection relocation; as well as longer-term improvements such as additional turning, acceleration/deceleration, and bypass lanes; and skid resistant pavement overlays with rumble slots along the centerline and edge of travel lane.

- **2-Lanes with 20' Median Alternative (Alternative 2S-20' Median)**

This alternative provided a 20-foot wide median (either paved or grass) with guardrail and typically one (1) lane per direction along existing US 113 in only the southern study area. Designed in accordance with 60 MPH criteria, 10-foot wide paved shoulders and 20-foot wide safety grading would have been provided (except in environmentally sensitive areas, where the safety grading

would have been replaced by guardrail to reduce impacts). At intersections, left turn lanes would have been provided in the median; right turn lanes would have been provided where warranted by traffic volumes. In order to facilitate passing maneuvers, four (4) passing lanes 12-foot wide and approximately 1 to 1.25 miles in length (two for northbound and two for southbound traffic) would have been provided. Passing would have been prohibited at all other locations.

- **Dualization Alternatives (3S, 3N, 4N Modified, and Combination Alternative)**

Each of the Dualization Alternatives proposed a four-lane divided roadway with a median (both 20-foot wide and 34-foot wide medians are being evaluated). Access would be partially controlled and landscaping in the median and on the roadside would be included. The Southern Dualization Alternatives were evaluated in accordance with 60 MPH design criteria (Alternative 3S); 50 MPH and 60 MPH design criteria was evaluated for the Dualization Alternatives along existing US 113 in the northern study area (Alternative 3N); the new location and combination alternatives were evaluated for 60 MPH design criteria. The northern Dualization Alternatives (Alternatives 3N, 4N Modified, and the Combination Alternative) were developed in segments with common endpoints so that they could be used in various combinations to produce the alternative with the least impacts and lowest cost while still meeting the project need.

Dualization on Existing Alignment (Alternatives 3S and 3N): The dualization of existing US 113 would have involved the construction of a new two-lane roadway adjacent to the existing facility and the retention of the existing roadway as the northbound or southbound roadway to the extent possible in both the southern and northern study areas. These alternatives would have used existing right-of-way where possible. A new interchange would have been provided along this alignment at MD 90.

Dualization on New Alignment (Alternative 4N Modified): The dualization on new alignment would have involved the construction of a new four-lane divided roadway only in the northern study area. The roadway would have been constructed on new location to minimize impacts to residential and commercial properties. A new interchange would have been provided along this alignment at MD 90. The preliminary new alignment alternatives presented at the Alternates Public Meeting in November 1995 were combined and revised to create Alternative 4N Modified. These revisions resulted in fewer impacts to the natural and socioeconomic environments.

Combination Alternative: A Combination Alternative which used parts of Alternative 3N (60 MPH design speed only) and Alternative 4N Modified was also considered in the northern study area. The Combination Alternative would have followed the Alternative 4N Modified alignment from US 50 through the previously graded interchange area at MD 90, then crossed US 113 near MD 589 and bypassed the Town of Showell to the east. The Combination Alternative would have tied back into existing US 113 just north of Showell, and then followed Alternative 3N along the existing alignment of US 113 to the northern project terminus at the Delaware state line. A new interchange would have been provided along this alignment at MD 90.

- **SOUTHERN PREFERRED ALTERNATIVE**
  Alternative 3S-34' Median
  Alternative 3S-34' Median is preferred for the Southern Study Area. The dualization of existing US 113 consists of two northbound lanes (with shoulders) and two southbound lanes (with shoulders) typically separated by a median 34-feet in width with guardrail (8-feet paved and 26-feet grass). At the crossing of Purnell Branch (Wetland W-8), a narrower 16-foot wide median and an epoxy coated sheet pile wall will be provided along the west side of the roadway to minimize wetland impacts. At Wetlands W-15, W-16 and W-17, a 16-foot wide median is also provided. At Wetlands W-2 and W-12, the median further narrows to paved 10-feet, also to minimize wetland impacts. The design speed and roadside grading will be consistent with AASHTO standards for 60 MPH. For the majority of this length, existing US Route 113 is used as either the northbound or southbound roadway. See Figures S-3A, -3B and -3C. The seven (7) plates for the **Southern Preferred Alternative** are presented in Appendix A (scale: 1" = 400').

- **NORTHERN PREFERRED ALTERNATIVE**
  Combination Alternative 3N/4N Modified - 34' Median
  Combination Alternative 3N/4N Modified - 34' Median is preferred for the Northern Study Area. These improvements will provide a new four-lane divided highway (with shoulders) from north of Berlin to Shingle Landing Road/Peerless Road and dualization along existing US 113, consisting of two northbound lanes (with shoulders) and two southbound lanes (with shoulders). A new interchange will be provided at MD 90, and the roadway will typically be separated by a median 34-feet in width with guardrail (8-feet paved, 26-feet grass). At wetland W-30, the dualized roadway will be separated by a 10-foot wide paved median to minimize impacts. At Wetland W-31, a median 16-feet wide in width will be provided. Near Racetrack Road, the alignment has been shifted slightly west to permit use of a portion of the existing US 113 box culvert crossing of Church Branch, thereby reducing impacts at Wetland W-28 and avoiding W-29. This shift places the southbound roadway for new US 113 in approximately the same location as the existing two-lane/two-way roadway for US 113 adjacent to St. Martin's Church. The design speed and roadside grading will be consistent with AASHTO standards for 60 MPH. See Figure S-3D. The three (3) plates for the **Northern Preferred Alternative** are presented in Appendix A (scale: 1" = 400').

6. Summary of Environmental Impacts

The majority of the US 113 Study Area is rural, with adjacent land uses consisting of agricultural land, rural residential and business developments, several historic properties, forested areas, and wetlands/Waters of the U.S. Table S-1 presents a summary of the environmental impacts for each alternative presented in the Draft EIS/Section 4(f) Evaluation (dated May 1997) and at the Combined Location/Design Public Hearing (held June 17, 1997) as well as the **Preferred Southern Alternative** and the **Preferred Northern Alternative.**

- **Alternatives 1S and 1N** (No-Build) were evaluated as the baseline condition and would have had no environmental impacts.

- **Alternatives 2S and 2N** (TSM) were proposed primarily within existing right of way and would have had minimal environmental impacts.

- **Alternative 2S - 20' Median (60 MPH)** (2 lanes with 20-foot wide median along existing US 113 in the southern study area) would have required the acquisition of 4 residences (1 minority), 1 business, and 31 acres of additional right-of-way. Furthermore, 5.8 acres of wetlands, 9.5 acres of floodplains, 39 acres of upland forest, 8 acres of upland meadow, and 56 acres of landscape/turf areas would have been required. Two (2) areas of archeological resources were affected.

- **Alternative 3S - 20' Median (60 MPH)** (dualize along existing US 113 in the southern study area) would have required the acquisition of 2 residences (1 minority), 1 business, and 67 acres of additional right-of-way. Furthermore, 11.8 acres of wetlands, 7.1 acres of floodplains, 47 acres of upland forest, 10 acres of upland meadow, and 67 acres of landscaped/turf areas would have been required. Ten (10) areas of archeological resources were affected.

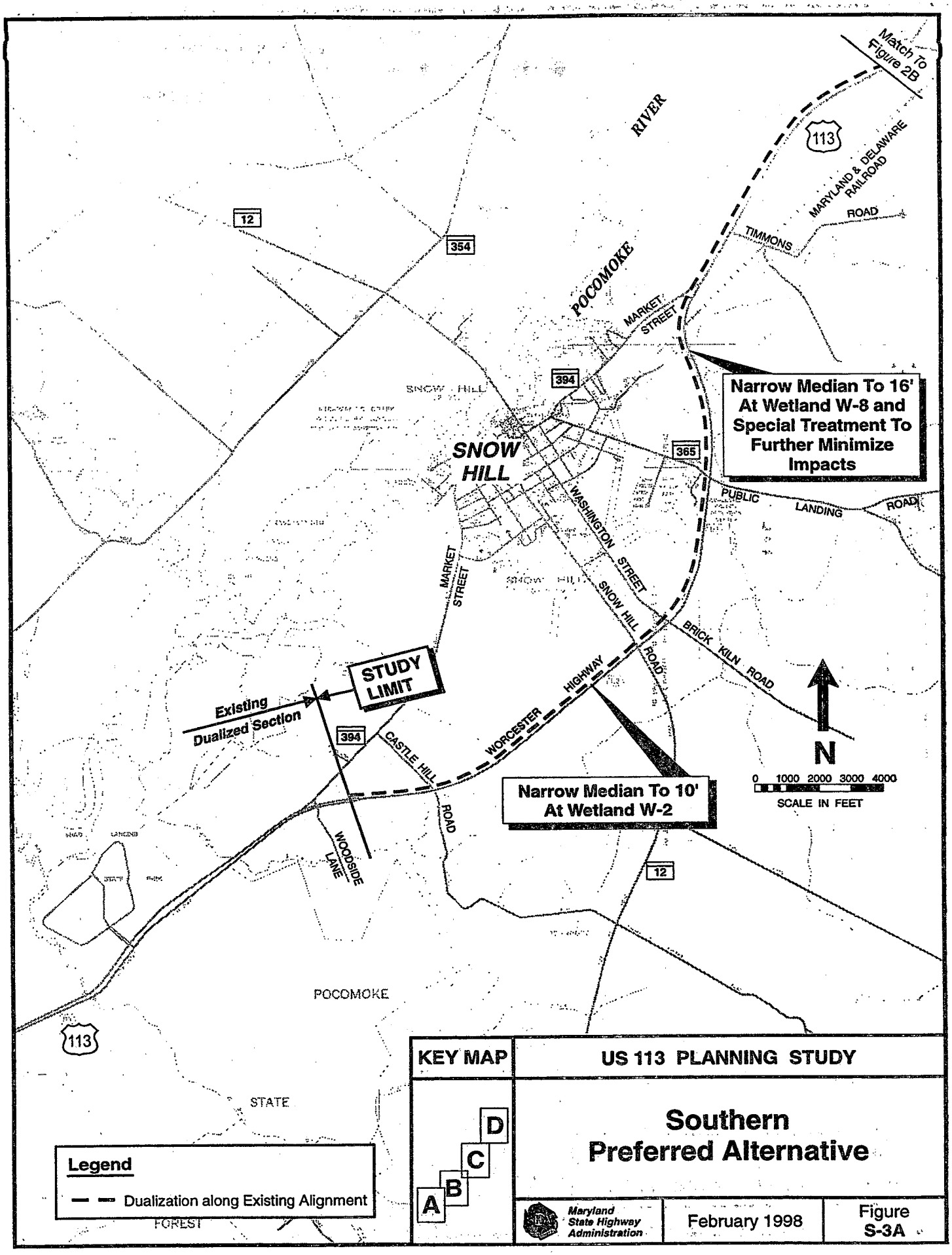
- **Alternative 3S - 34' Median (60 MPH)** (dualize along existing US 113 in the southern study area)would have required the acquisition of 2 residences (1 minority), 1 business, and 74 acres of additional right-of-way. Furthermore, 13.6 acres of wetlands, 8.4 acres of floodplains, 52 acres of upland forest, 11 acres of upland meadow, and 74 acres of landscaped/turf areas would have been required. Ten (10) areas of archeological resources were affected.

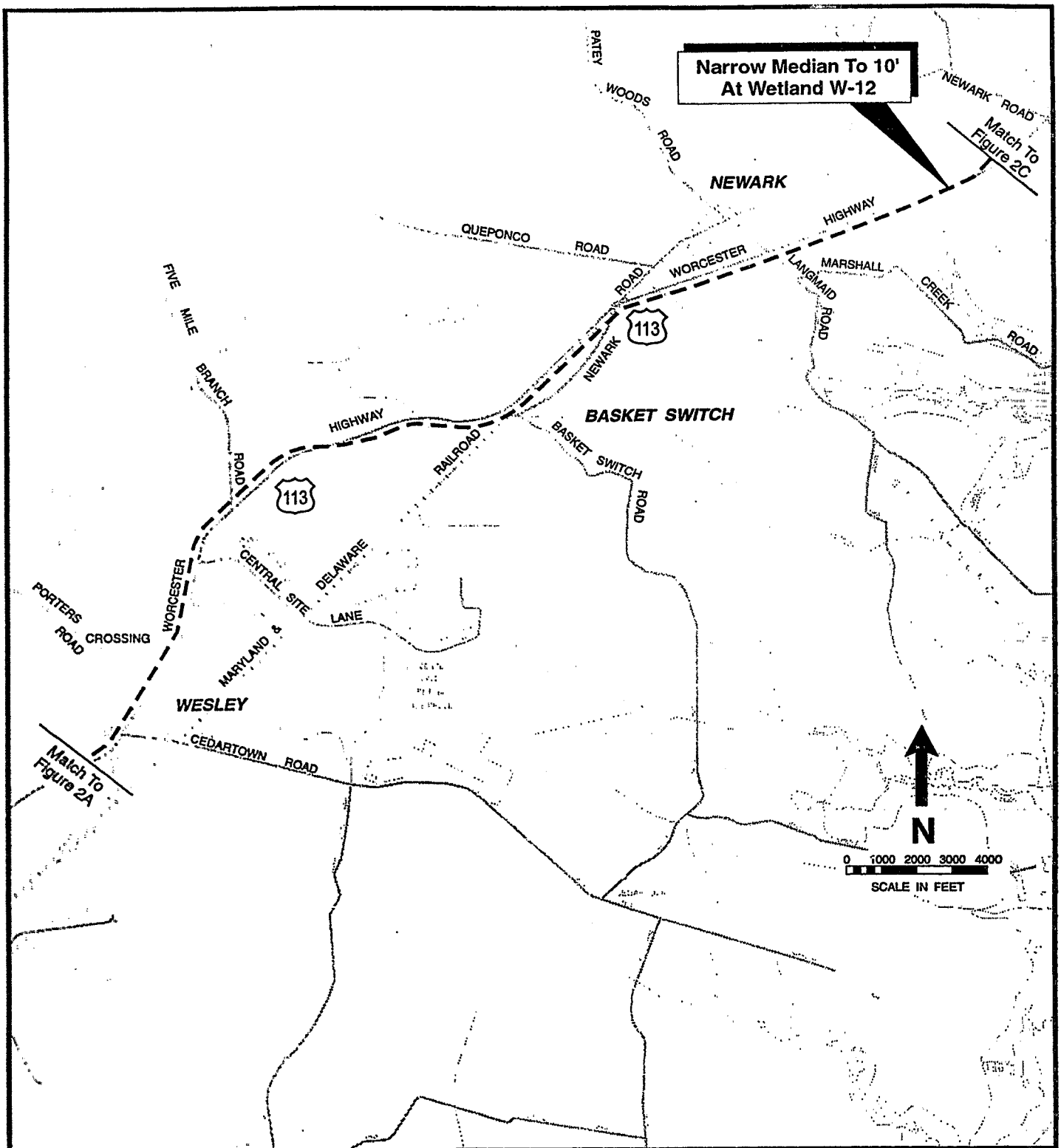
- **Alternative 3N - 20' Median/50 MPH** (dualize along existing US 113 in the northern study area) would have required the acquisition of 19 residences (5 minority), 7 businesses, and 86 acres of additional right-of-way (including a total of 0.99 acres from NRE three historic properties). Furthermore, 3.6 acres of wetlands, 5.2 acres of floodplains, 14 acres of upland forest, 15 acres of upland meadow, and 46 acres of landscaped/turf areas would have been required. Six (6) areas of archeological resources were affected.

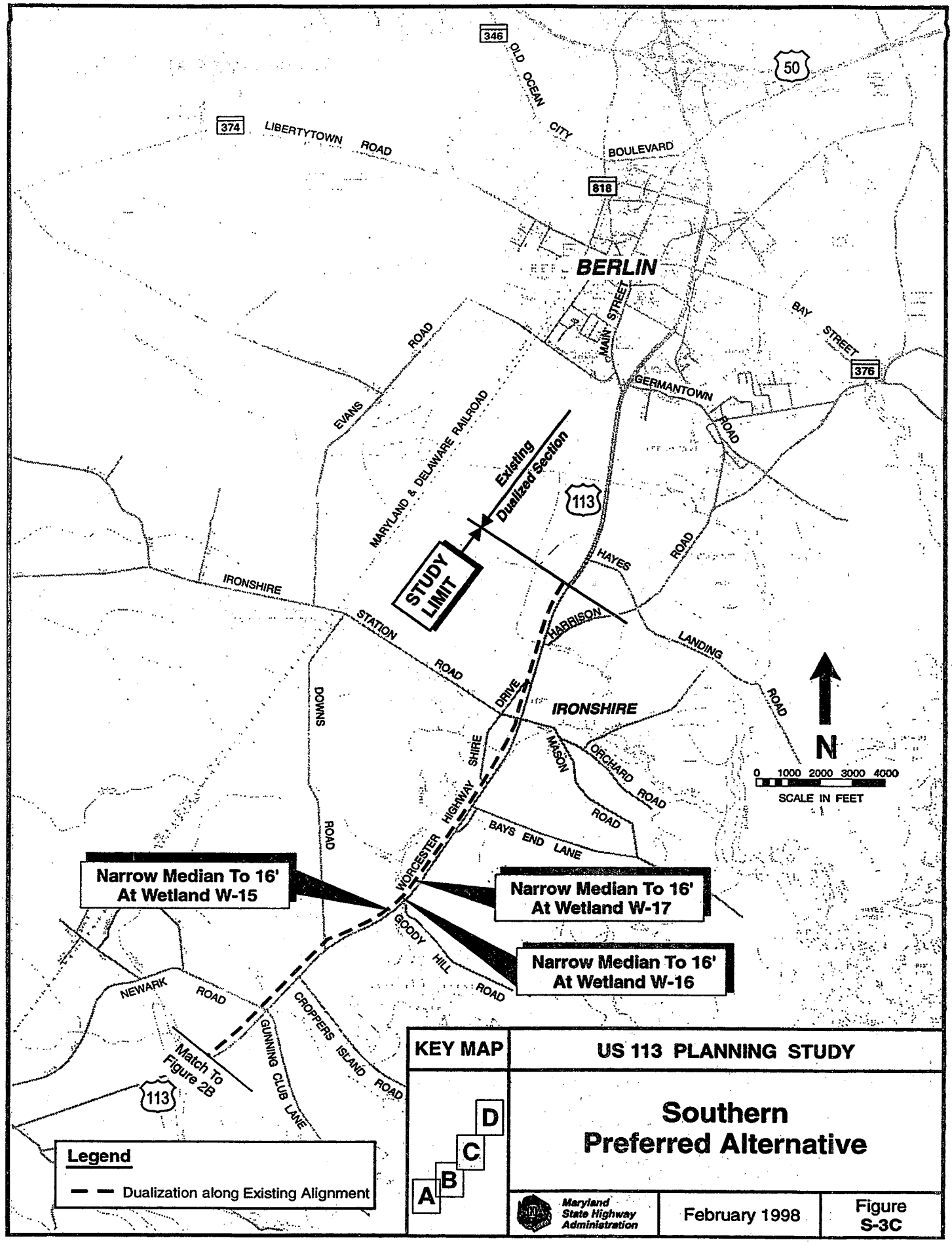
- **Alternative 3N - 34' Median/50 MPH** (dualize along existing US 113 in the northern study area) would have required the acquisition of 22 residences (5 minority), 7 businesses, and 97 acres of additional right-of-way (including a total of 1.13 acres from NRE three historic properties). Furthermore, 4.3 acres of wetlands, 5.7 acres of floodplains, 16 acres of upland forest, 17 acres of upland meadow, and 52 acres of landscaped/turf areas would have been required. Six (6) areas of archeological resources were affected.

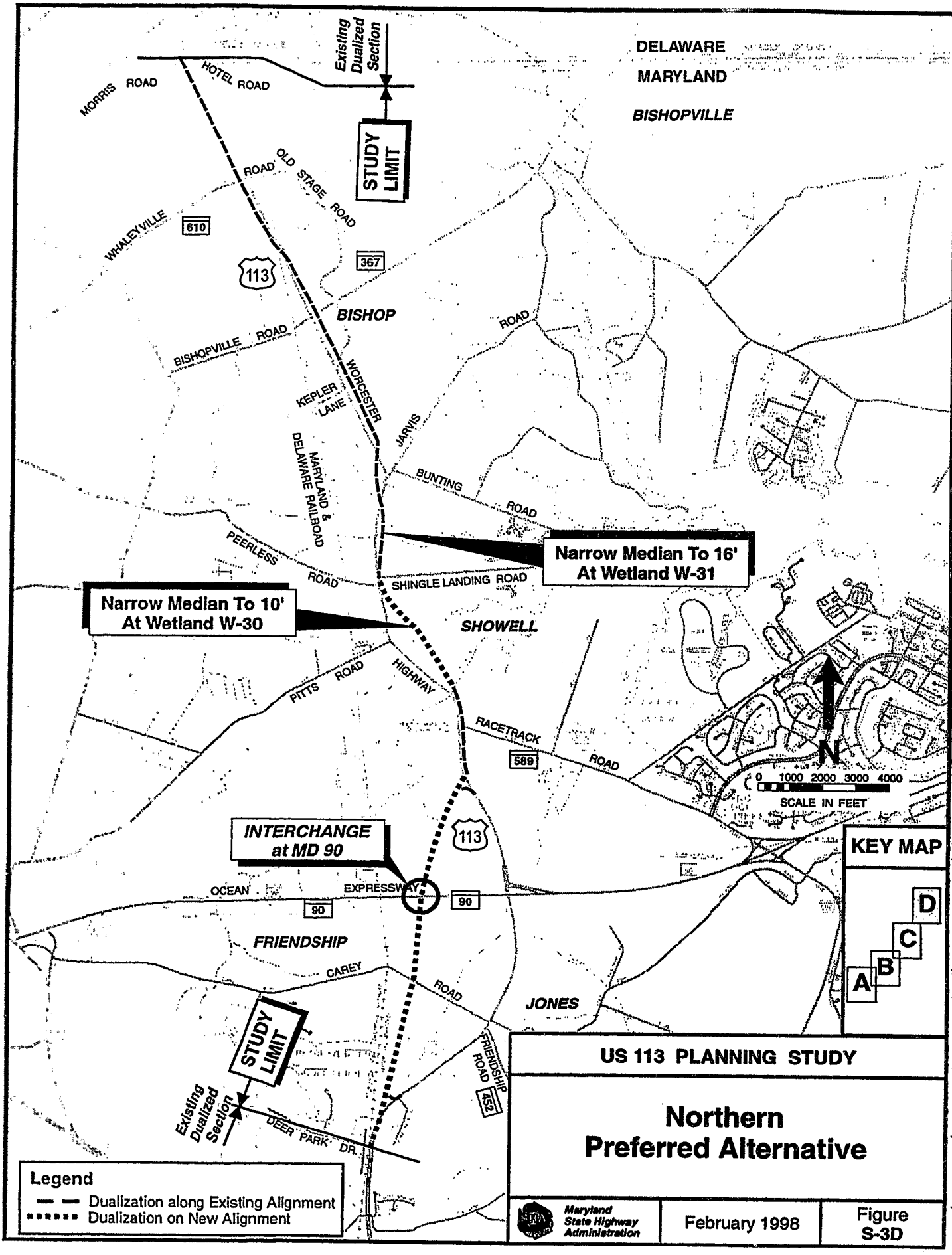
- **Alternative 3N - 20' Median/60 MPH** (dualize along existing US 113 in the northern study area) would have required the acquisition of 23 residences (5 minority), 6 businesses, and 122 acres of additional right-of-way (including a total of 1.11 acres from NRE three historic properties). Furthermore, 6.6 acres of wetlands, 8.0 acres of floodplains, 15 acres of upland forest, 17 acres of upland meadow, and 51 acres of landscaped/turf areas would have been required. Six (6) areas of archeological resources were affected.

- **Alternative 3N - 34' Median/60 MPH** (dualize along existing US 113 in the northern study area) would have required the acquisition of 24 residences (5 minority), 6 businesses, and 136 acres of additional right-of-way (including a total of 1.36 acres from NRE three historic


Match To Figure 2B
RIVER
POCOMOKE
113
MARYLAND & DELAWARE RAILROAD
ROAD
TIMMONS
12
354
MARKET STREET
394
SNOW HILL
SNOW HILL
365
Narrow Median To 16' At Wetland W-8 and Special Treatment To Further Minimize Impacts
PUBLIC LANDING ROAD
WASHINGTON STREET
MARKET STREET
SNOW HILL ROAD
BRICK KILN ROAD
STUDY LIMIT
Existing Dualized Section
394
CASTLE HILL ROAD
WORCESTER HIGHWAY
Narrow Median To 10' At Wetland W-2
N
0 1000 2000 3000 4000
SCALE IN FEET
WOODSIDE LANE
12
POCOMOKE
113
STATE
FOREST
Legend
Dualization along Existing Alignment
KEY MAP
A
B
C
D
US 113 PLANNING STUDY
Southern Preferred Alternative
Maryland State Highway Administration
February 1998
Figure S-3A


Narrow Median To 10'
At Wetland W-12
PATEY
WOODS
ROAD
NEWARK ROAD
Match To
Figure 2C
NEWARK
HIGHWAY
QUEPONCO
ROAD
WORCESTER
ROAD
LANGMAID
ROAD
MARSHALL
CREEK
ROAD
113
FIVE
MILE
BRANCH
ROAD
NEWARK
HIGHWAY
BASKET SWITCH
RAILROAD
BASKET
SWITCH
ROAD
113
CENTRAL
SITE
DELAWARE
LANE
WORCESTER
PORTERS
ROAD
CROSSING
MARYLAND &
WESLEY
CEDARTOWN
ROAD
Match To
Figure 2A
N
0 1000 2000 3000 4000
SCALE IN FEET
Legend
Dualization along Existing Alignment
KEY MAP
A
B
C
D
US 113 PLANNING STUDY
Southern
Preferred Alternative
Maryland
State Highway
Administration
February 1998
Figure
S-3B


346
OLD OCEAN CITY BOULEVARD
50
374
LIBERTYTOWN ROAD
818
BERLIN
MAIN STREET
BAY STREET
376
GERMANTOWN ROAD
EVANS ROAD
MARYLAND & DELAWARE RAILROAD
Existing Dualized Section
113
STUDY LIMIT
HAYES ROAD
IRONSHIRE STATION ROAD
HARRISON DRIVE
LANDING ROAD
IRONSHIRE
DOWNS ROAD
WORCESTER HIGHWAY
MASON ROAD
ORCHARD ROAD
N
0 1000 2000 3000 4000
SCALE IN FEET
BAYS END LANE
Narrow Median To 16' At Wetland W-15
Narrow Median To 16' At Wetland W-17
Narrow Median To 16' At Wetland W-16
GOODY HILL ROAD
NEWARK ROAD
CROPPERS ISLAND ROAD
GUNNING CLUB LANE
Match To Figure 2B
113
Legend
Dualization along Existing Alignment
KEY MAP
A
B
C
D
US 113 PLANNING STUDY
Southern Preferred Alternative
Maryland State Highway Administration
February 1998
Figure S-3C



US 113 PLANNING STUDY

Northern Preferred Alternative

Maryland State Highway Administration

February 1998

Figure S-3D

properties). Furthermore, 7.5 acres of wetlands, 8.5 acres of floodplains, 17 acres of upland forest, 19 acres of upland meadow, and 57 acres of landscaped/turf areas would have been required. Six (6) areas of archeological resources were affected.

- **Alternative 4N Modified - 20' Median (60 MPH)** (construct new dual highway in new location in the northern study area) would have required the acquisition of 7 residences, 4 businesses, and 111 acres of additional right-of-way. Furthermore, 22.4 acres of wetlands, 2.7 acres of floodplains, 53 acres of upland forest, 15 acres of upland meadow, and 15 acres of landscaped/turf areas would have been required. Two (2) areas of archeological resources were affected.

- **Alternative 4N Modified - 34' Median (60 MPH)** (construct new dual highway in new location in the northern study area) would have required the acquisition of 8 residences, 4 businesses, and 123 acres of additional right-of-way. Furthermore, 24.8 acres of wetlands, 3.0 acres of floodplains, 59 acres of upland forest, 17 acres of upland meadow, and 17 acres of landscaped/turf areas would have been required. Two (2) areas of archeological resources were affected.

- **Combination Alternative 3N/4N- 20' Median (60 MPH)** (a combination of dual highways in new location/existing location in the northern study area) would have required the acquisition of 15 residences, 4 businesses, and 102 acres of additional right-of-way. Furthermore, 11.2 acres of wetlands (4 minority), 2.9 acres of floodplains, 48 acres of upland forest, 17 acres of upland meadow, and 17 acres of landscaped/turf areas would have been required. Two (2) areas of archeological resources were affected.

◆ **SOUTHERN PREFERRED ALTERNATIVE** (dualize along existing US 113 in the Southern Study Area) requires the acquisition of 2 residences (1 minority), 1 business, and 94 acres of additional right-of-way (including landlocked parcels). Furthermore, 5.0 to 5.5 acres of wetlands, 8.4 acres of floodplains, 52 acres of upland forest, 11 acres of upland meadow, and 74 acres of landscaped/turf areas will be required. Ten (10) areas of archeological resources will be affected.

◆ **NORTHERN PREFERRED ALTERNATIVE** (a combination of dual highways in new location/existing location in the northern study area) requires the acquisition of 15 residences (4 minority), 4 businesses, and 285 acres of additional right-of-way (including landlocked parcels). Furthermore, 7.0 to 7.5 acres of wetlands, 2.6 acres of floodplains, 56 acres of upland forest, 19 acres of upland meadow, and 19 acres of landscaped/turf areas will be required. Two (2) areas of archeological resources will be affected. The Maryland Historical Trust has determined that the **Northern Preferred Alternative** will have an adverse effect on the St. Martins Church. See Appendix F of this document for the signed Memorandum of Agreement (MOA).

Potential sites for mitigation of the wetland impacts for the **Southern Preferred Alternative** and the **Northern Preferred Alternative** are presented in Section IV.I. of this document; see locations shown on Figures IV-2A through -2D.

7. Permits Required

Construction of the **Preferred Alternatives** will require the following permits:

- U.S. Army Corps of Engineers: Section 404 Permit
- Maryland Department of the Environment: National Pollutant Discharge Elimination System (NPDES) Permit
- Maryland Department of the Environment: Sediment and Erosion Control Plan
- Maryland Department of the Environment: Stormwater Management Plan
- Maryland Department of the Environment: Water Quality Certification
- Maryland Department of the Environment: Nontidal/Tidal Wetland and Waterways Permit

8. Areas of Controversy

During preparation of the Draft EIS/Section 4(f) Evaluation, a major concern expressed by several resource agencies pertained to the loss of wetlands associated with the Dualization Alternatives: specifically, each of the 3S, 3N, 4N Modified, and Combination Alternatives. On the basis of comments received, considerable refinements to avoid and minimize adverse environmental impacts (including residential displacements, loss of cultural resources, and wetlands) have resulted in the **Preferred Alternatives** - see Section II.E and Appendix A of this document. On the basis of these refinements, the Federal and state resource agencies have concurred with the **Preferred Alternatives** (see Section V.B.). Other concerns include impacts to cultural resources, loss of farmland, access management, and the potential for secondary/cumulative impacts.

Community concerns continue to focus on the frequency of fatal accidents along US 113 as evidenced by the very strong public support for dualizing the entire US 113 corridor. In addition, residents of the Friendship community along US 113 in the vicinity of MD 90 strongly support the new location dualization alternatives (i.e., Alternative 4N Modified, the Combination Alternative 3N/4N Modified and now the **Northern Preferred Alternative**); they believed that dualization along existing US 113 (Alternative 3N) would have divided their community. As evidenced by the strong support exhibited by the more than 700 participants at the Combined Location/Design Public Hearing held June 17, 1997 and the 2,248 letters of support (plus 6 in opposition), the community strongly and emphatically supports a divided highway along US 113. See Section V.F. for additional information.

9. Summary Table S-1

As shown on the following pages, Table S-1 presents a summary of the social, economic and natural environmental impacts of the project alternatives presented in the Draft EIS/Section 4(f) Evaluation, as well as the **Preferred Alternatives**. The following alternatives are addressed:

◆ **Left Side of Table (Southern Study Area)**

- **Alt. 1S:** No Build - retain existing one lane per direction.
- **Alt. 2S:** Transportation Systems Management (TSM) - one lane per direction with intersection improvements.

- **Alt. 2S-20' Median:** One lane per direction with 20-foot wide median/guardrail and passing lanes (and 60 MPH design speed).
- **Alt. 3S-20' Median:** Dualization to provide 4 lanes along existing US 113 and 20-foot wide median/guardrail (and 60 MPH design speed).
- **Alt. 3S-34' Median:** Dualization to provide 4 lanes along existing US 113 and 34-foot wide median (and 60 MPH design speed).

♦ **SOUTHERN PREFERRED ALTERNATIVE:** Dualization to provide four lanes along existing US 113 and 34-foot wide median except at six (6) sensitive wetland crossings, with 60 MPH design speed.

◆ **Right Side of Table (Northern Study Area)**

- **Alt. 1N:** No Build: retain existing one lane per direction.
- **Alt. 2N:** Transportation Systems Management (TSM) - one lane per direction with intersection improvements.
- **Alt. 3N-20' Median/50 MPH:** Dualization to provide 4 lanes along existing US 113 with 20-foot wide median/guardrail and 50 MPH design speed.
- **Alt. 3N-34' Median/50 MPH:** Dualization to provide 4 lanes along existing US 113 with 34-foot wide median and 50 MPH design speed.
- **Alt. 3N-20' Median/60 MPH:** Dualization to provide 4 lanes along existing US 113 with 20-foot wide median/guardrail and 60 MPH design speed.
- **Alt. 3N-34' Median/60 MPH:** Dualization to provide 4 lanes along existing US 113 with 34-foot wide median and 60 MPH design speed.
- **Alt. 4N Modified-20' Median:** Dual highway in new location to provide 4-lanes with 20-foot wide median/guardrail (and 60 MPH design speed).
- **Alt. 4N Modified-34' Median:** Dual highway in new location to provide 4-lanes with 34-foot wide median (and 60 MPH design speed).
- **Alt. 3N/4N Modified-20' Median:** Combination of Alts. 3N & 4N Modified to provide 4 lanes with 20-foot wide median/guardrail (and 60 MPH design speed).
- **Alt. 3N/4N Modified-34' Median:** Combination of Alts. 3N & 4N Modified to provide 4 lanes with 34-foot wide median (and 60 MPH design speed).

♦ **NORTHERN PREFERRED ALTERNATIVE:** Construction of divided highway in new location between US 113 and Shingle Landing Road and dualization along existing US 113 to Delaware state line providing four lanes and 34-foot wide median except at two (2) sensitive wetland crossings, with 60 MPH design speed.

Southern Study Area : 16.3 Miles					
Alt. 1S No-Build Existing US 113 (2 - lanes)	Alt. 2S Basic TSM + Intersection Improvements (2 - lanes)	Alt. 2S - 20' Median Median Traffic Barrier + Intersection Improvements (2 - lanes with median)	Alt. 3S - Dualize Along Existing US 113 (4 - lanes with median)		SOUTHERN PREFERRED ALTERNATIVE
		20' Wide Median	20' Wide Median	34' Wide Median	34' Wide Median*
		60 MPH Design	60 MPH Design		60 MPH Design
16.3 miles	16.3 miles	16.3 miles	16.3 miles	16.3 miles	16.3 miles
2 existing	2 existing	2 existing with passing lanes (4 separate segments, each 1± mile in length)	2 existing + 2 new	2 existing + 2 new	2 existing + 2 new
25	18 improved	18 improved	24 improved	24 improved	24 improved
B to D	-	-	-	-	-
B to D	-	-	-	-	-
B to E	B to E	B to D	A	A	A
C to E	C to E	C to D	A	A	A
no improvement	marginal improvement	moderate improvement	substantial improvement	substantial improvement	substantial improvement
32	-	-	-	-	-
44	42	38	34	34	34

Footnotes :

* The 34-foot wide median will be narrowed at the following six (6) sensitive wetland crossings to minimize impacts:
16-foot wide median at wetlands W-8, W-15, W-16, and W-17
10-foot wide median at wetlands W-2 and W-12

ENVIRONMENTAL ASSESSMENT FORM

		YES	NO	COMMENTS ATTACHED
A.	Land Use Considerations			
1.	Will the action be within the 100 year floodplain?	X		See III.G, IV.H
2.	Will the action require a permit for construction or alteration within the 50 year floodplain?		X	
3.	Will the action require a permit for dredging, filling, draining, or alteration of a wetland?	X		See III.H, IV.I
4.	Will the action require a permit for the construction or operation of facilities for solid waste disposal including dredge 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 III.C, IV.E
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 the Potomac River by conduits, cables or other like devices?		X	

		YES	NO	COMMENTS ATTACHED
11.	Will the action affect the use of a public recreation area, park, forest, wildlife management area, scenic river or wildland?	___	X	See III.F, IV.G
12.	Will the action affect the use of any natural or man-made features that are unique to the County, State, or Nation?	___	X	_____
13.	Will the action affect the use of an archaeological or historical site or structure?	X	___	See III.B, IV.C
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 III.F, IV.G
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 III.E, IV.F
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	_____

		YES	NO	COMMENTS ATTACHED
19.	Will the action require a permit for the construction and operation of facilities for treatment or distribution of water?	___	X	_____
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 IV.F, IV.G
22.	If so, will the discharge affect ambient water quality limits or require a discharge permit?	___	X	_____
C.	Air Use Considerations			
23.	Will the action result in any discharge into the air?	___	X	See III.J, IV.K
24.	If so, will the discharge affect ambient air quality limits or produce a disagreeable odor?	___	X	_____
25.	Will the action generate additional noise which differs in character or level from present conditions?	X	___	See III.K, IV.L See Noise Study Report
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	_____

		YES	NO	COMMENTS ATTACHED
D.	Plants and Animals			
28.	Will the action cause the disturbance, reduction, or loss of any rare, unique or valuable plant or animal?	X		See III.I, IV.J
29.	Will the action result in the significant reduction or loss of any fish or wildlife habitats?		X	See III.I, IV.J
30.	Will the action require a permit for the use of pesticides, herbicides or other biological, chemical, or radiological control agents?		X	
E.	Socioeconomic			
31.	Will the action result in a preemption or division of properties or impair their economic use?	X		See III.A, III.D, IV.B, IV.D
32.	Will the action cause relocation of activities or structures, or result in a change in the population density of distribution?	X		See III.A, IV.B
33.	Will the action alter land values?	X		See III.A, IV.B
34.	Will the action affect traffic flow and volume?	X		See I.C, IV.A
35.	Will the action affect the production, extraction, harvest or potential use of a scarce or economically important resource?		X	See III.D, IV.D

		YES	NO	COMMENTS ATTACHED
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 I.D
38.	Will the action affect the employment opportunities for persons in the area?	X		See III.A, IV.B
39.	Will the action affect the ability of the area to attract new sources of tax revenue?	X		See III.A, IV.B
40.	Will the action discourage present sources of tax revenue from remaining in the area, or affirmatively encourage them to relocate elsewhere?	X		See III.A, IV.B
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	See III.M, IV.N
43.	Could the action be eliminated without deleterious affects to the public health, safety, welfare, or the natural environment?		X	See I.C
44.	Will the action be of statewide significance?		X	

		YES	NO	COMMENTS ATTACHED
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 impact on the public health, safety, welfare, or environment?	___	X	See II.D
46.	Will the action require additional power generation or transmission capacity?	___	X	_____

G. Conclusion

47.	This agency will develop a complete environmental effects report on the proposed action.	X		Draft EIS/ Section 4(f) document dated May 1997 FINAL EIS document

11. Conclusions

a. Introduction

The US 113 Planning Study was undertaken for the purpose of identifying and evaluating improvements for the remaining two-lane sections of US 113 in Maryland. Although the 60 miles of US 113 in Delaware and 16.2 miles of the 40 miles of US 113 in Maryland are already dualized, the 16.3 miles south of Berlin and the 7.5 miles north of Berlin in Maryland are presently two-lane highways experiencing severe fatal accident problems. **A total of 49 people have died as a result of vehicular accidents along the two-lane portions of US 113 during the January 1980 through September 1997 period.**

This Final Environmental Impact Statement presents the results of studies conducted for the Draft Environmental Impact Statement/Section 4(f) Evaluation (dated May 1997) as well as refinements for the **Preferred Alternatives** completed to address both National Environmental Policy Act (NEPA) and US Army Corps of Engineers Section 404 Permit requirements. The following subsections present the conclusions from this comprehensive planning study; in the interest of brevity, frequent reference is made to expanded discussion presented elsewhere in this document.

b. Purpose and Need

The US 113 Planning Study focused on improvements to address safety and traffic operations needs along the remaining two-lane sections (23.8 miles in total length) of US 113 in Maryland. US 113 provides a critical connection on the Delmarva Peninsula for through and local traffic, including recreation trips. The need for this project is demonstrated by the high number of fatal accidents which have occurred along the two-lane portions of US 113. The fatal accident rate exceeds the statewide average for similar two-lane rural highways in Maryland. In addition, the Level of Service for the northern study area will decline by the design year 2020. The Purpose and Need for improvements along the two-lane portions of US 113 are presented in Chapter I.

c. Study Process

This study identified transportation alternatives that address the Project Need while minimizing impacts to the social, cultural, and natural environment. Following an Alternates Public Meeting held in November 1995 and based on citizen and environmental resource agency comments, reasonable alternatives were identified and presented in the Draft EIS/Section 4(f) Evaluation and at the Combined Location/Design Public Hearing including: No Build, Transportation Systems Management, Two-Lanes with Median, and Four-Lane Dualization. Dualization alternatives studied included Dualization on Existing Alignment, Dualization on New Alignment, and a Combination Alternative which made use of both existing and new alignments. Key milestones in this study are as follows:

- **1970's & 1980's:** several early studies to address completion of dualized highway for US 113 in Maryland (see Section I.D.).

- **early 1995:** initiation of current Project Planning Study.

- **November 30, 1995:** Alternates Public Workshop held in Berlin, Maryland to present preliminary alternatives for public comment. More than 200 citizens attended (see Section I.D. for summary of comments).

- **May 1997:** Circulation of Draft EIS/Section 4(f) Evaluation document.

- **June 17, 1997:** Maryland SHA and U.S. Army Corps of Engineers held a Combined Location/Design Public Hearing in Berlin, Maryland. More than 700 citizens attended; 12 elected officials and 32 citizens offered public testimony - all supported the project. More than 2,250 citizens submitted comment letters; all but six supported dualization of US 113 (see Section V.F. for listing of issues).

d. Major Issues

- **Fatal Accidents:** As has been so strongly and passionately expressed by elected officials and citizens, the high number of fatal accidents, and the personal injuries associated with other highway accidents, are the most important issues driving this planning study. See Sections I.C.3. and I.C.4 for details.

- **Schedule:** Closely linked to the fatal accidents, elected officials and citizens are frustrated about the delay in implementing improvements to US 113.

- **Residential Displacements:** While critical throughout the entire corridor, residents of the Friendship community along US 113 near MD 90 have been vocal in their support of a new location alignment and opposition to dualizing US 113 through their community. See Section IV.B. for details.

- **Impacts on Natural Resources:** The US 113 study area is rich in wetlands, floodplains, water resources, and woodlands which support a diversity of plant and animal species. Avoidance and minimization of impacts to these resources has been a major focus of this study. See Sections IV.D., E., F., G., H., I., and J. for further details on these resources, as well as new Section IV.Q. addressing the Cumulative Effects of local, County, State and regional development on these resources.

- **Impacts on Cultural Resources:** Dating from the late 1600's, existing US 113 is lined with numerous historic and archeological resources. See Sections III.B. and IV.C. for further details. Appendix F presents the signed Memorandum of Agreement for the St. Martin's Church, the only cultural resource impact associated with the **Preferred Alternatives.** Although some of the alternatives presented in the Draft EIS/Section 4(f) Evaluation required use of property from cultural resources protected under Section 4(f) of the U.S. Department of Transportation Act, the **Preferred Alternatives** have no Section 4(f) impacts.

e. Analysis Results

A detailed evaluation of the environmental impacts of the US 113 Planning Study alternatives was presented in Sections IV and V of the Draft EIS/Section 4(f) Evaluation (May 1997) and is presented in Section IV of this document. This evaluation is summarized in Section S.6. and tabulated on Table S-1.

This evaluation led the Project Planning Team to recommend a Southern Preferred Alternative and a Northern Preferred Alternative. The Project Team has extensively reviewed the technical studies completed for each project alternative and their anticipated operational characteristics, especially in terms of expected affect on accidents. The Team has also evaluated the potential impacts of all alternatives on the adjacent communities, natural environmental resources, the cultural environment, and land use. On the basis of this evaluation and in consideration of the resource agency viewpoints, and supported by the overwhelming outpouring of public support for dualization, the **Preferred Alternatives** are recommended for construction. This selection reflects the comparative advantages of a dualized highway (with some measure of access control) to reduce fatal accidents while placing the highway away from established communities and the minimization of most adverse impacts.

As is further discussed in Section II.D, the following presents the rationale for the **Preferred Alternatives**. Section II.E. and Appendix A present details on the **Preferred Alternatives**; the anticipated environmental consequences of the **Preferred Alternatives** are evaluated in detail in Section IV and summarized on Table S-1.

- **A divided highway is preferred over two-lane alternatives:** Because nearly 60 percent of the fatal accidents are the result of opposite direction collisions, a preferred alternative must therefore positively separate the two directions of travel in order to reduce the incidence of opposite direction accidents and thereby reduce fatal accidents. Only the dualization alternatives satisfy the purpose and need for this study.

- **Four-lanes are preferred over two-lanes:** Although a divided two-lane alternative was evaluated in the southern study area (Alternative 2S-20' Median), four lanes are preferred. The four-lane cross section better accommodates normal passing maneuvers and passing of slow and wide farm vehicles. Due to the limited passing opportunities with Alternative 2S-20' Median, improper and unsafe passing on the shoulders may have resulted from this alternative. A divided two-lane non-access controlled highway is atypical and not congruent with driver expectation. The four-lane cross section provides for safety, continuity, and has an overwhelming measure of public support.

- **Median width of 34-feet is preferred over a 20-foot width:** The 34-foot median provides more room for all vehicles at intersections and a greater amount of recovery area for errant vehicles.

- **Typically, dualization along existing US 113 is preferred over new location alternatives:** For the entire 16.3 miles of US 113 in the southern study area and about half of the 7.5 miles of US 113 in the northern study area (between Shingle Landing Road/Peerless Road and the Delaware state line), dualization along existing US 113 is preferred over new location alternatives because of fewer agricultural and natural resource impacts. In residential areas, the new two-lane roadway has been added to the side of existing US 113 with the least number of residences and businesses.

- **New location is preferred over existing location in vicinity of the Friendship Community and Showell:** Between Berlin and Shingle Landing Road/Peerless Road, the Northern Preferred Alternative is in a new location, which results in 9 fewer residential displacements, 2 fewer business displacements, 2.6 to 5.9 fewer acres of floodplain impacts, and avoids property impacts at three historic sites in comparison to the existing location dualize alternatives.

During development of the **Preferred Alternatives**, the Planning Team completed a detailed evaluation of alignment refinements and cross-section modifications in order to minimize wetland impacts. This evaluation included use of a narrower median cross section (either 16-feet or 10-feet), steeper side slopes, guardrail to reduce roadside grading widths and thus fill slopes in wetlands, and a sheet pile retaining wall at Wetland W-8. The results of this wetland crossing by wetland crossing analysis are presented in Section IV.I. and summarized on Table S-1.

Because the **Preferred Alternatives** impact wetlands, a "Section 404" analysis has been completed and is presented in Section IV.I. Prepared in accordance with the requirements of Executive Order 11990, this section provides the documentation as to why there are no practicable alternatives to impacting wetlands.

Minimization measures have been evaluated for the Preferred Alternatives and include engineering refinements such as cross section modifications. The detailed Mitigation Plan for the US 113 study is presented in Section IV.I. Based upon the above considerations, it is determined that there is no practicable alternative to the proposed construction in wetlands and that the proposed action includes all practicable measures to minimize harm to wetlands which may result from such use. In summary, based on the information currently available, further alignment shifts or cross section modifications in an attempt to avoid individual wetland impacts will result in increased impacts to residential and business areas or other natural resource features, including wetlands. During the final design phase, however, bridging will be considered for additional wetland minimization. The use of innovative engineering technologies (i.e., geotextiles, geogrids, etc.) and the evaluation of wetland dewatering for the construction of culverts and drainage ditches will be addressed during final design when additional, detailed information is available.

f. Description of Preferred Alternatives

◆ **SOUTHERN PREFERRED ALTERNATIVE**
Alternative 3S-34' Median (60 MPH)

In the Southern Study Area, five alternatives were considered. Because of the more rural nature of the southern study area, dualization on new alignment was not studied. Studies concluded that the dualization alternatives addressed the purpose and need for the project by separating opposite direction traffic with a median, allowing for the passing of slow moving vehicles (i.e., farm equipment) by providing two lanes per direction, and improving intersection operations with the inclusion of turning lanes and improved signing. These alternatives also provided continuity of traffic operations to match those on previously dualized portions of US 113. Analyses concluded that these alternatives successfully addresses the purpose and need while minimizing environmental impacts to the extent possible.

Alternative 3S-34' Median is preferred for the Southern Study Area. See Section II.E. for detailed description. The dualization of existing US 113 consists of two northbound lanes (with shoulders) and two southbound lanes (with shoulders) typically separated by a median 34-feet in width with guardrail (8-feet paved and 26-feet grass). At the crossing of Purnell Branch (Wetland W-8), a narrower 16-foot wide median and an epoxy coated sheet pile wall will be provided along the west side of the roadway to minimize wetland impacts. At Wetlands W-15, W-16 and W-17, a 16-foot wide median is also provided. At Wetlands W-2 and W-12, the median further narrows to paved 10-feet, also to minimize wetland impacts. The design speed and roadside grading will be consistent with AASHTO standards for 60 MPH. For the majority of this length, existing US 113 is used as either the northbound or southbound roadway. See Figures S-3A, -3B and -3C. The seven (7) plates for the **Southern Preferred Alternative** are presented in Appendix A (scale: 1" = 400').

◆ **NORTHERN PREFERRED ALTERNATIVE**
Combined Alternative 3N/4N Modified - 34' Median (60 MPH)

In the Northern Study Area, ten alternatives were considered. Dualization alternatives studied included: dualization on existing alignment, dualization on new alignment and a combination of dualization on existing and new alignment (Combination Alternatives). Analyses concluded that the Combination Alternative, which utilizes new alignment from Deer Park Road to Shingle Land Road and existing alignment from Shingle Land Road to the Delaware state line, successfully addresses the purpose and need for the project (as described above for the Southern Preferred Alternative) while attempting to balance natural, cultural, and socioeconomic impacts.

Combination Alternative 3N/4N Modified - 34' Median is preferred for the Northern Study Area. See Section II.E. for detailed description. These improvements will provide a new four-lane divided highway (with shoulders) from north of Berlin to Shingle Landing Road/Peerless Road and dualization along existing US 113, consisting of two northbound lanes (with shoulders) and two southbound lanes (with shoulders). A new interchange will be provided at MD 90, and the roadway will typically be separated by a median 34-feet in width with guardrail (8-feet paved, 26-feet grass). At Wetland W-30, the dualized roadway will be separated by a 10-foot wide paved median to minimize impacts. At Wetland W-31, a median 16-feet wide will be provided. Near Racetrack Road, the alignment has been shifted slightly west to permit use of a portion of the existing US 113 box culvert crossing of Church Branch, thereby reducing impacts at Wetland W-28 and avoiding Wetland W-29. This shift places the southbound roadway for new US 113 in approximately the same location as the existing two-lane/two-way roadway for US 113 adjacent to St. Martin's Church. The design speed and roadside grading will be consistent with AASHTO standards for 60 MPH. See Figure S-3D. The three (3) plates for the **Northern Preferred Alternative** are presented in Appendix A (scale: 1" = 400').

◆ Other Elements of the Preferred Alternatives

The following elements, developed in response to the fatal accident experience along US 113 and in response to resource agency requests, are included as elements of the **Preferred Alternatives:**

- **Wider shoulder/pull-off areas to facilitate roving truck weigh stations:** Throughout Maryland, the State Police use designated areas with wide shoulders to station their mobile truck scales. During final design, similar areas will be identified along the improved roadway in a location appropriate for the State Police and where adverse environmental and neighborhood impacts will not result.

- **Increased police enforcement:** In addition to increased truck weighing, State Police will enforce speed limits and other motor vehicle laws along US 113. SHA is coordinating with the State Police to increase enforcement along US 113. The State Police will also provide traveler assistance along this route.

- **Reduced fish blockages:** During final design, measures to facilitate fish passage through existing drainage structures under US 113 will be investigated.

- **Access management:** Partial control of access is proposed for the new location roadways (i.e., where feasible, access will be allowed only at public roads). SHA and Worcester County will work together to minimize the number of new access points along US 113.

h. Mitigation Measures

For the US 113 Project Planning Study, mitigation for wetland impacts has been conducted in three distinct and sequential phases. The mitigation sequence includes, in order of consideration: 1) avoidance of wetland impacts; 2) minimization of wetland impacts; and 3) compensation for unavoidable wetland impacts (as per Executive Order 11990). Avoidance and minimization measures are briefly summarized in Section S-11.f and described in detail in Section IV.I. The following summarizes the compensation measures presented in Section IV.I.:

- In accordance with the sequencing guidelines of the Maryland Compensatory Mitigation Guidance (1994), the site selection process identified 19 potential mitigation sites as suitable for "in-kind" replacement of wetlands. These 19 sites were reviewed by the regulatory and resource agencies and considered suitable for additional site investigations.

- Eight of the 19 sites were selected for detailed site evaluations based on landowner interest and location in the study area. The selected sites provided sufficient area for wetland mitigation within each sub-watershed that would be impacted by the **Preferred Alternatives**. Approximately 25 acres of wetland mitigation are proposed to compensate for approximately 12 acres of wetlands impacted.

- Groundwater monitoring wells will be installed on these eight sites to define hydrologic characteristics during the 1998 growing season. Upon completion of the monitoring period, the preferred mitigation sites will be selected for final design in consultation with the regulatory and resource agencies.

- A Technical Report for Wetland Mitigation will be prepared to address the specific goals and objectives of the wetland mitigation plan and conceptual design parameters.

TABLE OF CONTENTS

US 113 Planning Study
Snow Hill, Maryland to Delaware State Line

Office of Planning and Preliminary Engineering
Maryland State Highway Administration

Table of Contents

Signature Page/Contacts/Abstract

Summary

1. Administration Action S-1
2. Informational Contacts S-1
3. Introduction S-1
4. Description of Proposed Action/Purpose and Need S-1
5. Alternatives Considered S-4
6. Summary of Environmental Impacts S-6
7. Permits Required S-9
8. Areas of Controversy S-9
9. Summary Table S-1 ..... S-9
10. Environmental Assessment Form (EAF) S-11
11. Conclusions S-18

Table of Contents i
List of Figures vi
List of Tables viii

I. Purpose of and Need for Action

A. Introduction I-1
B. Project Location and Description I-1
C. Project Need I-2
  1. Existing Roadway Conditions I-2
  2. Traffic Volumes and Levels of Service I-3
  3. Overall Safety Experience I-6
  4. Fatal Accidents I-9
D. Planning and Project History I-11
E. County and State Programs I-12
F. Relationship to Other Modes of Transportation I-13

II. Alternatives Considered

A. History of US 113 ..... II-1
B. Preliminary Alternatives II-2
C. Alternatives Presented at the Alternates Public Workshop
  1. Introduction II-3
  2. No-Build Alternatives (Alternatives 1S and 1N) II-4
  3. Transportation Systems Management Alternative (Alternatives 2S and 2N) II-4
  4. Dualization Alternatives II-5

D. Alternatives Presented in the Draft EIS/Section 4(f) Evaluation
1. Introduction II-8
2. No-Build Alternatives - Baseline Alternatives 1S and 1N II-9
3. Transportation Systems Management Alternatives Alternatives 2S and 2N II-10
4. Alternative 2S-20' Median II-16
5. Introduction to the Dualization Alternatives II-20
6. Dualization Alternatives Along The Existing Alignment in the Southern Study Area II-21
7. Dualization Alternatives Along The Existing Alignment in the Northern Study Area II-25
8. Dualization Alternatives On New Alignment in the Northern Study Area II-31
9. Dualization Alternatives Along a Combination of Existing and New Alignments in the Northern Study Area II-35

E. Preferred Alternatives
1. Introduction II-40
2. Southern Preferred Alternative II-40
3. Northern Preferred Alternative II-46

III. Affected Environment

A. Social, Economic and Land Use
1. Social Environment III-1
2. Economic Environment III-11

B. Cultural Resources
1. Significant Historic Structures III-20
2. Archeological Sites III-23

C. Topography, Geology, and Soils
1. Topography III-24
2. Geology III-25
3. Soils III-26

D. Farmlands
1. Introduction III-27
2. Farmland Soils III-28
3. Farm Operation III-30

E. Ground Water Resources III-33

F. Surface Water Resources III-33
1. Streams and Rivers III-34
2. Lakes and Ponds III-35
3. Wild and Scenic Rivers III-36

G. Floodplain
1. Existing Floodplain Studies III-36
2. Existing Floodplain Conditions III-37

H. Wetlands
1. Methodology III-37
2. Identification and Delineation III-38
3. Wetland Functions III-63
I. Vegetation and Wildlife
1. Vegetation III-66
2. Wildlife and Wildlife Habitat III-67
3. Rare, Threatened and Endangered Species III-69
J. Air Quality III-69
1. Methodology III-70
2. Description of Air Sensitive Receptors III-70
3. Background CO Levels III-70
K. Noise Quality
1. Design Noise Level/Activity Relationships III-70
2. Existing Noise Environment III-71
L. Visual Quality
1. Existing Visual Environment III-76
2. Methodology III-76
M. Municipal, Industrial and Residual Waste Sites
1. Initial Site Assessment III-76
2. Preliminary Field Reconnaissance Results III-77

IV. Environmental Consequences

Introduction IV-1
A. Traffic and Transportation Network IV-2
1. No-Build Alternatives Baseline (Alternatives 1S and 1N) IV-3
2. Transportation Systems Management Alternatives (Alternatives 2S and 2N) IV-4
3. Two-Lanes with 20' Median Alternative (Alternative 2S-20' Median) IV-4
4. Dualization Alternatives and Preferred Alternatives (Alternatives 3S, 3N, 4N Modified, and 3N/4N Modified Combination Alternatives) IV-5
5. Safety IV-5
B. Social, Economic and Land Use
1. Social Environment IV-9
2. Economic Environment IV-19
3. Land Use IV-23
C. Cultural Resources
1. Historic Structures IV-30
2. Archeological Sites IV-39
D. Farmlands IV-43
E. Soils, Geology and Topography IV-44
F. Groundwater Resources IV-45

G. Surface Water Resources IV-46
H. Floodplains IV-56
I. Wetlands IV-58
J. Vegetation and Wildlife IV-89
  1. Vegetation IV-91
  2. Wildlife IV-93
  3. Rare, Threatened and Endangered Species IV-93
K. Air Quality IV-97
L. Noise Quality IV-99
  1. Criteria for Determining Noise Impact IV-111
  2. Predicted Noise Levels IV-124
  3. Construction Impacts IV-124
M. Visual Quality IV-128
N. Municipal, Industrial and Residual Waste Sites IV-128
O. Energy IV-128
P. Construction Impacts IV-129
  1. Traffic Detours IV-129
  2. Air Emissions IV-129
  3. Construction Noise Impacts IV-130
  4. Natural Resources - General IV-131
  5. Wetlands and Waters of the U.S. IV-131
  6. Floodplains IV-131
  7. Visual Quality IV-132
  8. National Geodetic Survey Monuments IV-132
  9. Hazardous Materials IV-132
Q. Cumulative Effects IV-132
  1. Introduction IV-135
  2. Scoping IV-136
  3. Methodology IV-154
  4. Cumulative Effects Analysis IV-155
  5. Conclusion IV-155
R. Relationship Between Local Short-Term Uses of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity IV-155
S. Irreversible and Irretrievable Commitments of Resources Which Would be Involved in the Proposed Action V-1

V. Comments and Coordination ..... V A-1
A. Agency Letters on Draft EIS/Section 4(f) Evaluation (circulated May 1997) and/or Combined Location/Design Public Hearing (held June 17, 1997) ..... V B-1
B. Agency Letters Concurring on SHA's Preferred Alternatives ..... V C-1
C. Elected Officials Letters ..... V D-1
D. Organizations/Associations Letters ..... V E-1
E. Minutes from InterAgency Meetings (excluding handouts) ..... V F-1
F. Public Letters ..... V G-1
G. Selected Revised Minutes of J.D. Review Meetings ..... V G-1

VI. List of Preparers

A. Federal Highway Administration VI-1
B. Maryland State Highway Administration VI-1
C. Rummel, Klepper & Kahl Team VI-2
D. Other Consultants to SHA VI-3

VII. Distribution List VII-1

VIII. References VIII-1

IX. Appendices IX-1

Appendix A Project Plates for Preferred Alternatives, at 1" = 400' Scale
PREFERRED ALTERNATIVES
Key Map + Figures 1 thru 10

Appendix B Farmland Conversion Impact Rating Forms

Appendix C Relocation Act

Appendix D Statewide Comparable Accident Data

Appendix E Fish and Wildlife Species in Worcester County

Appendix F Memorandum of Agreement

Appendix G Index

List of Figures

Figure | **Following Page No.**

Summary

S-1 Vicinity Map S-2
S-2 Study Area S-3
S-3 Preferred Alternatives S-7

I. Purpose of and Need for Action

I-1 Fatal Accidents (January 1980 through September 1997) I-10

II. Alternatives Considered

II-1 Preliminary Alternatives II-4

II-2 Improvement Locations
Alts. 1S No-Build / Alt. 2S TSM II-15
Alts. 1N No-Build / Alt. 2N TSM II-15

II-3 Typical Sections
Alts. 1S & 1N No-Build / Alts. 2S & 2N Basic TSM II-15

II-4 Typical Sections
Alt. 2S-20' Median II-16

II-5 Dualization Alternatives Presented in Draft EIS II-20

II-6 Typical Sections
Alts. 3S-20' Median / Alt. 3N-20' Median II-20

II-7 Typical Sections
Alts. 3S-34' Median / Alt. 3N-34' Median II-20

II-8 Typical Sections
Alts. 4N-20' Median / Alt. 4N-34' Median II-20

II-9 Southern/Northern Preferred Alternative II-40

II-10 Typical Sections
Southern Preferred Alternative II-40

II-11 Typical Sections
Northern Preferred Alternative II-46

Figure

Following Page No.

III. Affected Environment

III-1 Census Tract Boundary Map III-2
III-2 Community Facilities & Services III-9
III-3 Existing Land Use III-13
III-4 Zoning Classifications III-13
III-5 Comprehensive Development Plan III-17
III-6 Historic Sites (Northern Study Area) III-21
III-7 Geologic Map III-25
III-8 Soil Associations III-26
III-9 Prime and Statewide Important Farmland Soils III-28
III-10 Major Streams and Drainage Divides III-33
III-11 100-Year Floodplains III-37
III-12 Wetland Locations III-55
III-13 Air and Noise Receptor Locations III-71
III-14 Potential Waste Site Locations III-78

IV. Environmental Consequences

IV-1 1995 & No-Build 2020 ADT and LOS IV-4
IV-2 Potential Wetland Mitigation Sites IV-84

List of Tables

Table **Page No.**

Summary

S-1 Summary of Impacts ..... Following Page S-10

I. Purpose of and Need for Action

I-1 Average Daily Traffic (ADT) Volumes I-4
I-2 Detail Analysis of 7-Years Accident Data (All Accidents) (1990 through 1996) I-7
I-3 Tabulation of 17 Years + 9 Months Fatal Accident Data (January 1980 through September 1997) I-9

II. Alternatives Considered

II-1A No Build and TSM Alternatives II-12
II-1B No Build and TSM Alternatives II-13
II-1C No Build and TSM Alternatives II-14
II-1D No Build and TSM Alternatives II-15

III. Affected Environment

III-1 Worcester County Population Growth, 1940-2020 ..... III-2
III-2 Average Daily Seasonal Population of Ocean City III-2
III-3 Worcester County Census Tract Population Information III-2
III-4 Local Population Growth by Election District in Worcester County, 1985-1995 ..... III-3
III-5 Age Distribution In Study Area Census Tracts III-4
III-6 State, County, and Census Tract Economic Information III-5
III-7 Racial Population Characteristics III-6
III-8 Zoning Classifications III-15
III-9 Worcester County Land Use Trends 1973-1990 ..... III-16
III-10 Worcester County Land Use Forecast, 1990-2020 ..... III-19
III-11 Historic Standing Structures in the Study Areas III-21
III-12 Description of Common Soil Series in the Study Area III-26
III-13 Prime Farmland Soils III-29
III-14 Soils of Statewide Importance III-29
III-15 Farm Parcels per Operator Along US 113 ..... III-31
III-16 Distribution of Farm Operators Along US 113 ..... III-32
III-17 Wetland Summary III-56
III-18 Wetland Functions and Values III-65
III-19 Noise Abatement Criteria, Activity Relationships in CFR 772 ..... III-72

Table **Page No.**

III-20 Sensitive Receptor Sites and Ambient Noise Levels III-73
III-21 Potential Wastes Sites III-79

IV. Environmental Consequences

IV-1 Projected Accident Data IV-8
IV-2 Right-of-Way Impacts and Displacements by Alternative IV-11
IV-3 Business Displacements by Alternative IV-21
IV-4 Additional Right-of-Way Impacts by Alternative IV-24
IV-5 Summary of Impacts to Historic Structures IV-31
IV-6 Preliminary National Register of Historic Places Archeological Site Recommendations for US 113 Sites IV-41
IV-7 Farmland Impact Summary IV-44
IV-8A Mean Pollution Concentrations in Highway Runoff from Urban and Rural Highways IV-48
IV-8 Common Highway Runoff Constituents and Their Primary Sources IV-52
IV-9 Number, Probable Type, and Preliminary Size of Stream Crossings by Alternative IV-53
IV-10 Impacts to the 100-Year Floodplain IV-57
IV-11 Impacts to Wetlands Within the Study Area by Each Build Alternative IV-59
IV-12 Impacts to Wetlands By Alternative By Wetland Classification IV-61
IV-12A Wetland Impacts by the Preferred Alternatives and Available Mitigation Area by Watershed (Acres) IV-84
IV-12B Goals and Objectives for Wetland Mitigation IV-88
IV-13 Impacts to Vegetation IV-90
IV-14 CO Concentrations - Southern Study Area IV-95
IV-15 CO Concentrations - Northern Study Area IV-96
IV-16 Summary of Noise Levels No-Build Versus Dualization Alternatives, including the Southern Preferred Alternative - Southern Study Area IV-101
IV-17 Summary of Noise Levels No-Build Versus Dualization Alternatives, including Northern Preferred Alternative - Northern Study Area IV-102
IV-18 Summary of Noise Levels Ambient Versus Dualization Alternatives, including Southern Preferred Alternative - Southern Study Area IV-104
IV-19 Summary of Noise Levels Ambient Versus Dualization Alternatives, including Northern Preferred Alternative - Northern Study Area IV-105
IV-20 Criteria for Determining Feasibility and Reasonableness of Noise Abatement (A through U) IV-113
IV-21 Results of Screening Investigations IV-126
IV-22 Potential Waste Sites Affected by Each Build Alternative IV-127

Table **Page No.**

IV-22A 1983 and 1992 Water Quality Constituents and Parameters for a Selected Monitoring Station in the Isle of Wight Bay IV-145
IV-23 Comparison of Approximate Annual Population Growth Rate to Approximate Annual Wetland Loss IV-149
IV-24 Approximate Wetland Impacts Associated With Existing US 113 ..... IV-150
IV-25 Average Percentage of Footprint of Development IV-153
IV-26 Comparison Development in the County Versus the Floodplain IV-153

I.
PURPOSE OF AND NEED FOR ACTION

US 113 Planning Study
Snow Hill, Maryland to Delaware State Line

Office of Planning and Preliminary Engineering
Maryland State Highway Administration

I. PURPOSE OF AND NEED FOR ACTION

A. Introduction

The Purpose and Need Statement for the US 113 Planning Study was developed in early 1996 and concurred upon by the Federal Highway Administration (FHWA), U.S. Army Corps of Engineers (COE), U.S. Fish and Wildlife Service (FWS), and the U.S. Environmental Protection Agency (EPA), U.S. National Park Service (NPS), National Marine Fisheries Service (NMFS), Maryland Department of the Environment (MDE), Maryland Department of Natural Resources (DNR), Maryland Office of Planning (MOP), and Maryland Historical Trust (MHT) (see Chapter VI of the **Draft EIS/Section 4(f) Evaluation** (dated May 1997) for relevant correspondence).

Following the Project Location and Description presented in Section B of this Chapter, Section C presents the Purpose and Need Statement as revised based on updated accident characteristics and agency comments. Of particular note is the updated information presented for fatal accidents along the existing two-lane portions of US 113 (data are current through September 1997). In addition, Appendix D has been added to this document to provide supplemental and additional accident data on other comparable highways in Maryland.

B. Project Location and Description

US 113 departs from US 13 near Pocomoke City, Maryland and extends north 40 miles in Maryland and 60 miles in Delaware, rejoining US 13 in Dover, Delaware. US 113 provides a critical connection on the Delmarva Peninsula for through and local traffic, including recreation trips. US 113 directly links Pocomoke City, Snow Hill (the Worcester county seat) and Berlin, and indirectly serves Ocean City (the second most populated city in Maryland during the summer season). As discussed in Section II.A of this document, US 113 dates from the late 1600's; US 113 was an earth and shell road until the early 1900's, when it was paved generally along its present alignment.

The project study area for US 113 (Worcester Highway) lies entirely within Worcester County, Maryland and encompasses the remaining 23.8 miles of two-lane US 113 in Maryland, extending from south of Snow Hill, Maryland north to the Delaware state line (see Figure S-1). It excludes the 4.4 miles of presently dualized US 113 highway around Berlin, Maryland and, therefore, consists of two study areas:

- The **southern study area** extends along US 113 from south of Snow Hill, Maryland to south of Berlin, Maryland (approximately 16.3 miles).

- The **northern study area** extends from north of Berlin, Maryland to the Delaware state line (approximately 7.5 miles).

C. Project Need

The purpose of this study is to improve vehicular safety conditions and traffic operations along the two-lane portions of US 113 from south of Snow Hill, Maryland to the Delaware state line. County Residents Action for Safer Highways (CRASH), a local citizens group, requested an accident investigation and evaluation of improvements to address the safety conditions within the study area due to the number of fatal accidents. Need for this project is demonstrated by the fatal accident rate in the northern study area, which is significantly higher than the statewide average. Existing roadway conditions along US 113 are discussed in Section C.1. of this Chapter; Section C.2. addresses traffic operations and levels of service. Accident statistics are presented in Section C.3. of this Chapter. Section C.4 presents further details on fatal accidents along US 113.

1. Existing Roadway Conditions

US 113, combined with US 13 and US 50, have historically formed the backbone of the transportation system for the lower Eastern Shore of Maryland, including Worcester County, Maryland and Sussex County, Delaware. US 113 is functionally classified as a "Rural-other Principal Arterial" on the Federal Functional Classification System of Highways and as an "Intermediate Arterial" on the State Functional Classification System of Highways. These are the highest types of arterial classifications - these highways must handle longer-distance trips and should safely handle high-speed travel.

Due to its function, US 113 has been designated as part of the State Primary Highway System and is included in the National Highway System (designated by Congress in 1995). This project is included in the current approved federally required State Transportation Improvement Program (STIP).

No locations along existing US 113 in the southern study area are known to have substandard geometry. Several locations in the northern study area, however, have substandard horizontal geometry along US 113. These locations are as follows:

- US 113 at MD 452
- US 113 at Pitts Road
- US 113 at Jarvis Road

Although US 113 is not an access controlled roadway, there is a grade separated interchange at MD 90. Intersections with a flashing signal in the southern study area of US 113 occur at the following locations (see Figures S-2A, S-2B, S-2C):

- MD 394 (Market Street)
- Castle Hill Road
- MD 12 (Snow Hill Road)
- Washington Street / Brick Kiln Road
- MD 365 (Public Landing Road)
- Langmaid Road

In the northern study area, traffic signals or flashing signals occur at the following intersections (see Figure S-2D):

- MD 589 (Racetrack Road) (traffic signal)
- Pitts Road (flashing signal)
- MD 610 (Whaleyville Road - Hammond Road) (traffic signal)

US 113 is a four-lane divided roadway from south of Snow Hill to US 13 near Pocomoke City, through the Berlin area, and north of the Delaware state line. US 113 north and south of the existing four-lane divided highway portion east of Berlin has two different roadway sections. Figures S-2A through 2D show the area of divided and undivided roadways. The southern study area, from immediately south of Snow Hill to just south of Berlin, consists of a two-lane undivided roadway with two 12-foot lanes and 10-foot shoulders. The northern study area from north of Berlin to the Delaware state line typically consists of a two-lane undivided roadway with two 11-foot lanes and 8-foot shoulders. Auxiliary lanes exist at various locations along US 113, primarily for turning movements at intersections.

A pavement condition survey, conducted by SHA in 1994, indicated that the ride quality along US 113 is satisfactory throughout the project limits. The Distress Value, an indication of cracking, patching, surface defects and surface deformation, was found to be of medium distress in the southern study area. In the northern study area, the distress value was found to be low. The SHA Pavement Management Report rates roadways based on a combination of three factors: distress characteristics, traffic volumes and ride. In the southern study area, locations determined to have a poor rating have since been resurfaced. The US 113 roadway in the northern study area was rated as acceptable.

2. Traffic Volumes and Levels of Service

Average daily traffic (ADT) is the average number of vehicles traveling on a roadway during a 24-hour period. Summer ADT is traffic in areas where recreational traffic is most concentrated (this study defines summer to be the period between Memorial Day and Labor Day).

The current **ADT** (year 1995) ranges from a low of 3,500 to a high of 7,500 vehicles per day along the 16.3 mile southern study area and 6,400 to 12,200 vehicles per day within the 7.5 mile northern study area. The current **summer ADT** (1995) ranges from 4,900 to 8,900 vehicles per day within the southern study area and 8,300 to 18,500 vehicles per day within the northern study area. Summer ADT volumes range from 19 percent to 52 percent higher than the annual ADT for the same portion of US 113. Existing ADT volumes are presented in Table I-1.

Trucks currently make up about 14 percent of the ADT volumes on US 113. Approximately one third of these trucks are "light and medium duty" two to three axle trucks, with the balance being "heavy duty" trucks, including tractor trailer vehicles. More than 80 percent

of these trucks along US 113 are diesel powered. While detailed truck surveys have not been conducted, the large poultry industry that is characteristic of the eastern shore generates a considerable number of vehicles. The Perdue Processing plant is located in Salisbury, Maryland and numerous chicken farms are located within the US 113 study area. In addition, the extensive agricultural land uses throughout the study area, coupled with these chicken operations, accounts for a large portion of the truck traffic along existing US 113. Truck counts conducted on the Delmarva Peninsula indicates that the 14 percent trucks being experienced along US 113 is a relatively high percentage for trucks. Historical analyses of truck operations indicate that divided highways provide a safer, and therefore more preferred, highway than two-lane highways.

Design year (2020) traffic forecasts were prepared in accordance with the Comprehensive Development Plan for Worcester County and assume completion of four lanes along US 113 in Delaware. Because severe levels of traffic conditions/operations are not anticipated along most of US 113 in the year 2020, these forecasts indicate about a 1 percent difference in the design year among the alternatives under consideration (i.e., between the No-Build and dualization alternatives or Preferred Alternatives). The design year 2020 ADT within the southern study area ranges from 5,000 to 10,800 vehicles per day and 7,000 to 12,900 vehicles per day during the summer months. The design year ADT within the northern study area ranges from 10,100 to 20,000 vehicles per day during non-summer timeframe (or months) and 13,600 to 30,400 vehicles per day during the summer months. Projected ADT volumes are presented in Table I-1.

Table I-1: Average Daily Traffic (ADT) Volumes

Segment	Existing ADT (1995)	Design Year ADT (2020)*	Existing Summer ADT (1995)	*Design Year Summer ADT (2020)*
◆ **Southern Study Area** Two-lane US 113: Snow Hill to Berlin	3,500 to 7,500	5,000 to 10,800	4,900 to 8,900	7,000 to 12,900
◆ **Northern Study Area** Two-lane US 113: Berlin to Delaware line	6,400 to 12,200	10,100 to 20,000	8,300 to 18,500	13,600 to 30,400

* Design year traffic volumes vary by 1% for No-Build and Build Alternatives (including the Preferred Alternatives)

Traffic flow is measured by determining a level of service (LOS) for the roadway. Each level of service grade coincides with conditions that drivers experience while traveling along a roadway. LOS grade designations, from 'A' to 'F', are used to define traffic operations on any given section of highway. LOS 'A' indicates ideal conditions and LOS 'F' indicates severe congestion and long delays. A brief explanation of LOS is given below:

Level of Service 'A' - Free traffic flow, low volumes, free-flow speeds
Level of Service 'B' - Stable traffic flow, some speed restrictions, ability to maneuver freely is only slightly restricted
Level of Service 'C' - Stable traffic flow, increasing traffic volumes, ability to maneuver freely is noticeably restricted
Level of Service 'D' - Approaching unstable flow, heavy traffic volumes, decreasing speeds
Level of Service 'E' - Decreased speeds accompanied by delays, maneuverability is very limited
Level of Service 'F' - Severe congestion accompanied by delays, describes breakdown in traffic flow

NOTE: In the rural / agricultural areas through which US 113 passes (i.e., outside of the corporate limits of Berlin), travelers expect traffic conditions to be free of congestion, as represented by Levels of Service 'A', 'B' or 'C'.

US 113 in the southern study area currently operates at LOS 'C' conditions, including summer weekends when traffic demand is the greatest. The existing LOS in the northern study area is LOS 'C' to 'D' on weekdays throughout most of the year and LOS 'D' on summer weekends. In year 2020, the existing two-lane US 113 is expected to operate at LOS 'C' to 'D' condition in the southern study area including summer weekends, but is expected to operate at LOS 'D' on weekdays all year in the northern study area, and LOS 'F' between MD 589 and the Delaware state line on summer weekends. **In essence, traffic conditions now being experienced in the summer along the existing two-lane portions of US 113 are predicted to be the yearly average conditions in the design year 2020, with summer weekend conditions in the design year substantially worse.**

Specific locations in the northern study area now experiencing traffic congestion during the summer include the intersections of US 113 and: MD 589, MD 367, and MD 610. Each intersection experiences some congestion during the current summer months. The roadway segments between these intersections are also operating under unstable traffic flow conditions during the summer months and conditions are projected to become less stable. Traffic conditions are further discussed in Section IV.A. of this document.

The access needs of farm operators vary according to the time of year and crop. Peak times of the year for farm vehicle travel on US 113 are planting time and harvesting time. During these periods, farm vehicles are common on the roadway, as are the trucks that pick up and haul the produce to market. The mixture of these slow moving farm vehicles with other higher speed vehicles including tractor trailer trucks along US 113 creates an additional need for four travel lanes. Farming operations along US 113, which affect truck and vehicular operations, are further discussed in Section III.D.3.

As a result of a public comment raised during the June 17, 1997 Combined Location/Design Public Hearing, the U.S. Army Corps of Engineers requested an analysis of the effects on the US 113 project of Virginia's widening their Chesapeake Bay Bridge Tunnel (CBBT) from

two lanes to four lanes. The Chesapeake Bay Bridge Tunnel currently is a two-lane, undivided toll facility which spans the mouth of the Chesapeake Bay from Virginia Beach, Virginia to Cape Charles, Virginia. The facility, completed in 1964, is comprised of two separate sections of tunnel, two separate bridge sections, and four separate sections of causeway. Similar to US 113, the CBBT experiences seasonal fluctuations in average daily traffic attributable to recreational and vacation trips. Truck traffic servicing the Port of Hampton Roads, as well as Norfolk Naval Base and affiliated facilities, is a significant traffic component. Some of this truck traffic continues north along US 13 and US 113 through the eastern shore of Maryland. The CBBT construction project currently underway will widen/dualize the existing two-lane causeway sections and two-lane bridge sections to four-lanes. Completion of this construction is anticipated in 1999. Due to prohibitive costs, however, the two separate tunnel sections will not be widened and will remain two lanes.

Traffic projections for the CBBT indicate an increase similar to that expected for US 113. In 1992, traffic volumes along the CBBT were approximately 7,400 vehicles per day, which represented a LOS 'E' for the tunnels and LOS 'D' for the causeways. Projections anticipate vacation trips and truck trips increasing for the design year 2020 traffic flows. The projected year 2020 Average Annual Daily Traffic (AADT) is 16,720, which represents a LOS 'E' for the tunnels and 'B' for the widened causeways. The project planning study for US 113 in Maryland will not be measurably affected by the CBBT widening project due to the fact that the two tunnel segments will not be widened. By not widening the tunnel segments, the current and projected LOS for the tunnels are not forecast to significantly change. While the projected LOS for the causeway sections will increase, the two lane tunnels will prevent an overall increase in traffic volumes above that already incorporated into the US 113 projections.

3. Overall Safety Experience

Table I-2 presents a detailed analysis for the 443 accidents which occurred along the two-lane portions of US 113 for the **7-year period from 1990 through 1996 inclusive.** Table I-2 also provides considerable details on accident types (angle collision, rear end collision, etc.), time of day, weather, alcohol related, intersection related, and truck involvement. The following observations may be drawn from the 7-years of detailed accident data presented in Table I-2.

- the fatal accident rate is equal to or higher than the statewide average rate for **both study areas** (and **significantly** greater statistically in the **northern study area**).
- the injury accident rate and the overall accident rate in the **northern study area** are both greater than the respective statewide average rates for each category.
- the accident rates in the **northern study area** for fixed object and left turn accidents are greater than the similar statewide average, and **significantly** greater statistically for angle collisions. By calculating the percentage of total accidents for these three accident types in the northern study area, angle collisions represent 18 percent of the total accidents (i.e., 42 divided by 227), fixed object accidents represent 36 percent, and left turn accidents represent 6 percent.

- furthermore, in the **northern study area,** the wet surface related accident rate and alcohol related accident rate are **significantly** greater statistically than the statewide average rate.
- in the **southern study area,** the nighttime accident rate is greater than the statewide average rate.

Table I-2: Detail Analysis of 7-Years Accident Data (All Accidents) (1990 through 1996)

Accident Type	Southern Study Area			Northern Study Area		
	Total Accidents	Study Rate	State Average	Total Accidents	Study Rate	State Average
Fatal Accidents	9	2.6	2.3	10	**6.3**[4,5]	2.5
Fatalities	12			10		
Injury Accidents	103	29.3	67.8	122	76.4	72.5
Persons Injured	186			236		
Prop. Damage Accidents	104	29.5	57.3	95	59.5	62.5
TOTAL ACCIDENTS	216	61.4	127.5	227	142.2	137.5
Angle Collision	36	10.2	20.3	42	**26.3**[4,5]	19.3
Rear End	25	7.1	24.0	36	22.6	25.6
Fixed Object	81	23.0	36.2	81	50.7	42.6
Opposite Direction	24	6.8	8.9	14	8.8	9.3
Sideswipe	6	1.7	5.4	4	2.5	5.9
Left Turn	6	1.7	8.0	14	8.8	8.1
Pedestrian	2	0.6	1.7	3	1.9	2.0
Parked Vehicle	2	0.6	2.2	2	1.3	2.8
Other	34	9.7	20.8	31	19.4	22.0
Nighttime Acc.	74	34%	32%	71	31%	32%
Wet Surface Acc.	56	26%	28%	79	**35%**[4,5]	28%
Alcohol Related	18	8%	8%	29	**13%**[4,5]	8%
Intersection Related	69	32%	na[6]	92	40%	na[6]
% Trucks Involved in Total Accidents	8%	na[6]	na[6]	7%	na[6]	na[6]

Table I-2 continued on Page I-8
See next page for footnotes 1 through 6

Table I-2 continued: Detail Analysis of 7-Years Accident Data (1990 through 1996)

Notes:

1. Accident rates are presented as number of accidents per 100 million vehicle miles (MVM) of travel.
2. Because of the differences in existing shoulder widths and intensity of adjacent development, the statewide averages for the southern and northern study area sections are not the same.
3. The statewide average accident rates are derived from a database of all Maryland roadways. For roads with similar characteristics (e.g., similar functional classification, roadway cross-section, traffic operations), an accident average is computed. Hundreds of roads were used in computing the statewide accident rate for US 113.
4. **Significantly higher than the statewide average rate** for similar State maintained highways.
5. During the compilation and analysis of the above accident statistics, significance was determined by computing the 'Morin's Upper Control Limit' (RCU). Morin's Upper Control defines the upper limit of the range above which a statistic becomes significant. This methodology determined that fatal accidents, fixed object accidents, wet surface accidents, and alcohol related accidents in the northern study area are **significantly** higher than the statewide average for similar highways.

   Mathematically, the expression reads: $RCU = Ra + \sqrt{(K (Ra)/M)} - 1/2M$

   where:
   Ra = the statewide rate
   $K = 1.645$ the confidence interval
   M = 100 million vehicle miles traveled

6. "na" means "not available".

4. Fatal Accidents

The primary purpose for conducting this project planning study is the high number of fatal accidents. Historically, the fall and summer seasons have experienced the highest number of fatal accidents. As shown on **Table I-3** for the 17-year and 9-month period from January 1980 through September 1997, US 113 experienced 20 fatal accidents in the southern study area for a study rate of 3.0 fatal acc/100mvm compared to the statewide average of 2.8 fatal acc/100mvm. During this same 17-year 9-month period, the northern study area experienced 22 fatal accidents resulting in a study rate of 6.1 fatal acc/100mvm compared to the statewide average of 2.9 fatal acc/100mvm. Note that while the fatal accident rate in the southern study area is slightly above the statewide average, the fatal accident rate in the northern study area is **significantly** higher statistically than the statewide average.

Similarly, as shown for the 7-years (1990 through 1996) of total accident data analyzed in **Table I-2**, this trend has continued wherein the fatal accident rate is equal to or higher than the statewide average for **both study areas** and **significantly** greater statistically for the **northern study area.** From the period beginning January 1997 through September 1997 (nine months), 4 fatal accidents (causing 4 deaths) have occurred along the two-lane portions of US 113. Table I-3 and Figure I-1 (following page I-10) identify the locations and provide descriptions of the 42 fatal accidents for the 17 year + 9 month period beginning January 1980 and extending through September 1997. Trucks were involved in 16 of these 42 fatal accidents (39 percent). Truck drivers were at fault in 4 of the 42 fatal accidents (9.5 percent). Fifteen (15) of these fatal accidents were alcohol related (32 percent).

Table I-3: Tabulation of 17 Years + 9 Months Fatal Accident Data
(January 1980 through September 1997)
(see Figures I-1A through I-1D)

◆ Distribution of Fatal Accidents by Year:			
1980	1 accident	1990	2 accident
1981	2 accidents	1991	7 accidents
1982	5 accidents	1992	0 accidents
1983	1 accident	1993	1 accident
1984	2 accidents	1994	4 accidents
1985	1 accident	1995	3 accidents
1986	2 accidents	1996	2 accidents
1987	2 accidents	1997 (9 months)	4 accidents
1988	2 accidents		
1989	1 accident	Total	42 accidents

Table I-3 continued on next page.

Table I-3 (continued): Tabulation of 17 Years + 9 Months Fatal Accident Data
(January 1980 through September 1997)
(see Figures I-1A through I-1D)

◆ **Distribution of Fatal Accidents by Collision Type**

	See Fig. I-1A	See Fig. I-1B	See Fig. I-1C	See Fig. I-1D	Total
Angle	5	0	0	3	8 (19%)
Rear End	1	1	0	0	2 (5%)
Fixed Object	0	2	1	1	4 (9.5%)
Opposite Direction	3	6	0	15	24 (57%)
Sideswipe	0	0	0	1	1 (2.5%)
Left Turn	0	0	0	0	0 -
Pedestrian	0	0	0	2	2 (5%)
Parked Vehicle	0	0	0	0	0 -
Other (Bicycle)	0	0	1	0	1 (2.5%)
Totals	9	9	2	22	42

◆ **Distribution of Fatal Accidents by Day/Night**

Day	7	4	2	7	20 (48%)
Night	2	5	0	15	22 (52%)
Totals	9	9	2	22	42

◆ **Distribution of Fatal Accidents by Pavement Surface Condition**

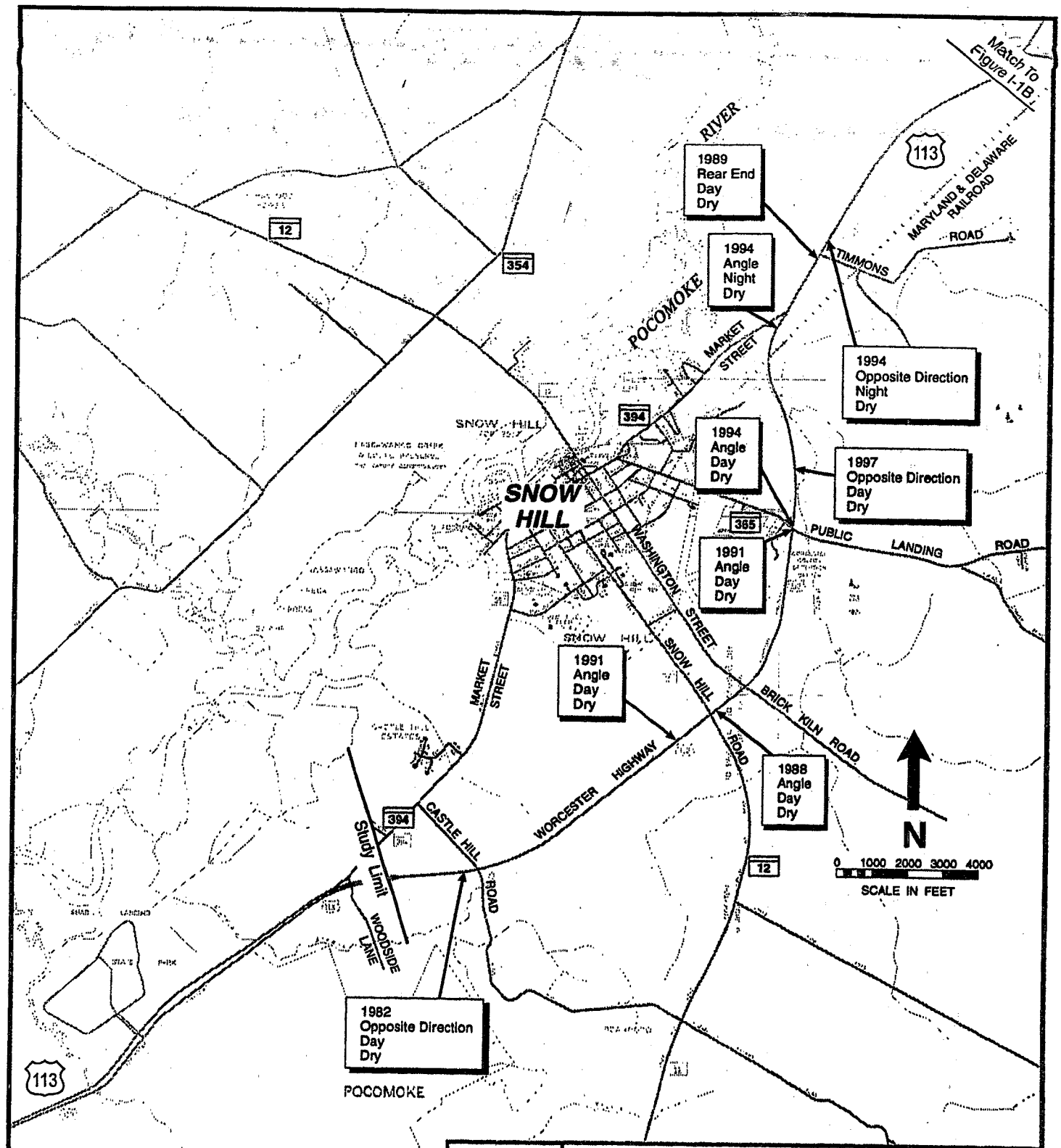
Wet	1	3	0	7	11 (26%)
Dry	8	6	2	15	31 (74%)
Totals	9	9	2	22	42

◆ **Distribution of Fatal Accidents by Location**

US 113 @ Intersecting Cross Street	12 (29%)
Along US 113 Between Intersections	30 (71%)
Total	42

◆ **Distribution of Fatal Accidents by Driver's Familiarity & Fault**

"At-Fault" Driver	-	Driver #2/Other	
Local		Local	24 (57%)
Local		Out-of-Town	4 (9.5%)
Local		Fixed Object	4 (9.5%)
Local Pedestrian		Local	1 (2.5%)
Local Pedestrian		Unknown	1 (2.5%)
Out-of-Town		Out-of-Town	3 (7%)
Out-of-Town		Local	3 (9.5%)
Bicyclist		Out-of-Town	1 (2.5%)
		Total	42



Legend

Accident Year → 1990
Collision Type → Pedestrian
Time → Day
Condition → Dry

KEY MAP

A B C D

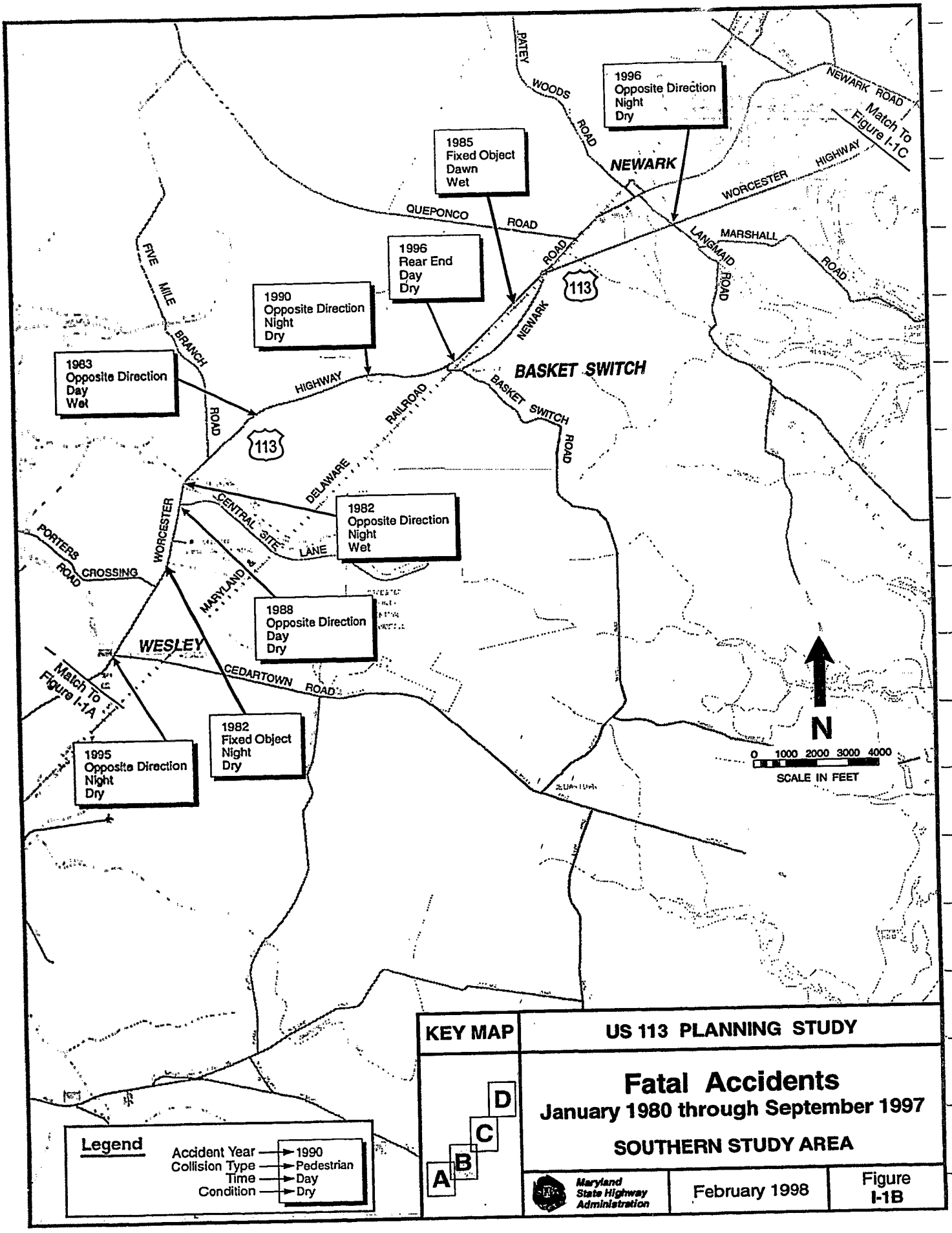
US 113 PLANNING STUDY

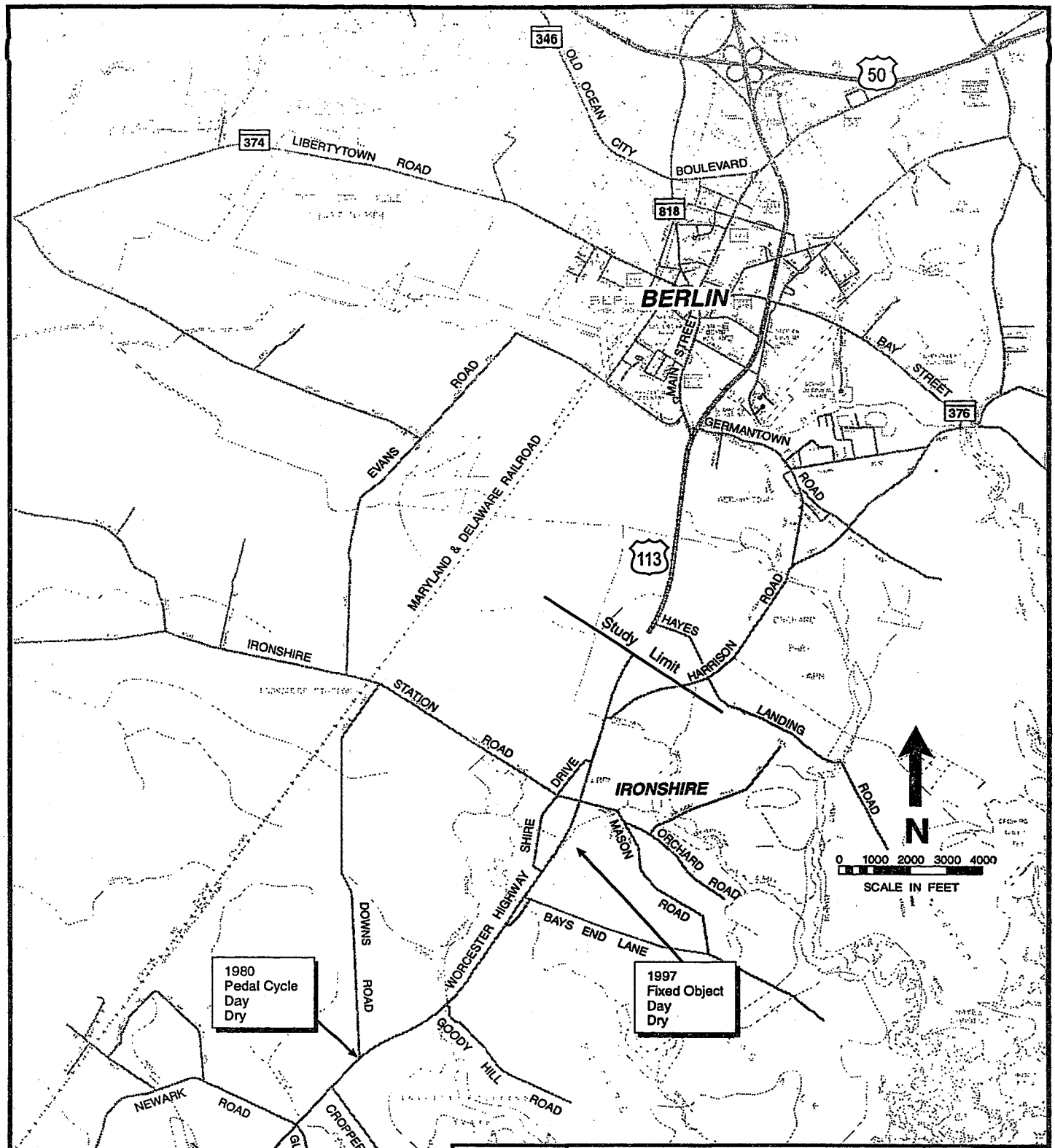
Fatal Accidents

January 1980 through September 1997

SOUTHERN STUDY AREA

Maryland State Highway Administration | February 1998 | Figure I-1A


1996
Opposite Direction
Night
Dry
1985
Fixed Object
Dawn
Wet
1996
Rear End
Day
Dry
1990
Opposite Direction
Night
Dry
1983
Opposite Direction
Day
Wet
1982
Opposite Direction
Night
Wet
1988
Opposite Direction
Day
Dry
1982
Fixed Object
Night
Dry
1995
Opposite Direction
Night
Dry
NEWARK
BASKET SWITCH
WESLEY
PATEY WOODS ROAD
NEWARK ROAD
Match To Figure I-1C
WORCESTER HIGHWAY
QUEPONCO ROAD
MARSHALL ROAD
LANGMAID ROAD
FIVE MILE BRANCH ROAD
NEWARK ROAD
HIGHWAY
RAILROAD
BASKET SWITCH ROAD
DELAWARE
CENTRAL SITE LANE
WORCESTER
PORTERS ROAD CROSSING
MARYLAND
CEDARTOWN ROAD
Match To Figure I-1A
113
N
0 1000 2000 3000 4000
SCALE IN FEET
Legend
Accident Year → 1990
Collision Type → Pedestrian
Time → Day
Condition → Dry
KEY MAP
A
B
C
D
US 113 PLANNING STUDY
Fatal Accidents
January 1980 through September 1997
SOUTHERN STUDY AREA
Maryland State Highway Administration
February 1998
Figure I-1B



US 113 PLANNING STUDY

Fatal Accidents

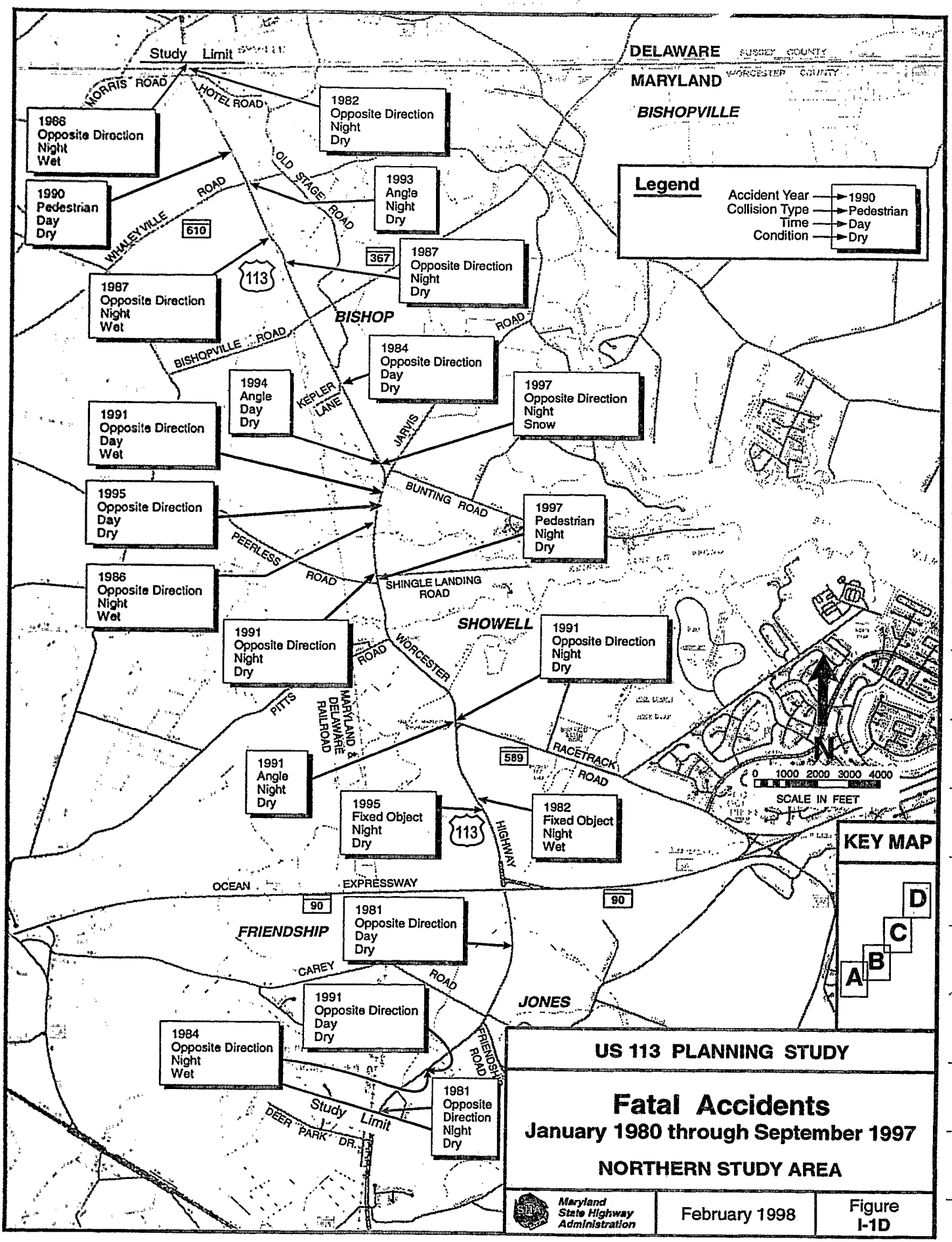
January 1980 through September 1997

SOUTHERN STUDY AREA

Maryland State Highway Administration

February 1998

Figure I-1C



US 113 PLANNING STUDY

Fatal Accidents

January 1980 through September 1997

NORTHERN STUDY AREA

Maryland State Highway Administration | February 1998 | Figure I-1D

D. Planning and Project History

Historical information for US 113 is presented in Section II.A of this document. A project planning study for the dualization of US 113 (northern study area) was originally conducted in the early 1970's and an alignment was selected at that time. Since right-of-way was not preserved, development has occurred along that alignment. The next study began in the late 1980's which addressed the changes in environmental regulations and updated the previous study. Several alternatives and their impacts were identified. An Alternates Public Meeting was held in November of 1990 and shortly thereafter, the project was dropped with the understanding that many of the safety and congestion issues could be resolved through local intersection improvements by SHA's District 1 office. Many local intersection improvements have been implemented and have had positive effects on reducing accidents. Several additional improvements have been identified and are scheduled for implementation as funding becomes available. A list of local intersection improvements and their completion dates (some dates are projected) is included in Table II-1 under No-Build improvements.

Fatalities have been occurring along US 113 at an alarming rate. A local citizens group, County Residents Action for Safer Highways (CRASH), has been very vocal in their support for improvements to the two-lane portions of US 113 from Snow Hill to the Delaware state line in order to address the fatal accidents occurring along the corridor. As a direct consequence of the efforts of CRASH, the Governor, and study area elected officials (senators, delegates, and mayors) requested that SHA study the characteristics of US 113 and develop solutions that will create a safer roadway. A primary goal of this project has been to identify safety solutions, thereby minimizing future fatal accidents.

SHA held an Alternates Public Workshop on November 30, 1995 from 5:00 to 8:00 PM at the Berlin Middle School to present the preliminary alternatives for public comment. In addition to aerial mapping showing the preliminary TSM and dualization alternatives, a slide show concerning the US 113 planning process and information regarding environmental impacts, accident statistics, and right-of-way acquisition procedures were also available. SHA representatives were available to answer questions. More than 200 citizens attended the meeting, including local politicians and the media. A total of 42 comments were received from mailers, letters, and citizens at wall displays. In general, almost all commenters agreed that further improvements are needed throughout, and almost half were in favor of a relocated US 113 in the northern study area. Comments and ideas received at the workshop were incorporated into the development of the detailed alternatives. The following summarizes the comments received at and following this meeting:

- Nine people were in favor of dualizing US 113, with no preferred alternative.
- Two people were opposed to dualizing US 113.
- At the northern end of the project, 16 people were in favor of relocating US 113.
- Two people were in favor of widening US 113, specifically along its current location.
- Several people supported lower speed limits along US 113.
- Several people would like to see the project move along quickly.
- Several people strongly agreed that further spot improvements are needed.

The following responses address comments offered by the public as a result of the Alternates Public Meeting concerning lowering the speed limits and increasing enforcement:

- **Lowering Speed Limit:** The possibility of lowering the speed limit along US 113 was investigated, however, neither the SHA nor the State Police recommend lowering the speed since this may cause additional safety problems. Currently, US 113 is posted for appropriate speeds and lowering the speed below the operating speed would cause some drivers to slow down in order to obey the posted speed while others may not obey the speed limit. This could cause rear-end type collisions or additional accidents by drivers attempting to pass the "slow" moving vehicles.

- **Increase Enforcement:** A special enforcement team has been assigned to US 113 to look for aggressive drivers. A motorcycle team is working radars in the project area. Use of headlights on "all the time" along the two-lane stretches of US 113 also went into effect on April 30, 1997. Four trucking companies in the area were known to be using headlights prior to this date.

Maryland SHA and the U.S. Army Corps of Engineers held a Combined Location/Design Public Hearing on June 17, 1997 from 7 PM until completion of testimony at the Stephen Dectaur High School in Berlin, Maryland. All alternatives presented in the Draft EIS/Section 4(f) Evaluation were offered for public and agency review and comment. In addition to detailed mapping, a slide show concerning the purpose and need of the US 113 Planning Study, description of the alternatives under consideration, and anticipated environmental impacts were presented. SHA representatives were also available to answer questions prior to the Hearing. More than 700 citizens attended the meeting; 12 elected officials and 32 citizens offered public testimony - all supported the project. In addition to comment letters from Federal and state agencies, more than 2,250 citizens submitted comment letters. See Section V for additional details.

E. County and State Programs

The Comprehensive Development Plan for Worcester County, adopted in 1989, identifies US 113 as a key element of the county's regional arterial highway system. The plan recognizes the need to upgrade US 113 and recommends that Worcester County work with the State of Maryland to develop a plan of improvements along US 113 and MD 90 that meets the needs of the County. This Development Plan calls for US 113 to be upgraded to four lanes throughout its length. This project has been included in the Highway Needs Inventory (HNI) since the early 1960's. In the 1970's, the dualization of the roadway was studied; the present HNI shows dualization of the roadway which would provide continuity along US 113.

The current project planning study is included in the Development and Evaluation Section of the Maryland Department of Transportation 1997-2002 Consolidated Transportation Program (CTP). This project was added to the 1995 program in response to the safety concerns raised by elected officials and the citizens' group, CRASH, which was formed specifically to address improvements that promote safe travel on US 113 and MD 90. As a result of the extremely strong support from

local, state, and Federal elected officials and local citizens, it is anticipated that funding for final design, right of way acquisition, and construction will be forthcoming in the near future.

Other related projects included in the 1997-2002 CTP within Worcester County are:

- safety improvements and median barrier along 4.4 miles of MD 90 east of US 113 (funded in construction program).
- safety study along MD 90 between US 50 and US 113.
- bicycle/pedestrian bridge parallel to Verrazano Bridge over Sinepuxent Bay (now under construction).
- other minor roadway surfacing / local intersection improvement projects.

F. Relationship to Other Modes of Transportation

The Worcester County Commission on Aging, located in Snow Hill, operates the general public, elderly and disabled transportation service on demand for the County. The general public service operates seven days per week, providing service between Pocomoke City, Snow Hill, Berlin, Ocean City and Selbyville, Delaware. The demand response service operates Monday through Friday, providing door-to-door service throughout the county.

The Worcester County transportation system operated 162,850 miles providing 23,752 trips during FY 1995. The Commission on Aging utilizes six buses to operate its general public service and ten vehicles to provide its demand response service.

At this time, there are no immediate plans to expand service. In FY 1997, however, a Transportation Development Plan (TDP) will be completed. The TDP will evaluate current service, recommend changes to improve efficiency and to meet any unmet demand. In addition, future service for the next five years will be considered and appropriate recommendations will be made.

Currently, there are no Park-n-Ride facilities in the area served by transit.

Throughout the study area, the Maryland and Delaware Railroad (MDDE) line between Frankford, Delaware and Snow Hill, Maryland is parallel to US 113 (including grade crossings near Bishop and Newark). The rail line consists of a single track and accommodates train operations up to 25 miles per hour (meeting Federal Railroad Administration Class 2 standards). The MDDE provides only freight service on this line and serves customers in Bishop, Berlin and Snow Hill. Service is provided two to three days per week and usually occurs on weekdays during daylight hours. Service is occasionally provided over three consecutive days, however, including weekends, to meet special needs of shippers in the Snow Hill area. All MDDE traffic on this line is currently interchanged with the Consolidated Rail Corporation at Frankford, Delaware.

II.
ALTERNATIVES CONSIDERED

US 113 Planning Study
Snow Hill, Maryland to Delaware State Line

Office of Planning and Preliminary Engineering
Maryland State Highway Administration

II. ALTERNATIVES CONSIDERED

A. History of US 113

The US 113 project corridor follows a very old north-south route generally along the high ground between the Pocomoke River and Atlantic coastal bays. A road was in place by 1697 and was cited as "... the Road going up along the Sea Side" (Torrence 1935:p.243). Patents for land in the area of Snow Hill had been issued as early as 1670 and the town was created by a legislative decree in 1686. An early map (1670) by Augustine Herrman was the first to show European settlements along the Pocomoke River and plantations on both sides of the river from the bay to Dividing Creek in the south part of Worcester County. Based on the Herrman map and other evidence, it appears that the project vicinity was first settled by Europeans after 1670, but not in significant numbers until the late 1680's.

As the Eastern Shore was settled, a network of dirt roads connected the various towns. By the 1700s, a north-south highway, roughly following portions of US 13 and US 113 of today, started at Newcastle, passed south through Dover, Milford and Georgetown in Delaware, and then St. Martin's, Snow Hill and Pocomoke in Maryland, before proceeding down the Eastern Shore of Virginia to Cape Charles. This gave the lower Eastern Shore a direct route to the North (Source: *A History of Road Building in Maryland* State Roads Commission of Maryland, 1958).

US 113 was an earth and shell road until 1906, when the portion at Snow Hill was paved during the 1906 through 1921 time period. By 1912, US 113 between Snow Hill and Berlin was paved; Berlin to Showell was paved between 1916 and 1917; and Showell to the Delaware state line was paved by 1921. (Source: *Construction Record for Roadlife Studies,* State Roads Commission Statewide Highway Planning Survey).

Today, US 113 links the widely separated population centers of Pocomoke City, Snow Hill, Berlin, and Ocean City (via US 50 or MD 90) within Worcester County. Both Worcester County residents and interstate travelers rely on US 113 to serve their long-distance travel needs through the eastern position of Delmarva.

Recognizing this travel characteristic, US 113 is designated a "Rural-other Principal Arterial" on the Federal Functional Classification System of Highways, which was jointly developed by Worcester County and the Maryland State Highway Administration (SHA) and approved by the Federal Highway Administration (FHWA). It is an "Intermediate Arterial" on the State Functional Classification System of Highways. Since these functions serve the long distance traveler, a high degree of mobility is an important factor when planning and designing future improvements. Arterials have high design speeds to facilitate the movement of traffic over long distances and to provide better safety features. Control of access is particularly desirable on the highest classes of arterials to limit the side friction adjacent land access causes. Since many arterials are also often high volume roadways, a divided highway with the appropriate degree of access control is the preferred design when warranted by traffic demand (AASHTO, 1990).

As an important regional arterial, US 113 is part of the State Primary Highway System, a limited mileage system of highways deemed essential to Maryland's economic and social well being. This 1,280 mile system links the state's major urban centers and county seats via mostly dualized highways, many with access controls. Perhaps even more important, US 113 has been designated as a National Highway System route. This is a selective system of nationally important highways that has a specified FHWA funding source provided by Congress.

Not only is US 113 an important highway within Maryland, but it also serves, along with US 13, as an important regional highway on the Delmarva Peninsula. Within Delaware, the Delaware Department of Transportation (DelDOT) and local county governments are examining legislative and policy initiatives to preserve the integrity of these routes for through and local travellers. **Delaware's Corridor Capacity Preservation Program** addresses highway planning/design, land use, zoning, development, and access control aspects of the S.R. 1/US 13/US 113 corridor from Dover to the Maryland state line (draft program dated September 9, 1997). Maryland and Worcester County will be working with DelDOT and local county governments in Delaware to address many of these similar issues along US 113 to Maryland.

B. Preliminary Alternatives

On the basis of the project need as discussed in Section I and environmental constraints identified in the project corridor as shown in Section III of this document, preliminary alternatives for improvements to the existing two-lane portions of US 113 were developed. These preliminary alternatives were presented during the Alternates Public Meeting Workshop, held in November 1995, using aerial photography showing all of the known environmental features and alignments. Following this Workshop, alignments were retained for further engineering and environmental studies.

As shown on Figure S-1 and Figures S-2A through 2D, the US 113 planning study consists of two study areas:

- The **southern study area** extends from the existing dualized portion of US 113 just south of Snow Hill to the existing dualized portion of US 113 just south of Berlin, a distance of approximately 16.3 miles. Alternatives in the southern study area are designated with an "S."

- The **northern study area** extends from the existing dualized portion of US 113 just north of Berlin to the Delaware state line, a distance of approximately 7.5 miles. Alternatives in the northern study area are designated with an "N."

Development of project alternatives began in early 1995 with the preparation of an environmental inventory of resources in the study area. Environmental constraints mapping was developed using existing data sources including National Wetland Inventory (NWI) maps, Federal Emergency Management Agency (FEMA) 100-year floodplain maps, and Maryland Historical Trust (MHT) files. The results of field work further refined wetland boundaries shown on the NWI and Department of Natural Resources (DNR) Wetland Inventory mapping, verified known and previously unknown historic sites, and assessed the potential for archeological resources.

State and federal regulatory agencies have had the opportunity to review and comment on development of this study. InterAgency Review meetings, hosted by the Maryland State Highway Administration (SHA), have served as a forum for interaction between the agencies and the study team on the project's purpose and need and the alternatives retained for detailed study. The goal of the InterAgency Review meetings is to identify critical issues and resolve problems early in the planning process. The following agencies have participated in the InterAgency Review meetings:

- Federal Highway Administration
- US Army Corps of Engineers
- US Environmental Protection Agency
- US Fish and Wildlife Service
- National Marine Fisheries Service
- Maryland Department of the Environment
- Maryland Department of Natural Resources
- Maryland Historical Trust
- Maryland Office of Planning

A summary of the issues addressed at recent InterAgency Review meetings and recent Field Review meetings is provided in Chapter V, Comments and Coordination.

SHA has met on several occasions with local public officials, representatives from the County Residents Action for Safer Highways (CRASH) organization, and local communities including Friendship to provide information regarding the status of the project and to obtain input from local citizens on alternative modifications.

C. Alternatives Presented at the Alternates Public Workshop

1. Introduction

SHA held an Alternates Public Workshop on November 30, 1995 to present the preliminary alternatives for public comment. Comments and ideas received at the workshop were incorporated into the development of the detailed alternatives.

Preliminary alternatives considered for the **southern study area** included the No-Build (Alternative 1S), TSM (Alternative 2S), and dualization along the existing alignment (Alternative 3S). Although the No-Build Alternative does not meet the project need; it was used as a baseline for the comparison of other alternatives. The TSM Alternative provided local intersection improvements such as signing, lighting, and marking as well as turning and acceleration/deceleration lanes, and bypass lanes. Alternative 3S, a Dualization Alternative, included the construction of a two-lane roadway parallel to the existing road resulting in a four-lane divided roadway with a 34-foot median. Figures II-1A through 1C depicts the preliminary alignment of Alternative 3S.

In the **northern study area**, the preliminary alternatives considered included No-Build (Alternative 1N), TSM (Alternative 2N), dualization along the existing alignment (Alternative 3N) and dualization along new alignment (Alternative 4N with options). The No-Build and TSM Alternatives, as well as the dualization along the existing alignment (Alternative 3N) were similar in concept to those alternatives developed for the southern study area. The dualization on new alignment (Alternative 4N) involved the construction of a new four-lane, divided roadway on new location. In addition to the primary alignment (Alternative 4N), two options were developed (Options A and B). Options A and B both left the Alternative 4N alignment just north of the graded US 113 / MD 90 interchange area and crossed to the east side of existing US 113 just south of Racetrack Road (MD 589). All three alignments (Alternative 4N, Option A, and Option B) provided a bypass of the town of Showell and rejoined Alternative 3N just north of Showell. Alternative 4N again left the 3N alignment just north of Bishop and tied back into existing US 113 at the Delaware state line. Figure II-1D depicts the preliminary alignments of Alternates 3N, 4N, Option A, and Option B.

2. No-Build Alternatives (Alternatives 1S and 1N)

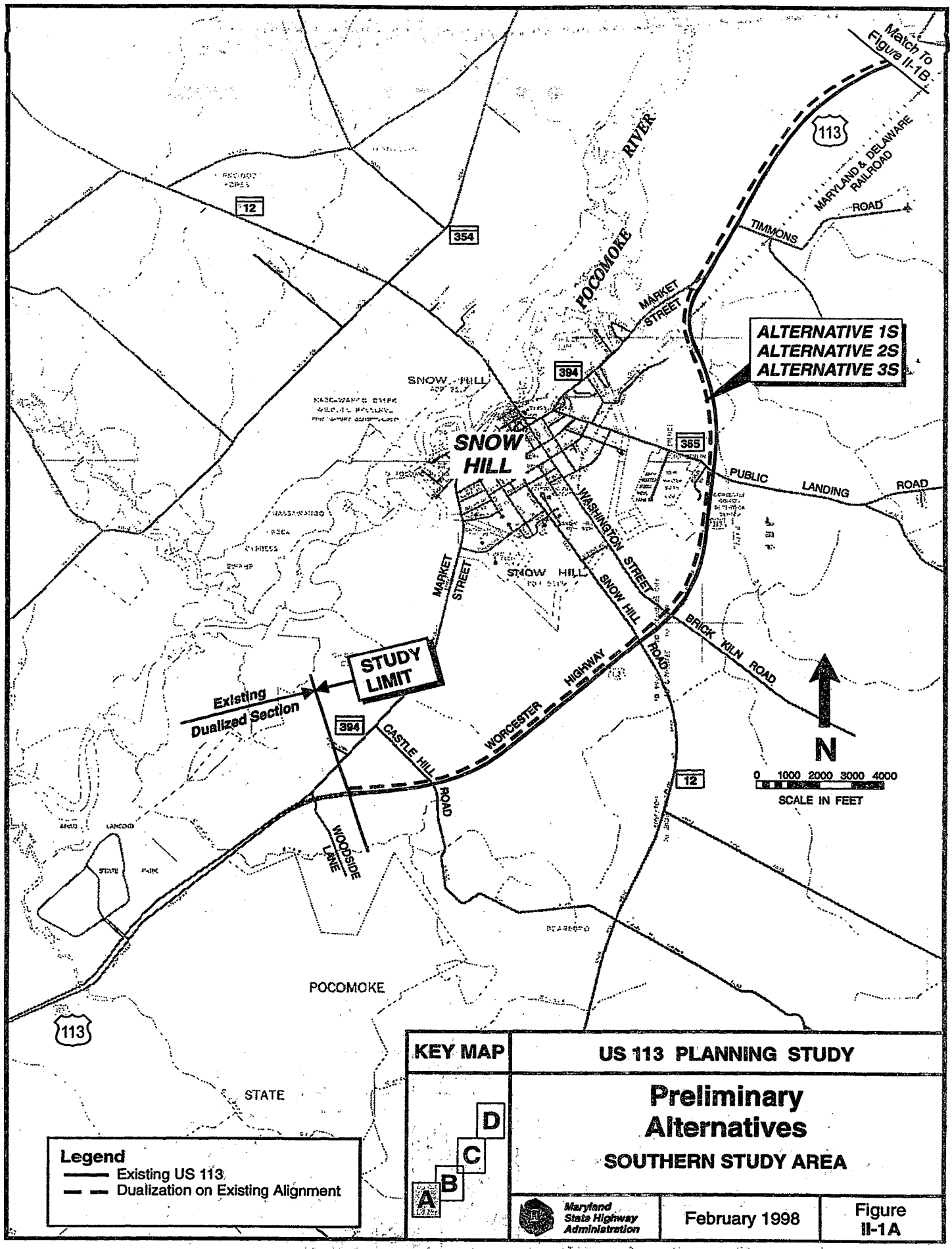
The No-Build Alternatives did not provide any significant safety or capacity improvements. Minor improvements would occur as part of normal maintenance and safety operations. The routine maintenance operations would not measurably reduce the accident rate or affect roadway capacity.

> *The No-Build Alternative was retained for detailed study. Although this alternative does not meet the project need for safety and capacity improvements, it provided a basis for comparison of the impacts of the other alternatives. A list of improvements included under the No-Build Alternative is presented in Table II-1. Each improvement listed as part of the No-Build has been, or is currently programmed for, implementation.*

3. Transportation Systems Management Alternative (Alternatives 2S and 2N)

The Transportation Systems Management (TSM) Alternative provided local intersection improvements to the existing US 113 roadway. These improvements would be part of an integrated plan of phased safety and capacity improvements, as well as traffic management strategies to provide relatively low cost refinements to the existing transportation system. The TSM Alternatives included short-term spot improvements such as signing and marking, street lighting, warning flashers, traffic signals and intersection relocation, as well as longer-term improvements such as additional turning, acceleration/deceleration, and bypass lanes; skid resistant pavement overlays; and rumble slots along the median and along the outside edges of pavement.

> *The TSM Alternative was retained for detailed study. Like the No-Build Alternative, the TSM Alternative does not fully address all of the safety issues along US 113 but provided a low cost option to improve safety and operations at intersections along US 113.*



US 113 PLANNING STUDY

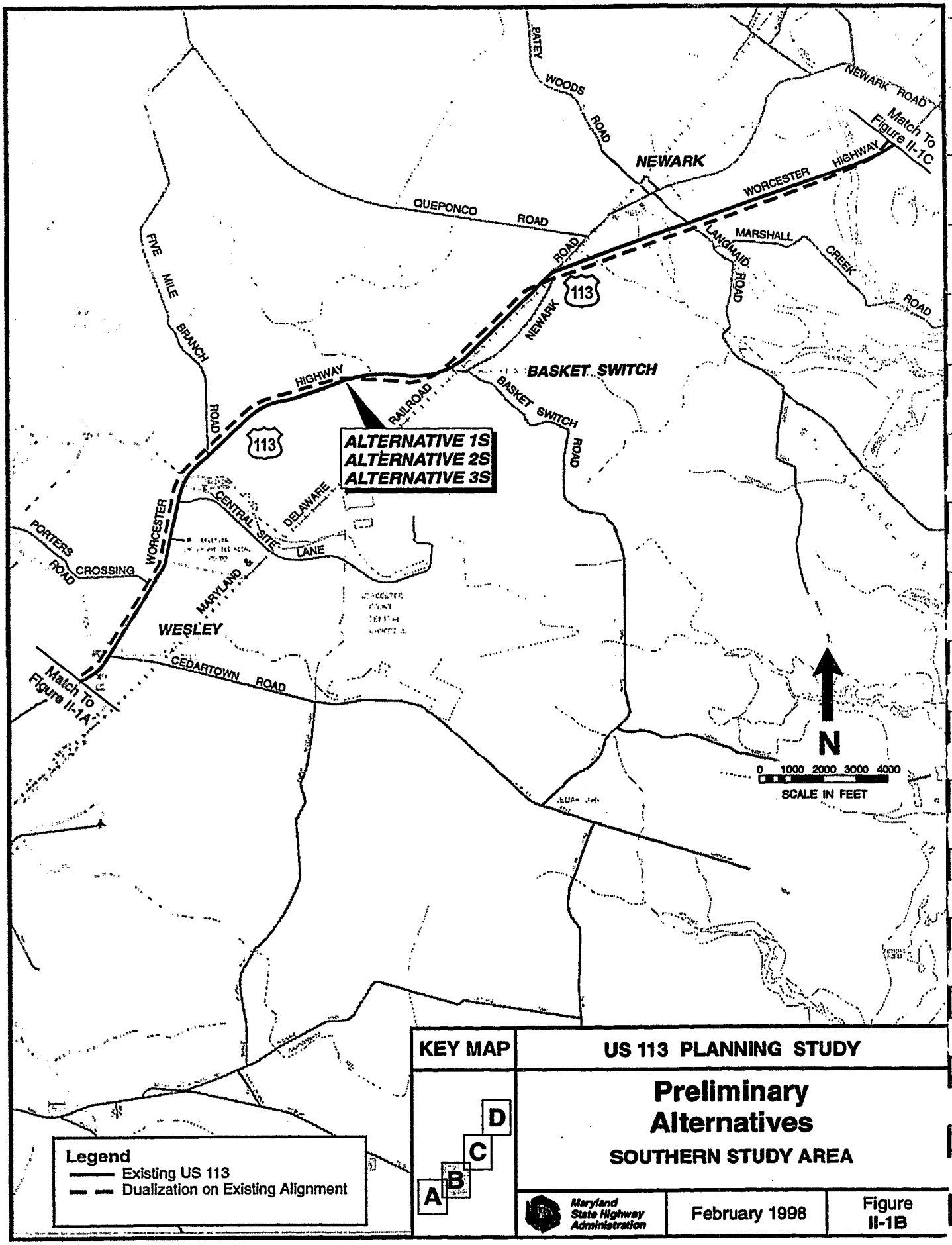
Preliminary Alternatives

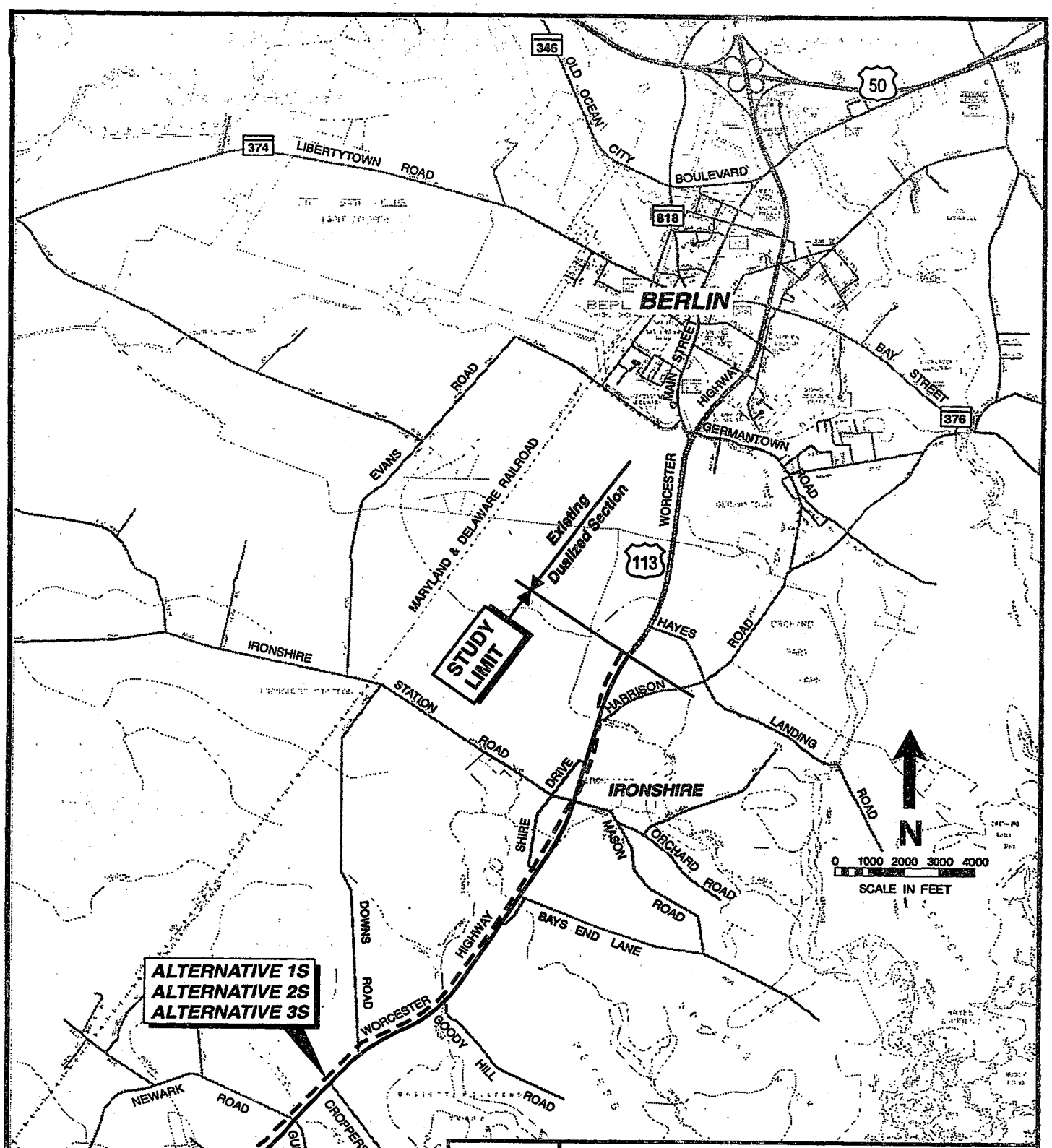
SOUTHERN STUDY AREA

Maryland State Highway Administration

February 1998

Figure II-1A


PATEY WOODS ROAD
NEWARK ROAD
Match To Figure II-1C
NEWARK
WORCESTER HIGHWAY
QUEPONCO ROAD
MARSHALL CREEK ROAD
LANGMAID ROAD
ROAD
113
NEWARK
FIVE MILE BRANCH ROAD
HIGHWAY
BASKET SWITCH
RAILROAD
BASKET SWITCH ROAD
113
ALTERNATIVE 1S
ALTERNATIVE 2S
ALTERNATIVE 3S
DELAWARE
CENTRAL SITE LANE
WORCESTER
PORTERS ROAD CROSSING
MARYLAND &
WESLEY
CEDARTOWN ROAD
Match To Figure II-1A
N
0 1000 2000 3000 4000
SCALE IN FEET
Legend
Existing US 113
Dualization on Existing Alignment
KEY MAP
A
B
C
D
US 113 PLANNING STUDY
Preliminary Alternatives
SOUTHERN STUDY AREA
Maryland State Highway Administration
February 1998
Figure II-1B



US 113 PLANNING STUDY

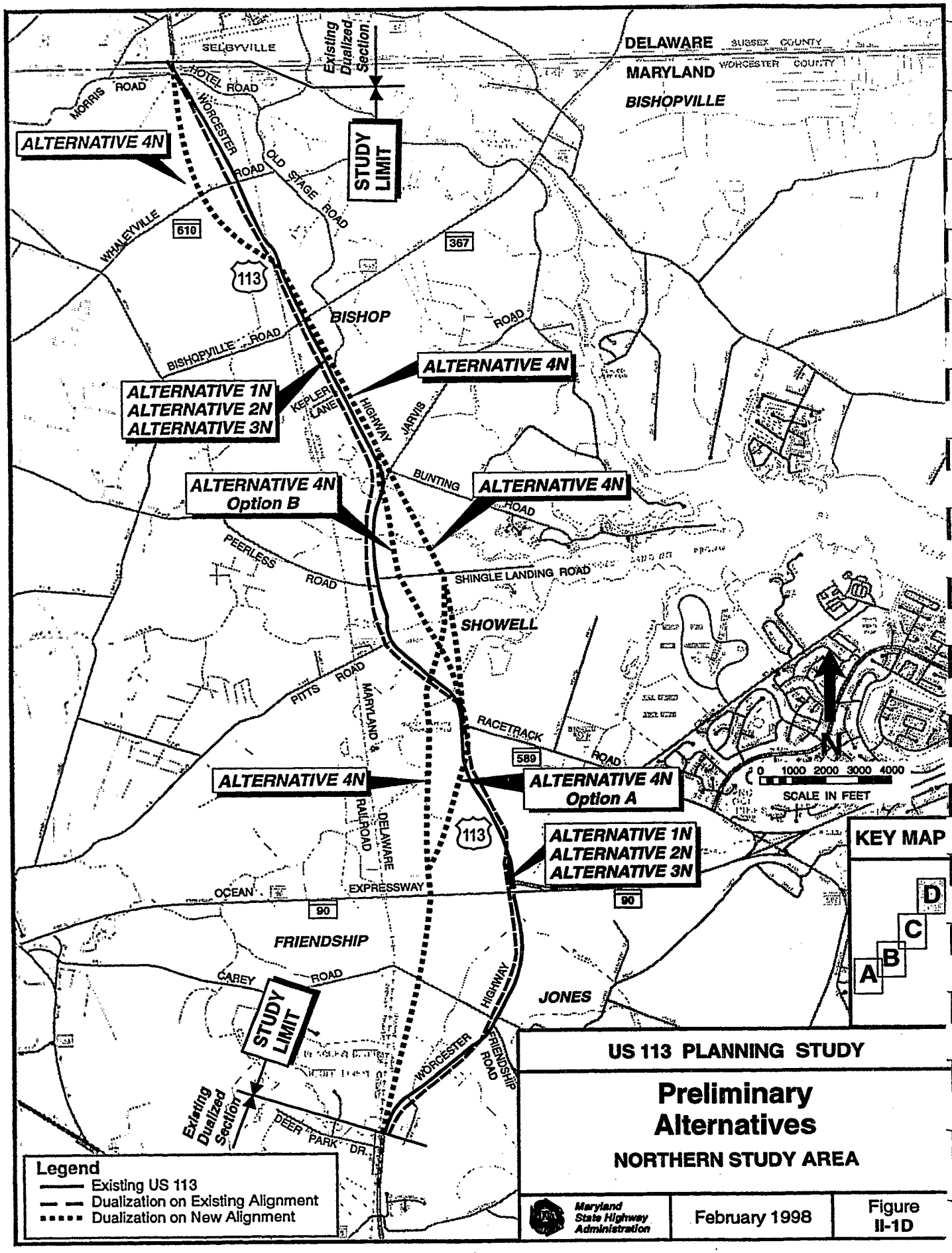
Preliminary Alternatives

SOUTHERN STUDY AREA

Maryland State Highway Administration

February 1998

Figure II-1C



US 113 PLANNING STUDY

Preliminary Alternatives

NORTHERN STUDY AREA

Maryland State Highway Administration | February 1998 | Figure II-1D

Following the Alternatives Public Meeting and the initial review of alternatives retained for detail study, additional TSM alternatives were identified that could possibly satisfy the need of the project. These Alternatives called for the inclusion of a median along the entire length of the two-lane roadway, with intersection improvements/turn lanes and passing lanes provided. Median widths evaluated as a part of this concept included a 6-foot median with a traffic barrier, a 20-foot median with traffic barrier, and a 34-foot depressed grass median.

Therefore, the original TSM Alternatives are referred to as Alternatives 2S and 2N in this document. These alternatives now include a full-length pavement overlay and raised pavement markers.

On the basis of the higher traffic volumes and capacity problems for any two-lane concept in the northern study area, no further evaluations of Alternative 2N-Median were made and it was dropped from detailed study. In the southern study area, the 6-foot median option was dropped because of the inability to provide left turn lanes or "shelter" vehicles within the 6-foot wide median as well as the unacceptably too narrow offset distance between the travel lanes and the face of the barrier (2-feet). While the 34-foot wide median was supported by some agencies for improved water quality, it too was dropped from further consideration because its environmental impacts were nearly identical to the already developed Alternative 3S with 20-foot wide median. The 34-foot wide median could be considered as a design option. The two-lane concept with a 20-foot wide median and traffic barrier was retained for the southern study area and was presented in the ***Draft EIS/Section 4(f) Evaluation*** *as Alternative 2S-20' Median. A detailed description of the Alternative 2S-20' Median is included in the next section of this Chapter (Section II-D.4).*

4. Dualization Alternatives

All the dualization alternatives were proposed as four-lane divided roadways with access partially controlled. Median and roadside landscaping would also be included.

◆ Dualization on Existing Alignment (Alternatives 3S and 3N)

Dualization of existing US 113 involved the construction of a new two-lane roadway adjacent to the existing facility and the retention of the existing roadway where possible as either the northbound or southbound roadway. These alternatives used existing right-of-way to the extent possible. The new roadway would be constructed on either the east or west side of the existing roadway to minimize impacts to the natural environment and reduce the number of residential and commercial displacements. The typical roadway section would consist of two 12-foot travel lanes in each direction, a 34-foot depressed grass median, 10-foot outside shoulders, and 20-feet of safety grading where possible.

Following the initial review of alternatives retained for detail study, additional feasible alternatives were identified that could possibly satisfy the need of the project and are analyzed in later sections of this Chapter. One alternative called for a 20-foot wide median with traffic barrier. These new alternatives were referred to as Alternatives 3S-20' Median and 3N-20' Median in the ***Draft EIS/Section 4(f) Evaluation.***

Consequently, the previous Alternatives 3S and 3N were renamed Alternatives 3S-34' Median and 3N-34' Median.

In addition to these median width options, safety grading options were also evaluated in only the northern study area (i.e., 50 MPH or 60 MPH design speeds). As shown on Figure II-7, 9' of roadside grading was evaluated for the 50 MPH design speed and 20' for the 60 MPH design speed. Highway safety research demonstrates that these widths, when combined with the 10' wide paved shoulders also shown on Figure II-7, provide a sufficient width for the majority of errant vehicles to safely recover and allow the driver when traveling at the appropriate design speed to regain control of the vehicle before a severe accident occurs. These two widths of safety or roadside grading were evaluated to assess potential environmental impacts associated with the two options.

Each of these alternatives is described in detail in Section II-D.

- **Dualization on New Alignment (Alternative 4N with Options)**

The dualization on new alignment involved the construction of a new four-lane divided roadway away from the existing US 113 facility. The roadway would be constructed on new location to minimize impacts to residential and commercial properties. The typical roadway section consisted of two 12-foot travel lanes in each direction, a 34-foot depressed grass median, 10-foot outside shoulders, and 20-feet of safety grading on both sides of the roadway.

Alternative 4N left existing US 113 north of US 50, headed in a northerly direction on the west side of the existing roadway in the Friendship area and traversed through the graded area reserved for the previously graded MD 90 interchange., It then crossed existing US 113 and continued on the east side of the existing roadway through the Showell area. From this point, it continued parallel to and just on the east side of US 113 crossing over to the west side in the Bishop area, and tied back into the existing roadway just before the Delaware state line.

Alternative 4N had two optional alignments in the Showell area. Options A and B both left the Alternative 4N alignment just north of the graded US 113 / MD 90 interchange area and crossed to the east side of existing US 113 just south of Racetrack Road (MD 589). All three alignments (Alternative 4N, Option A, and Option B) provided a bypass of the town of Showell and rejoined Alternative 3N just north of Showell. Alternative 4N again left the 3N alignment just north of Bishop and tied back into existing US 113 at the Delaware state line. Figure II-1D depicts the preliminary alignments of Alternates 3N, 4N, Option A, and Option B.

Following the Alternates Public Workshop, SHA made the decision to carry only portions of the new alignment Dualization Alternatives ahead for detailed study. The rational for dropping the other roadway segments is as follows:

North of the MD 90 interchange, the original Alternative 4N alignment was dropped to avoid a residential displacement, reduce right-of-way costs by approximately $500,000, reduce wetland impacts at the proposed Church Branch crossing by 0.6 acres, reduce woodland impacts by 2.4 acres, reduce farmland impacts by 5.5 acres, reduce forested habitat fragmentation in the vicinity of Church Branch, and avoid impacts to the historic Saint Martin's Church. The Alternative 4N Modified alignment retained for detailed study has been shifted slightly from the original Alternative 4N Option A/B alignment to avoid a residential displacement while not creating any additional impacts in the vicinity.

From North of Racetrack Road (MD 589) to Jarvis Road, the remaining portions of Alternative 4N and Alternative 4N Option A were dropped from detailed study to reduce forested habitat fragmentation and wetland impacts (approximately 1.4 acres) associated with Middle and Birch Branches and to avoid conflicts with on-going and proposed residential development along Shingle Landing Road. Alternative 4N Option B was realigned for Alternative 4N Modified to tie back into existing US 113 just north of Shingle Landing Road to avoid five residential displacements and minimize conflicts with the on-going development to the east.

From Jarvis Road to just north of Bishopville Road (MD 367), the original Alternative 4N was shifted to use existing US 113 as the proposed southbound roadway, thereby reducing the required right-of-way and the associated natural and socioeconomic impacts. North of Bishopville Road, the original Alternative 4N diverged from existing US 113 to the west to avoid three residential and two business displacements. The Alternative 4N Modified alignment used a flatter curve to reduce wetland impacts by 1.5 acres and reduce forested habitat fragmentation.

Following the initial review of alternatives retained for detail study, additional feasible alternatives were identified that could possibly satisfy the need of the project and are analyzed in later sections of this Chapter. This alternative called for a 20-foot wide median with traffic barrier. This new alternative is referred to as Alternative 4N Modified-20' Median, with the previous alternative now referred to as Alternative 4N Modified-34' Median.

Each of these alternatives is described in detail in the next section of this Chapter (Section II-D).

D. Alternatives Presented in the Draft EIS/Section 4(f) Evaluation

1. Introduction

Fifteen (15) alternatives were presented in the **Draft EIS/Section 4(f) Evaluation** (May 1997) for consideration by the public and resource agencies for the US 113 study areas. Written descriptions and typical sections for these alternatives are presented in this Chapter; plans at a scale of 1"=400' were presented in Appendix A of the **Draft EIS/Section 4(f) Evaluation** (Figures 1 through 7 for Alternative 2S-20' Median; Figures 8 through 17 for the dualization alternatives). Impacts associated with these alternatives were fully addressed in Chapters IV and V of the **Draft EIS/Section 4(f) Evaluation** and are compared on Table S-1 of this document.

After considering the benefits and impacts of the alternatives presented for consideration in the **Draft EIS/Section 4(f) Evaluation** and the comments received on that document and at the Combined Location/Design Public Hearing (held June 17, 1997), the Project Planning Team recommended Alternative 3S-34' Median as the Preferred Alterative for the southern study area and Combination Alternative 3N/4N Modified-34' Median as the Preferred Alternative for the northern study area (meeting held September 17, 1997). The Preferred Alternatives are presented in Section II.E of this document. As discussed in Section II.E, the Southern Preferred Alternative and the Northern Preferred Alternative have been substantially modified to avoid or minimize adverse environmental impacts, especially wetlands impacts. These modifications include narrowed median and use of guardrail in lieu of full safety grading at sensitive environmental crossings. The following lists the fifteen (15) alternatives presented in detail in the **Draft EIS/Section 4(f) Evaluation.**:

◆ **Southern Study Area: 16.3 miles**

- **Alt. 1S:** No Build - retain existing one lane per direction.
- **Alt. 2S:** Transportation Systems Management (TSM) - one lane per direction with additional safety improvements.
- **Alt. 2S-20' Median:** One lane per direction with 20-foot wide median/guardrail and passing lanes (and 60 MPH design speed).
- **Alt. 3S-20' Median:** Dualization to provide 4 lanes along existing US 113 and 20-foot wide median/guardrail (and 60 MPH design speed).
- **Alt. 3S-34' Median:** Dualization to provide 4 lanes along existing US 113 and 34-foot wide median (and 60 MPH design speed).

- **Northern Study Area: 7.5 miles**

- **Alt. 1N:** No Build: retain existing one lane per direction.

- **Alt. 2N:** Transportation Systems Management (TSM) - one lane per direction with additional safety improvements.

- **Alt. 3N-20' Median/50 MPH:** Dualization to provide 4 lanes along existing US 113 with 20-foot wide median/guardrail and 50 MPH design speed.

- **Alt. 3N-34' Median/50 MPH:** Dualization to provide 4 lanes along existing US 113 with 34-foot wide median and 50 MPH design speed.

- **Alt. 3N-20' Median/60 MPH:** Dualization to provide 4 lanes along existing US 113 with 20-foot wide median/guardrail and 60 MPH design speed.

- **Alt. 3N-34' Median/60 MPH:** Dualization to provide 4 lanes along existing US 113 with 34-foot wide median and 60 MPH design speed.

- **Alt. 4N Modified-20' Median:** Dual highway in new location to provide 4-lanes with 20-foot wide median/guardrail (and 60 MPH design speed).

- **Alt. 4N Modified-34' Median:** Dual highway in new location to provide 4-lanes with 34-foot wide median (and 60 MPH design speed).

- **Alt. 3N/4N Modified-20' Median:** Combination of Alts. 3N & 4N Modified to provide 4 lanes with 20-foot wide median/ guardrail (and 60 MPH design speed).

- **Alt. 3N/4N Modified-34' Median:** Combination of Alts. 3N & 4N Modified to provide 4 lanes with 34-foot wide median (and 60 MPH design speed).

2. No-Build Alternatives - Baseline Alternatives 1S and 1N

The No-Build Alternatives provided no major improvements to the existing US 113 roadways. Minor improvements would have occurred as part of normal maintenance and safety operations. These improvements, however, did not provide features that would prevent further opposite direction collisions where the probable cause is identified as the failure to drive in the designated lane or failure to keep right of the centerline. Specific improvements recently

implemented or programmed for implementation are listed in Table II-1, locations of these improvements are shown on Figures II-2A through II-2D. Typical sections are shown on Figure II-3. The routine maintenance operations would not measurably affect roadway capacity or reduce the accident rate. Spot improvements would continue as funding becomes available.

- **DECISIONS:** *The No-Build Alternatives did not meet the project need of improving safety and are not therefore preferred.*

3. Transportation Systems Management Alternatives Alternatives 2S and 2N

The Transportation Systems Management (TSM) Alternatives would have provided improvements along the existing roadway to enhance safety and reduce traffic congestion without major alteration to the existing two-lane highway. The TSM improvements included intersection improvements and additional measures to improve the safety of the existing two-lane roadway. While not presently programmed for implementation, these improvements would have been part of an integrated plan of phased safety and capacity improvements. The TSM Alternatives included the continued short-term spot improvements such as signing and marking, street lighting, warning flashers, and addressed longer-term improvements with additional turning, acceleration/deceleration, and bypass lanes; skid resistant pavement overlays; and rumble slots along the centerline and along the outside edges of pavement. The improvements would have been prioritized by SHA during the final design phase. Specific TSM improvements are listed in Table II-1, locations of these improvements are shown on Figures II-2A through II-2D. Typical sections are shown on Figure II-3.

The estimated construction costs for the TSM Alternatives 2S and 2N was as follows:

- **Alternative 2S** (see Tables II-1A, -1B, -1C and Figures II-2A, -2B, -2C)

  Total Cost for Improvements = $6.4 M

  This cost includes installing a skid resistant pavement overlay and Hazard Warning Rumble Slots along the length of the study area on the center line and on the outside edges of pavement and spot intersection improvements.

- **Alternative 2N** (see Table II-1D and Figure II-2D)

  Total Cost for Improvements = $2.2 M

  This cost includes installing a skid resistant pavement overlay and Hazard Warning Rumble Slots along the length of the study area on the center line and on the outside edges of pavement and spot intersection improvements.

- **DECISIONS:** *Like the No-Build, the Transportation Systems Management Alternatives are not preferred because they did not adequately address the project need, including the safety and operational problems along the existing 23.8 miles of two-lane US 113.*

  - **Southern Study Area - Alternative 2-S**

    Dualization is preferred over TSM: The TSM alternative would provide some operational improvements and would slightly reduce the overall accident rate. Sixty percent of the fatalities were opposite direction type of collisions along US 113, and the TSM does not offer a solution for this problem. Since this alternative does not fully address the purpose and need of the project, it is not preferred for selection as a permanent solution.

  - **Northern Study Area - Alternative 2N**

    Dualization is preferred over TSM: The TSM alternative is not expected to result in any significant reduction in the number of fatal accidents since it does not include measures to directly address the fatal accidents as described for the Southern Study Area above. In addition, there is a capacity problem in the northern study area. Severe congestion is expected by the design year 2020 along US 113 for the portion north of MD 589 to the Delaware state line. The TSM Alternative would not provide relief to congestion. For these reasons, it is not preferred for selection.

Table II-1A: No-Build and TSM Alternatives (see Figure II-2A)

Map Number	US 113 Improvement Location	No-Build Improvements Alternative 1S	Status	TSM Improvements Alternative 2S
1	US 113 at Castle Hill Road	Install intersection flashing beacon	Complete	none
2	US 113 at Snow Hill Road/MD 12	Install street lighting Install intersection flashing beacon Install oversized intersection warning signs and stop signs	Complete Complete Complete	none
3	US 113 at Washington Street/Brick Kiln Road	Install intersection flashing beacon	Complete	none
4	US 113 at Public Landing Road / MD 365	Install street lighting Install northbound and southbound bypass lanes Install stop sign ahead sign Install intersection flashing beacon	Complete Complete Complete Complete	none
5	US 113 at RR Crossing (south of MD 394)	none		Install mechanical crossing arms
6	US 113 at MD 394	Install street lighting Install intersection flashing beacon Install improved signing	Complete Complete Complete	Construct northbound bypass lane; Install new bypass lane markings
7	US 113 at Timmons Road	Install street lighting	Planned	Construct southbound bypass lane Install new bypass lane markings Install stop line on Timmons Road

Note: No-Build improvements are currently funded for implementation.

Table II-1B: No-Build and TSM Alternatives (see Figure II-2B)

Map Number	US 113 Improvement Location	No-Build Improvements Alternative 1S	Status	TSM Improvements Alternative 2S
8	US 113 at Cedartown Road	Install street lighting Mark intersection for no passing	Complete Complete	Construct southbound bypass lane Install new bypass lane markings
9	US 113 at Porters Crossing Road	Install street lighting	Complete	Construct northbound bypass lane Install new lane markings
10	US 113 at Central Site Lane	Install southbound intersection warning sign	Complete	Install street lighting
11	US 113 at Five Mile Branch Road	Install street lighting Mark intersection for no passing	Complete Complete	Construct northbound bypass lane Install new lane markings
12	US 113 at Basket Switch Road	Install street lighting	Complete	Construct southbound bypass lane Install new lane markings
13	US 113 at Newark Road (South)	Install street lighting Mark intersection for no passing	Complete Complete	Construct northbound and southbound bypass lane Install new bypass lane markings
14	US 113 at RR Crossing (north of Newark Road)	none		Install mechanical crossing arms
15	US 113 at Langmaid Road	Install northbound and southbound bypass lanes Install street lighting Install intersection flashing beacon Mark intersection for no passing	Complete Complete Complete Complete	none

Note: No-Build improvements are currently funded for implementation.

Table II-1C: No-Build and TSM Alternatives (see Figure II-2C)

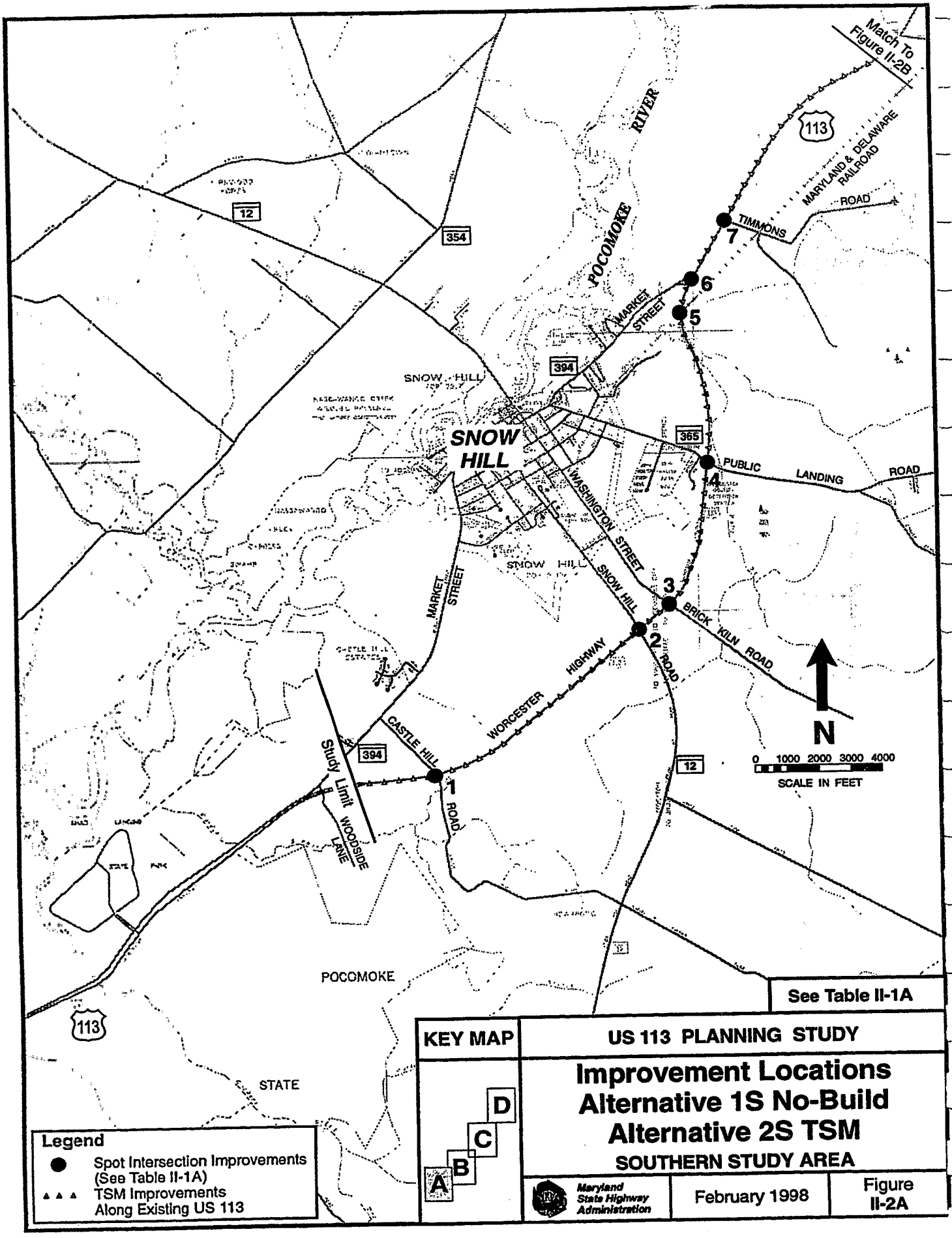
Map Number	US 113 Improvement Location	No-Build Improvements Alternative 1S	Status	TSM Improvements Alternative 2S
16	US 113 at Gunning Club Lane/Newark Road (north)	Install stop lines on side roads Construct northbound bypass lane Install street lighting	Complete Complete Complete	Install concrete channelization island
17	US 113 at Croppers Island Road	Install street lighting	Complete	Construct southbound bypass lane Install new lane markings
18	US 113 at Downs Road	Install street lighting	Complete	Construct northbound bypass lane Install new lane markings
19	US 113 at Goody Hill Road	Install street lighting	Complete	Construct southbound bypass lane Install new lane markings
20	US 113 at Bays End Lane	Mark intersection for no passing	Complete	Construct southbound bypass lane Install new lane markings
21	US 113 at Shire Road (south)	Install street lighting Mark intersection for no passing Install stop line on Shire Road	Complete Complete Complete	Construct northbound bypass lane Install new lane markings
22	US 113 at Ironshire Station Road/Mason Road	Install street lighting Mark intersection for no passing Install stop line on Mason Road	Complete Complete Complete	none
23	US 113 at Shire Road (north)	Install street lighting Install stop line on Shire Road Mark intersection for no passing	Complete Complete Complete	Construct northbound bypass lane Install new bypass lane markings
24	US 113 at Harrison Road	Install street lighting Install stop line on Harrison Road Mark intersection for no passing	Complete Complete Complete	Construct southbound bypass lane Install new bypass lane markings
25	US 113 at Friendship Road / MD 452	Construct acceleration and deceleration lanes along northbound US 113 Construct southbound US 113 bypass lane	Planned Planned	none

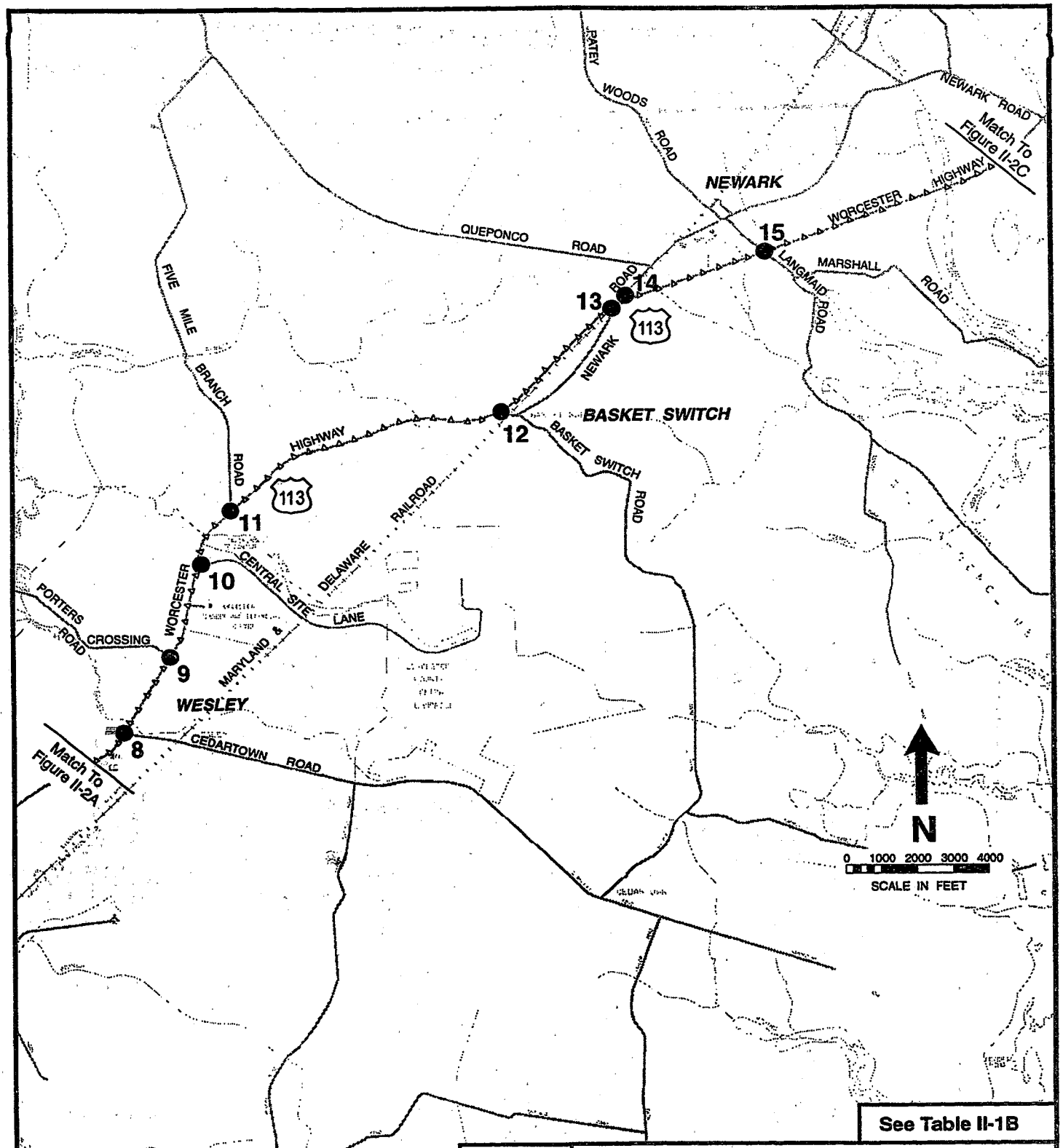
Note: No-Build improvements are currently funded for implementation.

Table II-1D: No-Build and TSM Alternatives (see Figure II-2D)

Map Number	US 113 Improvement Location	No-Build Improvements Alternative 1N	Status	TSM Improvement Alternative 2N
26	US 113 at Jones Road/Carey Road	none		Install stop lines on Jones Road and Carey Road
27	US 113 at Racetrack Road / MD 589	Provide acceleration/deceleration lanes on northbound US 113 Install traffic signal with advance warning signs and flashing beacon	Complete Complete	none
28	US 113 at Pitts Road	Widen Pitts Road to provide left and right turn lanes Install intersection flashing beacon	Complete Complete	none
29	US 113 at Peerless Road	none		Construct northbound bypass lane Install stop line and stop sign on Pearless Road
30	US 113 at Shingle Landing Road	none		Install street lighting
31	US 113 at Bunting Road/Jarvis Road	Relocate the Jarvis Road/Bunting Road intersection Construct southbound US 113 left turn lane	Planned Planned	none
32	US 113 at Kary Asphalt Entrance	Widen southbound US 113 shoulder to extend acceleration lane Widen northbound US 113 shoulder to provide bypass lane Overlay with 1 ½" bituminous concrete	Planned Planned	none
33	US 113 at Bishopville Road / MD 367	Provide northbound and southbound bypass lanes on US 113 Construct westbound MD 367 right turn lane Install street lighting	Planned Planned Planned	Mark intersection for no passing
34	US 113 at RR Crossing (south of MD 610)	none		Install mechanical crossing gates
35	US 113 at Whaleyville Road/ MD 610	Install northbound and southbound left turn lanes; Install southbound right turn lane; Install traffic signal	Complete Complete Complete	Install additional street lighting Construct curbing in southeast quadrant of intersection
36	US 113 at Morris Road/Hotel Road	none		Construct acceleration lane along southbound US 113 Install oversized intersection warning signs and stop signs

Note: No-Build improvements are currently funded for implementation.


Match To Figure II-2B
113
MARYLAND & DELAWARE RAILROAD
ROAD
TIMMONS
7
6
5
4
3
2
1
POCOMOKE
RIVER
MARKET STREET
12
354
394
365
SNOW HILL
SNOW HILL
WASHINGTON STREET
SNOW HILL
PUBLIC LANDING ROAD
BRICK KILN ROAD
ROAD
MARKET STREET
WORCESTER HIGHWAY
CASTLE HILL
ROAD
Study Limit
WOODSIDE LANE
N
0 1000 2000 3000 4000
SCALE IN FEET
POCOMOKE
STATE
See Table II-1A
KEY MAP
A
B
C
D
US 113 PLANNING STUDY
Improvement Locations
Alternative 1S No-Build
Alternative 2S TSM
SOUTHERN STUDY AREA
Maryland State Highway Administration
February 1998
Figure II-2A
Legend
Spot Intersection Improvements (See Table II-1A)
TSM Improvements Along Existing US 113

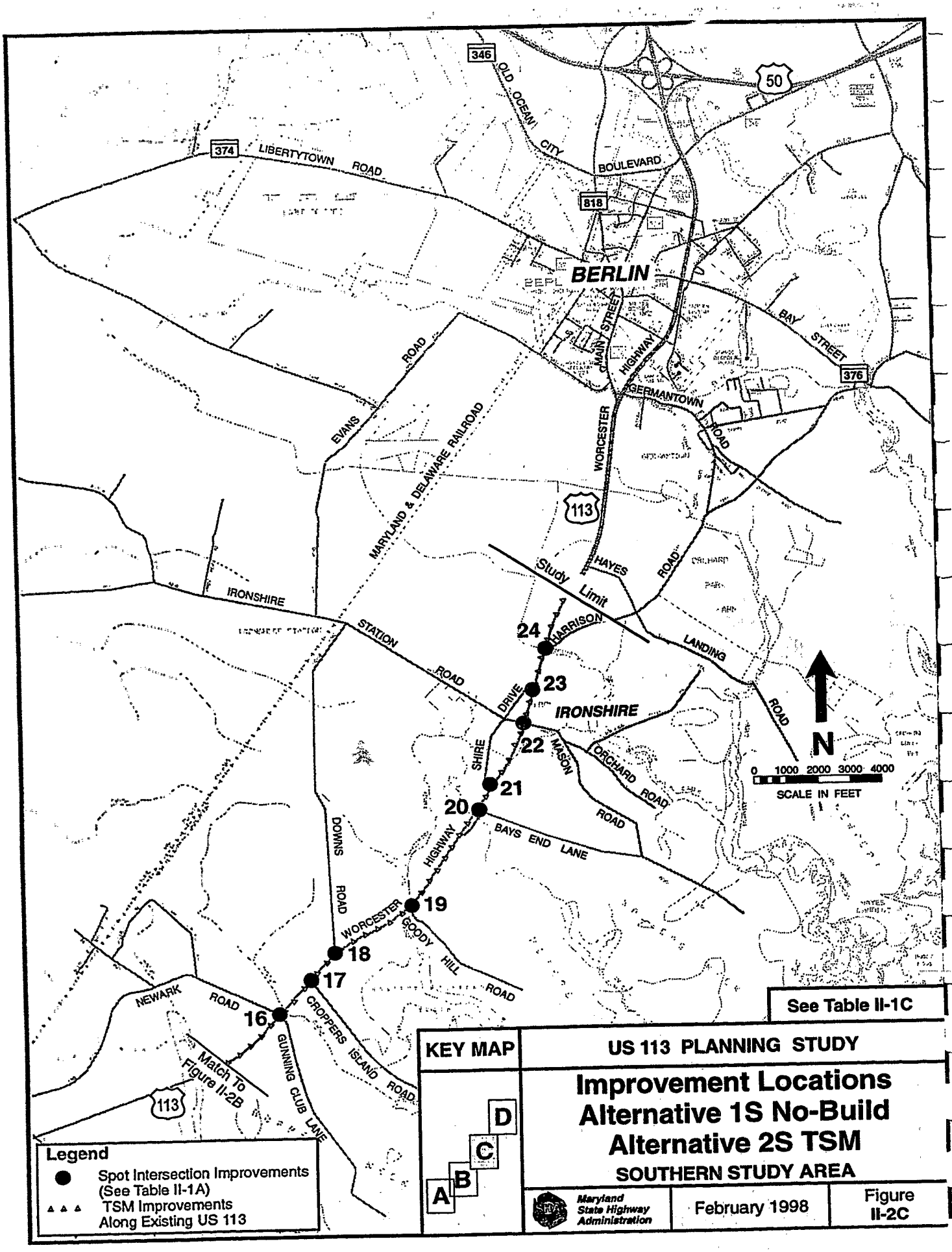


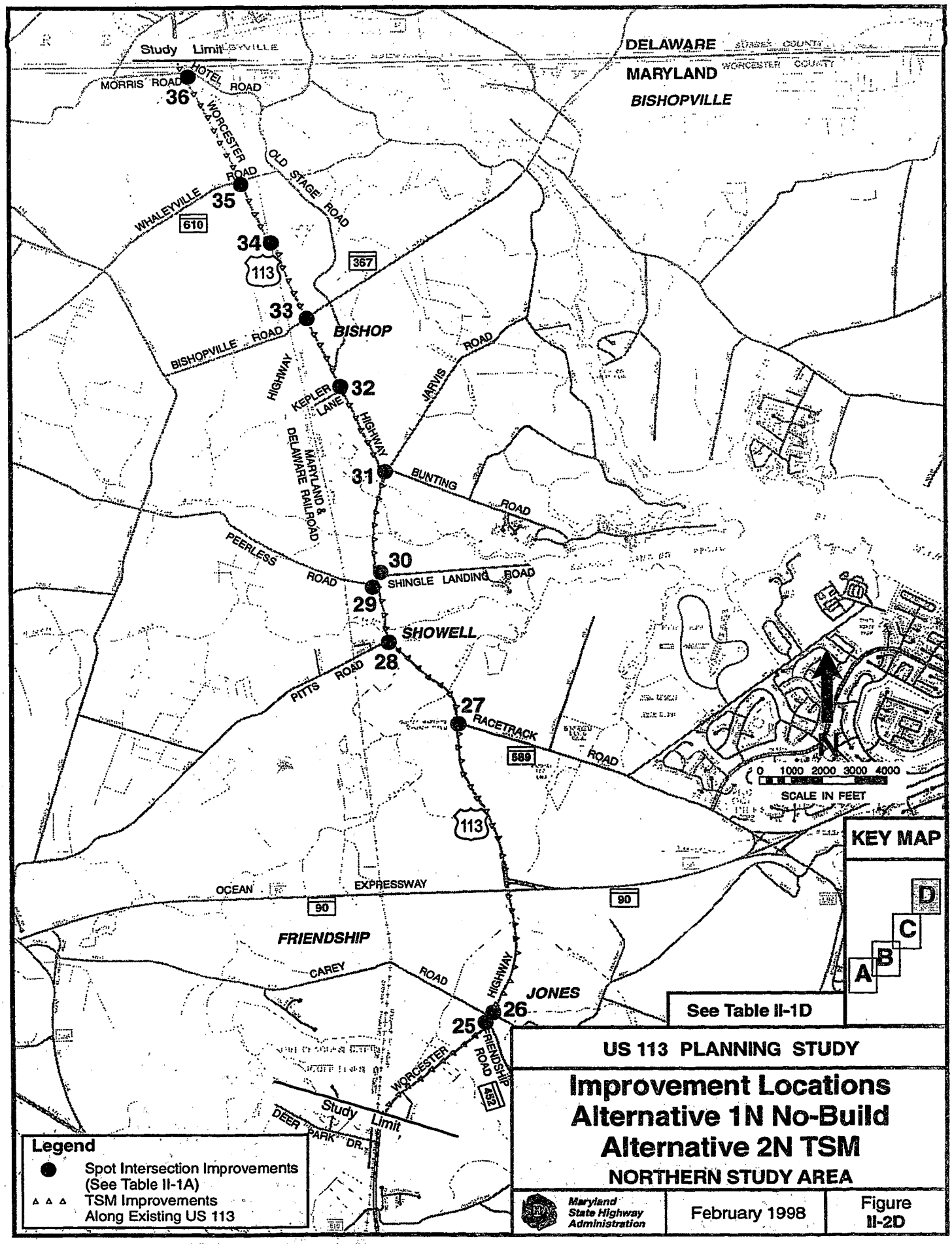
See Table II-1B

Legend

- ● Spot Intersection Improvements (See Table II-1A)
- △ △ △ TSM Improvements Along Existing US 113

KEY MAP	US 113 PLANNING STUDY	
A B C D	**Improvement Locations Alternative 1S No-Build Alternative 2S TSM** SOUTHERN STUDY AREA	
	Maryland State Highway Administration	February 1998	Figure II-2B


346
OLD OCEAN CITY BOULEVARD
50
374
LIBERTYTOWN ROAD
818
BERLIN
MAIN STREET
HIGHWAY
BAY STREET
376
GERMANTOWN ROAD
EVANS ROAD
MARYLAND & DELAWARE RAILROAD
WORCESTER
113
HAYES ROAD
Study Limit
IRONSHIRE
STATION ROAD
HARRISON
LANDING ROAD
24
23
DRIVE
IRONSHIRE
22
MASON
ORCHARD ROAD
SHIRE
21
20
ROAD
BAYS END LANE
DOWNS ROAD
HIGHWAY
19
WORCESTER
GOODY HILL ROAD
18
17
NEWARK ROAD
16
CROPPERS ISLAND ROAD
GUNNING CLUB LANE
Match To Figure II-2B
113
N
0 1000 2000 3000 4000
SCALE IN FEET
See Table II-1C
Legend
Spot Intersection Improvements (See Table II-1A)
TSM Improvements Along Existing US 113
KEY MAP
A B C D
US 113 PLANNING STUDY
Improvement Locations
Alternative 1S No-Build
Alternative 2S TSM
SOUTHERN STUDY AREA
Maryland State Highway Administration
February 1998
Figure II-2C



US 113 PLANNING STUDY

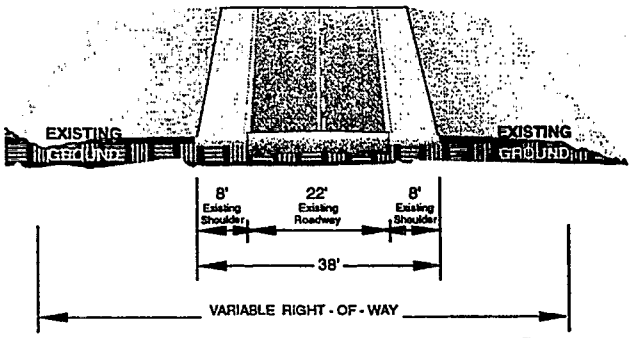
Improvement Locations Alternative 1N No-Build Alternative 2N TSM

NORTHERN STUDY AREA

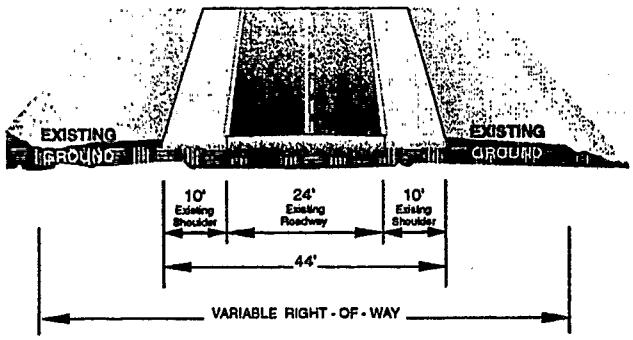
Maryland State Highway Administration

February 1998

Figure II-2D



ALTERNATIVE 1N - NO BUILD
ALTERNATIVE 2N - BASIC TSM



ALTERNATIVE 1S - NO-BUILD
ALTERNATIVE 2S - BASIC TSM

NOTE: Basic TSM includes full width skid resistant pavement overlay with rumble slots in shoulders and along centerline.

The dimensions shown are for the purpose of determining cost estimates and environmental impacts and are subject to change during the final design phase.

US 113 PLANNING STUDY

Typical Sections
Alternatives 1S & 1N No-Build
Alternatives 2S & 2N Basic TSM

Maryland State Highway Administration	February 1998	Figure II-3

4. Alternative 2S-20' Median

Improvement alternatives along the existing US 113 alignment which provided a median but retained the one-travel lane per direction configuration were developed in early 1997 following an initial review of the environmental impacts of the alternatives then under consideration. These new alternatives addressed a two-lane roadway with various median widths, passing lanes as required, and 10-foot shoulders. The median widths evaluated were:

- a 6-foot median with a traffic barrier
- a 20-foot median with a traffic barrier
- a 34-foot depressed grass median

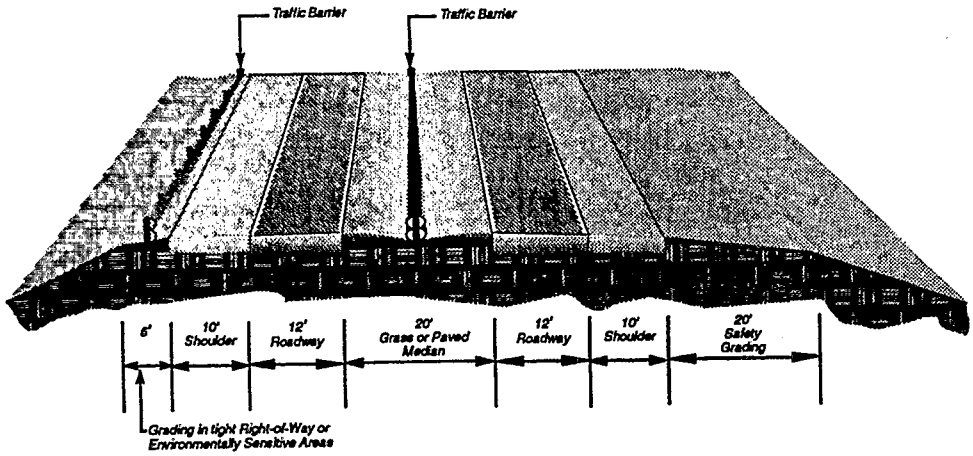
While intersection improvements would also have been incorporated into these designs, these alternatives did address all of the safety issues along US 113. These alternatives would have introduced some new safety concerns and did not address operational problems, however, they would have provided an option to reduce head-on accidents with potentially less environmental impacts than a full dualization alternative.

As previously discussed in Section II.C.3 of this document, the 6-foot wide median option was not evaluated further because of the inability to provide left turn lanes or "shelter" vehicles at intersections within the narrow median. Also, the 34-foot median option was not further evaluated, primarily because its impacts would be nearly identical to the already developed Alternative 3S-20' median. And finally, the higher traffic volumes and capacity problems in the northern study area precluded further consideration of Alternative 2N-Median options.

Consequently, only Alternative 2S-20' Median was addressed in the Draft EIS/Section 4(f) Evaluation document. Typical sections for Alternative 2S-20' Median are shown on Figure II-4. Detailed plans for the Alternative 2S-20'-Median, at a scale of 1" = 400', were presented in **Draft EIS/Section 4(f) Evaluation** Appendix A, Figures 1 though 7.

On the south, Alternative 2S-20' Median began approximately 1,000' north of Woodside Lane as a transition from two travel lanes per direction separated by a 75-foot± wide median to one travel lane per direction separated by a 20-foot wide median with traffic barrier. Through the first curve, the alignment stayed on the east side of the existing roadway.

Continuing north, the new northbound lane would have been constructed parallel to and east of the existing roadway (to become the new southbound lane) utilizing existing US 113 as the southbound lane. This section of the alignment intersected with Castle Hill Road, Snow Hill Road (MD 12), Washington Street/Brick Kiln Road, and Public Landing Road (MD 365), and passes over Purnell Branch, intersects with the Maryland and Delaware Railroad, Market Street (MD 394N) and Timmons Road. Immediately north of Public Landing Road (MD 365), a northbound passing lane 12-feet in width and approximately 1 mile in length would have been provided. This lane ended just past the Market Street (MD 394N) intersection. As shown on **Draft EIS/Section 4(f) Evaluation** Appendix A, Figures 1, 2 and 3, the majority of the right-of-way for this alternative is already in place.

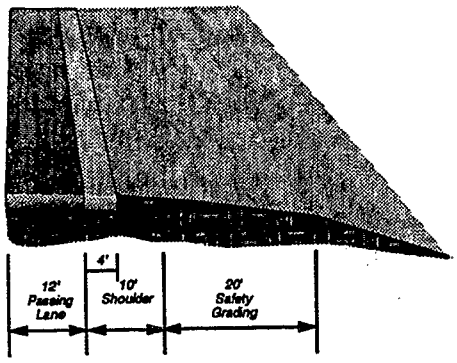


ALTERNATIVE 2S - 20' MEDIAN (2 - LANES DIVIDED)

NOTE:
Passing lanes 12-feet in width and approximately 1 to 1.25 miles in length would be provided at the following locations:

- Northbound between Public Landing Road (MD355) and Market Street (MD 394N)
- Southbound between Timmons Road and Cedartown Road*
- Northbound between Basket Switch Road and Langmaid Road
- Southbound between Landmaid Road and Gunning Club Road/Newark Road

* Passing lane removed in area of wetland W-8 during preparation of Final EIS.



ALTERNATIVE 2S - 20' MEDIAN (SHOWING PASSING LANE)

The dimensions shown are for the purpose of determining cost estimates and environmental impacts and are subject to change during the final design phase.

US 113 PLANNING STUDY		
Typical Sections **Alternative 2S - 20' Median**		
Maryland State Highway Administration	February 1998	Figure II-4

Alternative 2S-20' Median then curved to the east, 3,600 feet north of Timmons Road, passing in front of the Snow Hill Mennonite Church along the west side of US 113. Between Timmons Road and Cedartown Road, a southbound passing lane 12-feet in width and approximately 1 mile in length would be provided.

Continuing in a northeasterly direction to 1,300 feet south of Cedartown Road, this alternative paralleled the existing roadway to the west, utilizing existing US 113 as the northbound lane. The alignment then curved to the north, intersecting with Cedartown Road.

Continuing in an northeasterly direction, this alternative paralleled existing US 113 on the west, utilizing approximately 8,800 feet of existing US 113 as the northbound lane. This section of the alignment crossed over both Poorhouse Branch and Five Mile Branch, and intersected with Porters Crossing Road, Central Site Lane and Five Mile Branch Road. Approximately 200 linear feet of Five Mile Branch Road would have been reconstructed to improve its intersection with US 113.

The alignment then curved to the east and stayed on the west side of existing US 113. To accomplish this transition, approximately 1,600 linear feet of the existing roadway would have been reconstructed.

Continuing in an easterly then northeasterly direction, the alignment paralleled existing US 113 to the west up to Basket Switch Road, where it transitioned to the east side of US 113. This section of the alignment intersected with Basket Switch Road, Newark Road, the Maryland and Delaware Railroad track, Langmaid Road, Newark Road/Gunning Club Lane, and passed over Massey Branch and Porter Creek. Between Basket Switch Road and Langmaid Road, a northbound passing lane 12-feet in width and approximately 1 mile in length would have been provided. A similar southbound passing lane would also have been provided between Langmaid Road and Newark Road.

Continuing in a northeasterly direction, Alternative 2S-20' Median transitioned from the east side to the west side of the existing roadway between Gunning Club Lane and Croppers Island Road. This alternative continued in a northeasterly direction, paralleling existing US 113 to the west. This section of the alternative intersected with Croppers Island Road, Downs Road, Goody Hill Road, Bays End Lane, both ends of Shire Drive, Ironshire Station/Mason Road and Harrison Road, and crossed over Goody Hill Branch and Poplartown Branch. Alternative 2S-20' Median along the existing two-lane portions of US 113 met the existing dualized US 113 at Hayes Landing Road.

- **Summary of Alternative 2S 20' Median:**

  - Alternative 2S would typically have been along the centerline of the existing two-lane US 113; shifts occurred so as to avoid/minimize displacements and sensitive environmental features (streams and wetlands). One travel lane would have been provided per direction.

- Design Speed was 60 MPH.

- Median width provided 8-feet of recovery area for vehicles that leave the roadway toward the center.

- The paved outside shoulders would have been 10-feet wide and 20-feet of safety grading would have been provided. In sensitive areas (such as a wetland or stream crossing), guardrail would have been provided in place of the roadside grading to minimize impacts.

- Left turn lanes and median breaks would have been provided at the following intersections:

  - Castle Hill Road
  - Snow Hill Road (MD 12)
  - Brick Kiln Road/Washington Street
  - Public Landing Road (MD 365)
  - Market Street (MD 394N) (T intersection)
  - Timmons Road (T intersection)
  - Cedartown Road (T intersection)
  - Porters Crossing Road (T intersection)
  - Central Site Lane (T intersection)
  - Five Mile Branch Road (T intersection)
  - Basket Switch Road (T intersection)
  - Newark Road
  - Langmaid Road
  - Gunning Club Lane/Newark Road
  - Croppers Island Road (T intersection)
  - Downes Road (T intersection)
  - Goody Hill Road (T intersection)
  - Bays End Lane (T intersection)
  - Shire Road (south) T intersection)
  - Mason Road/Ironshire Station Road
  - Shire Road (north) (T intersection)
  - Harrison Road (T intersection)

- Passing lanes 12-feet in width and approximately 1 to 1.25 miles in length would have been placed at the following four locations:
  - Northbound between Public Landing Road (MD 365) and Market Street (MD 394N). NOTE: This passing lane was subsequently deleted during preparation of this Final EIS.
  - Southbound between Timmons Road and Cedartown Road.
  - Northbound between Basket Switch Road and Langmaid Road.
  - Southbound between Langmaid Road and Gunning Club Road/Newark Road.

- Driveways and minor service roads would have been provided with a right-in/right-out only.

- Drivers from driveways that needed to access the other side of the road would have had to turn right and travel to the nearest intersection to make a U-turn (i.e., driver entering US 113 from a driveway on the northbound side of the road that wants to travel southbound would turn right heading northbound, go to the next intersection, and use the left turn lane for a U-turn).

- The estimated cost for Alternative 2S-20' Median was:

Right of Way	$ 1.4 M
Engineering & Construction	$47.4 M
TOTAL (1997 $)	$48.8 M

◆ **DECISION:** *Dualization is preferred over Alternative 2S-20' Median. Alternative 2S-20' Median would provide a 20-foot wide median with traffic barrier in the middle and passing lanes. Although this alternative has the advantage of reducing impacts to sensitive areas because of the reduced roadway section and would address the opposite direction collision, it is not preferred for the following reasons:*

- The narrow median could be expected to increase the number of fixed object collisions due the proximity of the guardrail in the narrow median. A reduced median width provides less of a recovery area for vehicles that leave the roadway.

- Passing lanes may result in high speed accidents, due to drivers not familiar with this type of roadway. Restricted passing (passing lanes of one mile in length provided in two areas in each direction) could lead to improper passing on the shoulders. (NOTE: For the purposes of the special wetland mitigation studies presented on Table IV-11, the passing lane in Wetland W-8 was deleted).

- The roadway width does not allow for passing slow moving, wide farm vehicles on this road except for the two one-mile sections with passing lanes, thus affecting the safety and operations of the roadway.

- Alternative 2S-20' Median does not provide for continuity through the corridor. It provides for one lane in each direction with passing lanes. This roadway would therefore be atypical and not congruent with driver expectations.

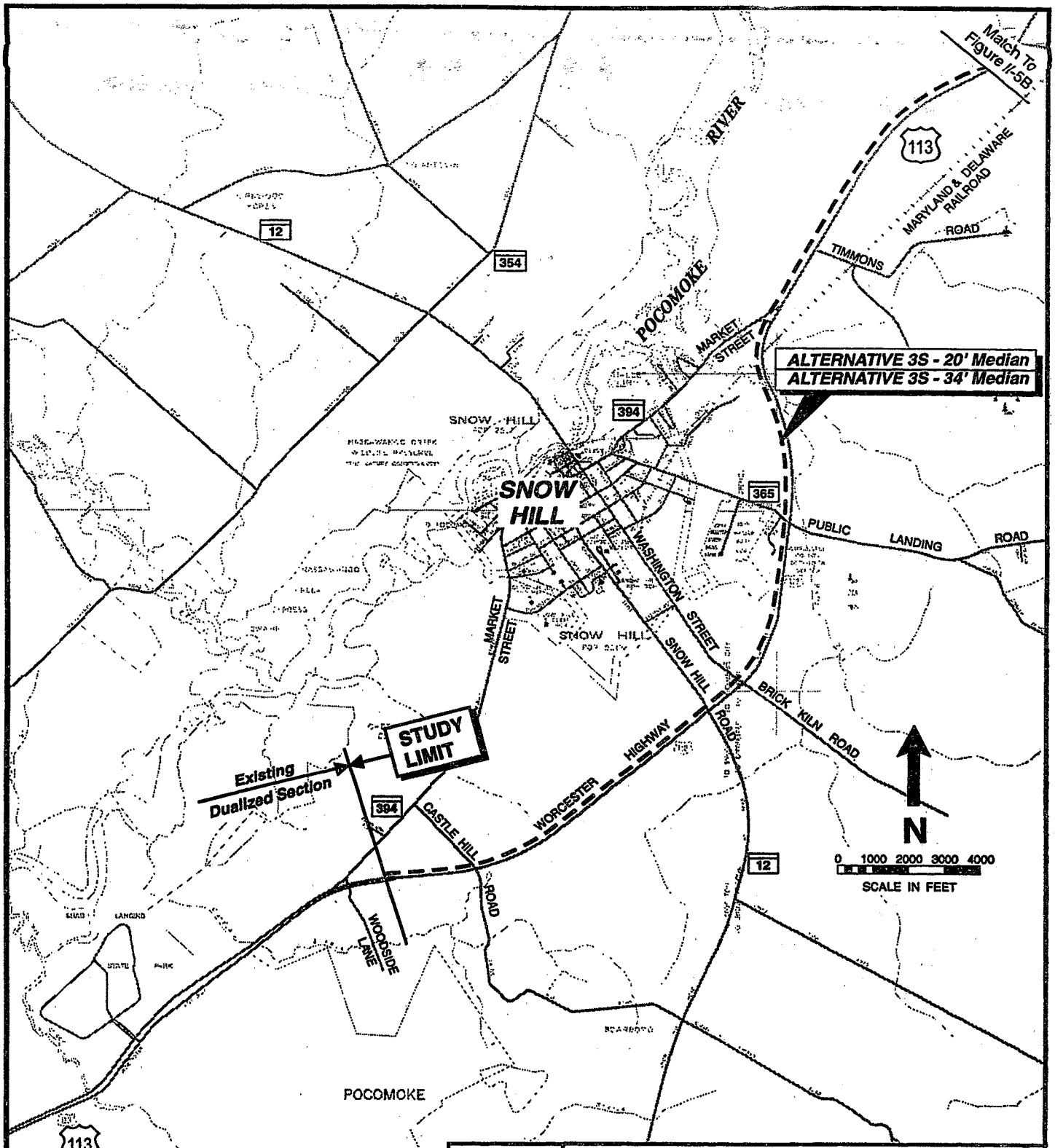
5. Introduction to the Dualization Alternatives

The dualization alternatives presented for public and agency consideration in the **Draft EIS/ Section 4(f) Evaluation** for US 113 proposed a four-lane divided roadway with a median. Access would have been partially controlled where possible and median and roadside landscaping would have been provided. The dualization alternatives in the southern study area were developed for a design speed of 60 MPH with both 20-foot wide and 34-foot wide medians evaluated (the 20-foot wide median was studied because it represented the minimum separation into which left turn lanes and a narrow divider can be provided; the 34-foot wide median was studied because it provided the full 30-feet of recovery area width appropriate for this design speed). The dualization alternatives in the northern study area were developed for design speeds of both 50 MPH and 60 MPH along the existing US 113 alignment, and 60 MPH along the new location alignment. The purpose of evaluating the 50 MPH alignment along existing US 113 in the northern study area was to permit study of a slightly more curvilinear alignment which would, perhaps, reduce residential and environmental impacts. Median widths of 20-feet and 34-feet were evaluated for all dualization alternatives in the northern study area. Evaluation of the 20-foot and 34-foot median widths in both the southern and northern study areas permitted an assessment of impacts on residential properties and environmental resources. In addition, these dualization alternatives in the northern study area were developed in segments with common end points so that they could have been used in various combinations.

The dualization alternatives retained for detailed study in the **Draft EIS/Section 4(f) Evaluation** are graphically presented on Figures II-5A through II-5D. Typical sections for the dualization alignment with a 20-foot median with traffic barrier (Alternatives 3S-20' Median and 3N-20' Median) are shown on Figure II-6; the typical sections for the dualization alignment with a 34-foot median (Alternatives 3S-34' Median and 3N-34' Median) are shown on Figure II-7; the typical sections for the new location alignments (Alternatives 4N Modified-20' Median and 4N Modified -34' Median) are presented on Figure II-8. Detailed plans of the dualization alternatives, at a scale of 1" = 400', were presented in the **Draft EIS/Section 4(f) Evaluation** Appendix A, Figures 8 though 17.

The dualization alternatives were developed and refined to minimize impacts to the natural, socioeconomic, and cultural environment while meeting the project need. Major environmental constraints affecting the location of the project alternatives included wetlands, streams, existing and planned residential and commercial properties, historic sites, and utility locations.

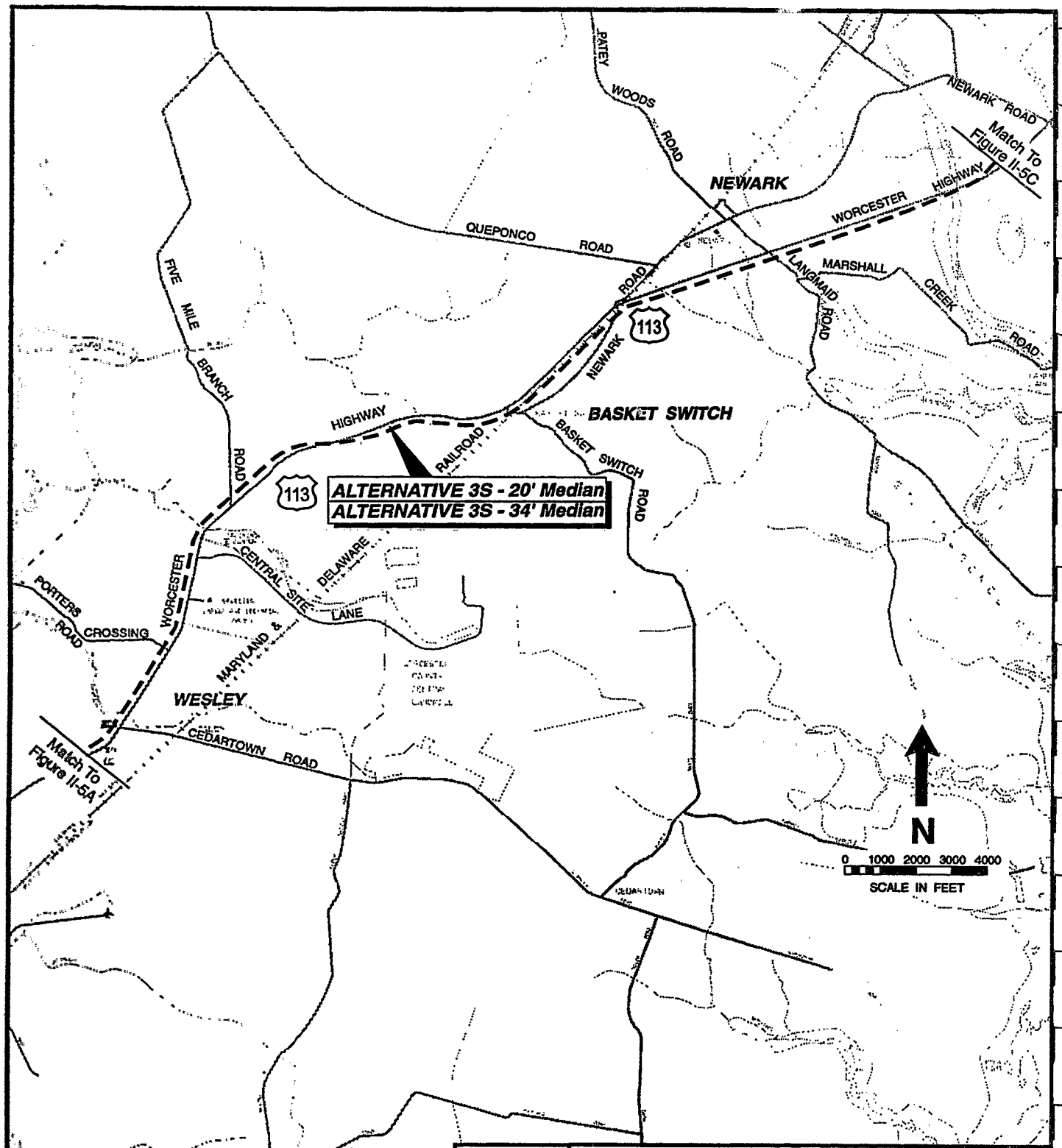
Section II.E. presents a detailed description of the Southern Preferred Alternative and the Northern Preferred Alternative; plates of these alternatives at a scale of 1"=400' are presented in Appendix A of this document.

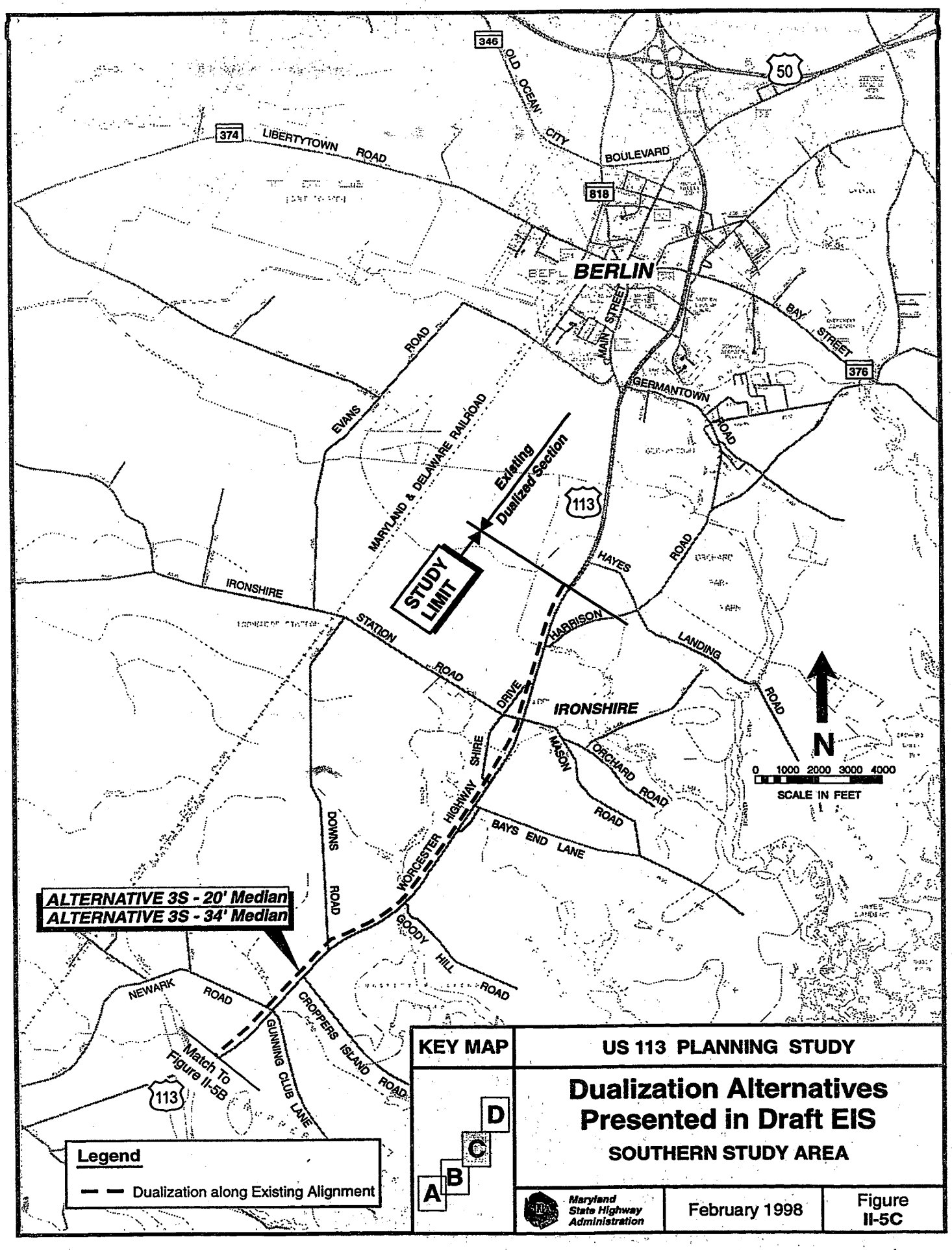


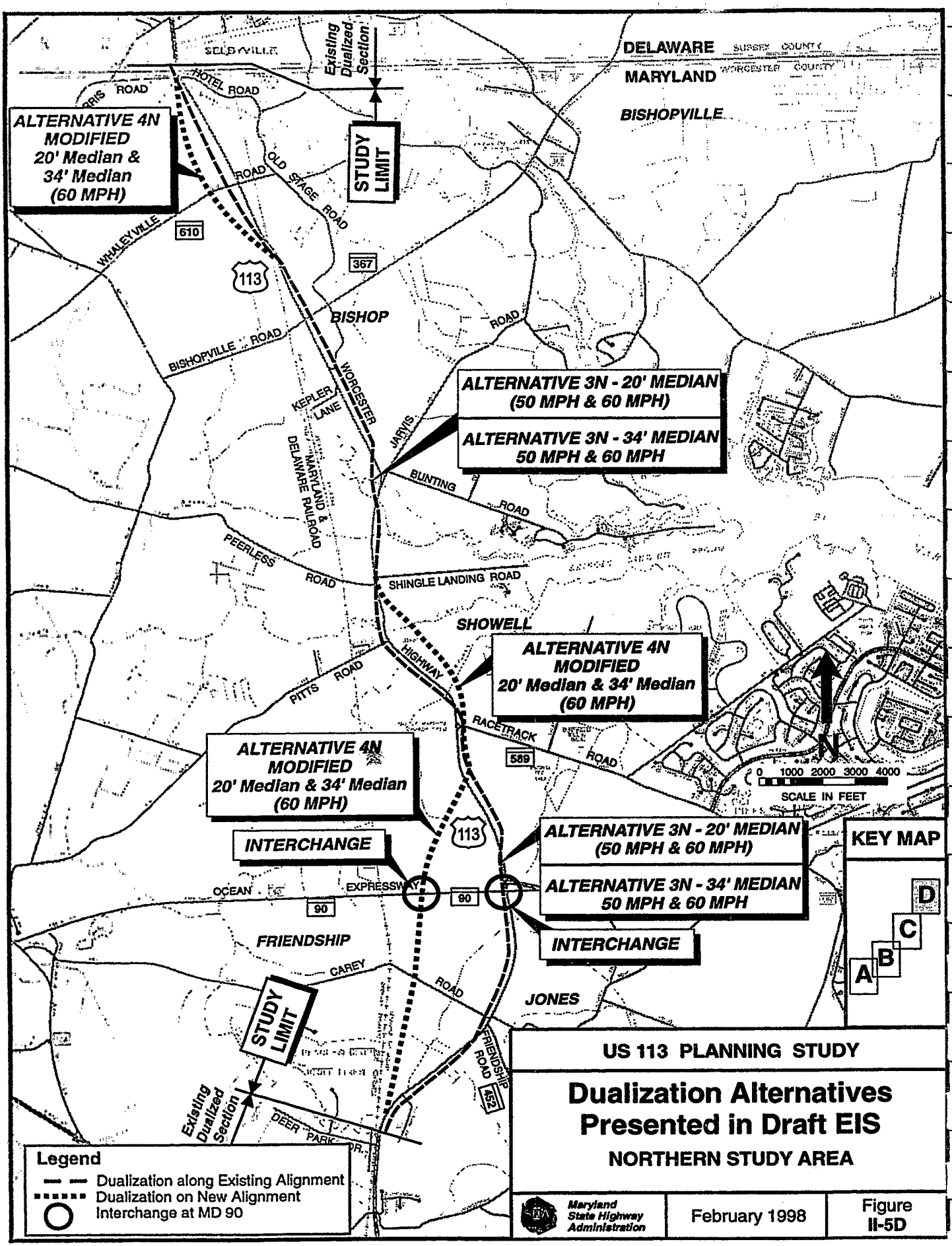
Legend

— — Dualization along Existing Alignment

KEY MAP	US 113 PLANNING STUDY	
A B C D	**Dualization Alternatives Presented in Draft EIS** **SOUTHERN STUDY AREA**	
	Maryland State Highway Administration	February 1998	Figure II-5A


PATEY
WOODS
ROAD
NEWARK ROAD
Match To Figure II-5C
NEWARK
WORCESTER
HIGHWAY
QUEPONCO
ROAD
MARSHALL
CREEK
LANGMAID
ROAD
ROAD
113
FIVE
MILE
BRANCH
ROAD
NEWARK
HIGHWAY
BASKET SWITCH
RAILROAD
BASKET
SWITCH
ROAD
113
ALTERNATIVE 3S - 20' Median
ALTERNATIVE 3S - 34' Median
DELAWARE
CENTRAL
SITE
LANE
WORCESTER
PORTERS
ROAD
CROSSING
MARYLAND &
WESLEY
CEDARTOWN
ROAD
Match To Figure II-5A
N
0 1000 2000 3000 4000
SCALE IN FEET
Legend
Dualization along Existing Alignment
KEY MAP
A
B
C
D
US 113 PLANNING STUDY
Dualization Alternatives Presented in Draft EIS
SOUTHERN STUDY AREA
Maryland State Highway Administration
February 1998
Figure II-5B


346
OLD OCEAN CITY BOULEVARD
50
374
LIBERTYTOWN ROAD
818
BERLIN
MAIN STREET
BAY STREET
376
GERMANTOWN ROAD
EVANS ROAD
MARYLAND & DELAWARE RAILROAD
Existing Dualized Section
113
STUDY LIMIT
HAYES ROAD
IRONSHIRE
STATION ROAD
HARRISON
LANDING ROAD
DRIVE
IRONSHIRE
MASON
ORCHARD ROAD
ROAD
N
0 1000 2000 3000 4000
SCALE IN FEET
WORCESTER HIGHWAY
SHIRE
BAYS END LANE
DOWNS ROAD
ALTERNATIVE 3S - 20' Median
ALTERNATIVE 3S - 34' Median
GOODY HILL ROAD
NEWARK ROAD
CROPPERS ISLAND ROAD
GUNNING CLUB LANE
Match To Figure II-5B
113
Legend
Dualization along Existing Alignment
KEY MAP
A
B
C
D
US 113 PLANNING STUDY
Dualization Alternatives Presented in Draft EIS
SOUTHERN STUDY AREA
Maryland State Highway Administration
February 1998
Figure II-5C

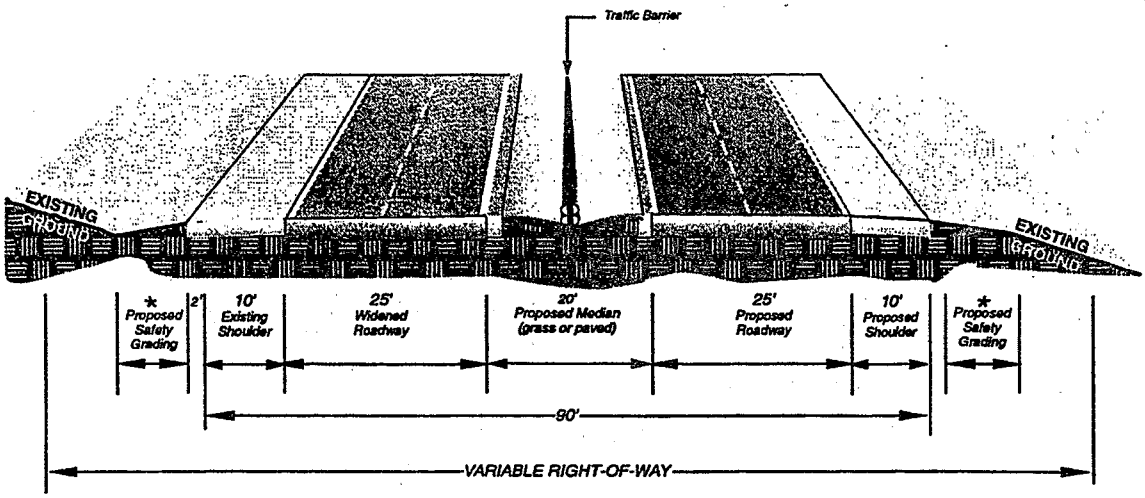


US 113 PLANNING STUDY

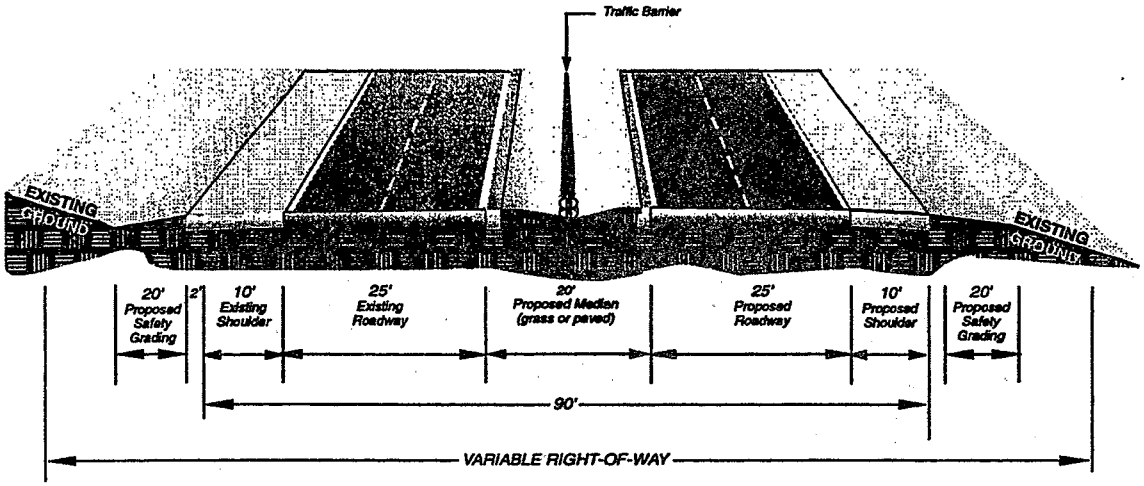
Dualization Alternatives Presented in Draft EIS

NORTHERN STUDY AREA

Maryland State Highway Administration | February 1998 | Figure II-5D



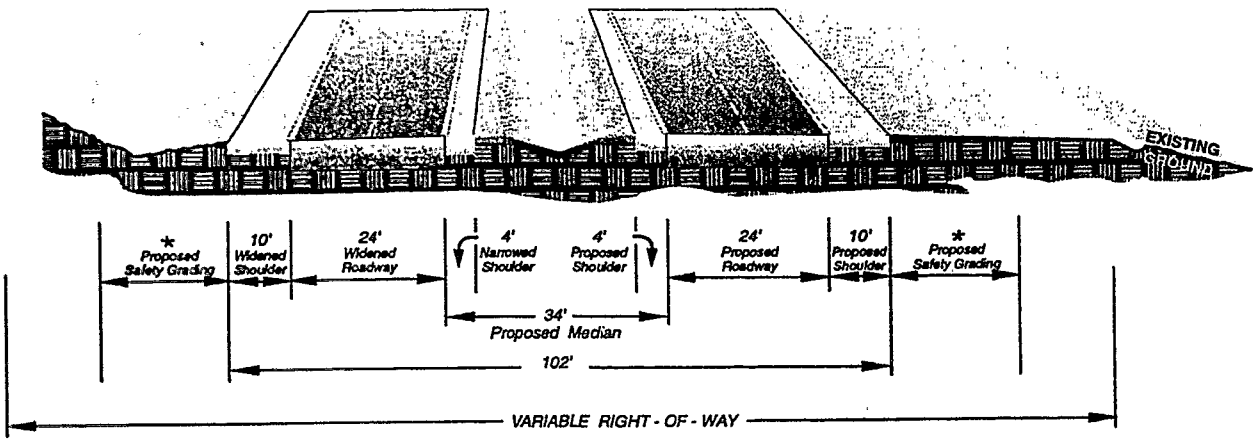
ALTERNATIVE 3N - 20' MEDIAN
DUALIZATION ALONG EXISTING ALIGNMENT
(50 MPH & 60 MPH)



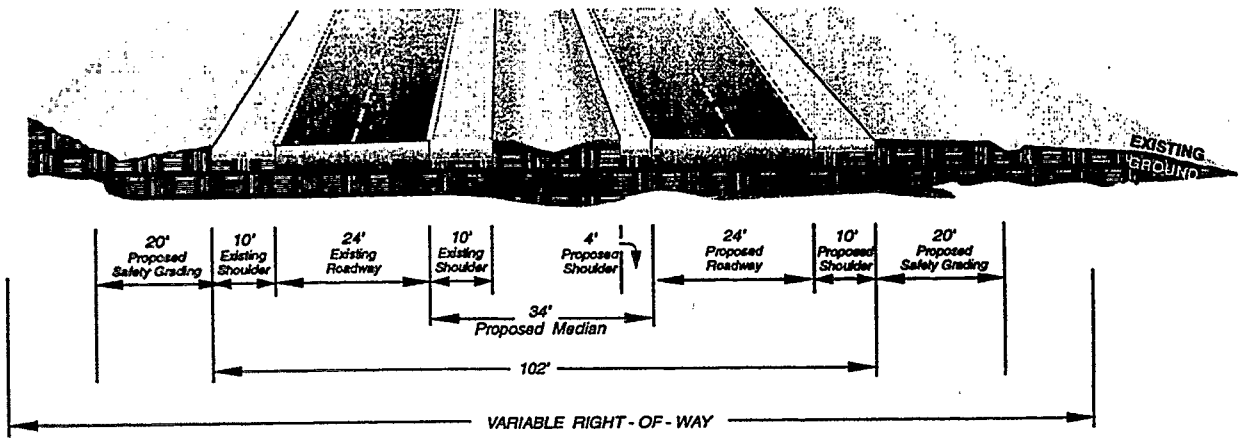
ALTERNATIVE 3S - 50 MPH
DUALIZATION ALONG EXISTING ALIGNMENT
(60 MPH)

The dimensions shown are for the purpose of determining cost estimates and environmental impacts and are subject to change during the final design phase.

US 113 PLANNING STUDY		
Typical Sections **Alternative 3S - 20' Median** **Alternative 3N - 20' Median**		
Maryland State Highway Administration	February 1998	Figure II-6



ALTERNATIVE 3N - 34' MEDIAN DUALIZATION ALONG EXISTING ALIGNMENT (50 MPH & 60 MPH)



ALTERNATIVE 3S - 34' MEDIAN DUALIZATION ALONG EXISTING ALIGNMENT (60 MPH)

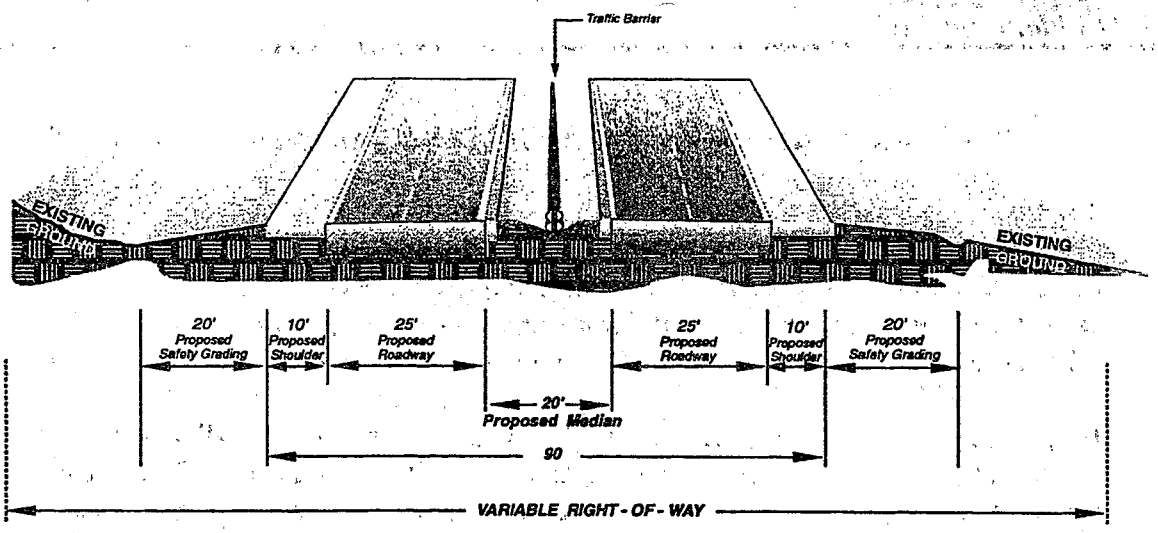
* 50 MPH Design Speed requires 9' of Safety Grading
60 MPH Design Speed requires 20' of Safety Grading

The dimensions shown are for the purpose of determining cost estimates and environmental impacts and are subject to change during the final design phase.

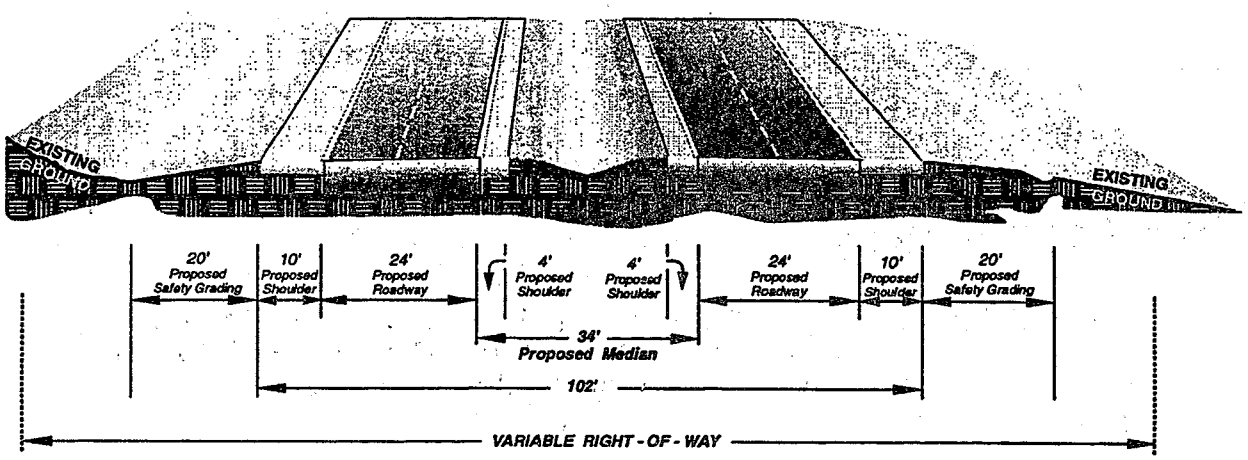
US 113 PLANNING STUDY

Typical Sections
Alternative 3S - 34' Median
Alternative 3N - 34' Median

Maryland State Highway Administration	February 1998	Figure II-7



ALTERNATIVE 4N MODIFIED - 20' MEDIAN DUALIZATION ON NEW ALIGNMENT (60 MPH)



ALTERNATIVE 4N MODIFIED - 34' MEDIAN DUALIZATION ON NEW ALIGNMENT (60 MPH)

The dimensions shown are for the purpose of determining cost estimates and environmental impacts and are subject to change during the final design phase.

US 113 PLANNING STUDY		
Typical Sections Alternative 4N - 20' Median Alternative 4N - 34' Median		
Maryland State Highway Administration	February 1998	Figure II-8

6. Dualization Alternatives Along the Existing Alignment in the Southern Study Area

The typical roadway section for these alternatives consisted of two 12-foot travel lanes in each direction, a median, 10-foot outside shoulders, and 20-feet of safety grading on both sides of the roadway where appropriate. This alternative was designed for a 60 MPH design speed with two alternative median widths and treatments. The proposed typical sections for Alternative 3S are shown on Figure II-6 for 3S-20' Median and Figure II-7 for 3S-34' Median.

Beginning in the south, the dualization for Alternatives 3S-20' Median and 3S-34' Median began as an extension of the existing dualized US 113, approximately 450 feet east of Market Street (MD 394S) and Woodside Lane intersection. Through the first curve, the median transitioned from a width of 75-feet ± to the proposed median section, and shifted the proposed dualization to the west of the existing roadway. Approximately 2,300 feet of mainline roadway up to just south of Castle Hill Road would have been reconstructed.

Continuing north, a new roadway would have been constructed parallel to the existing roadway to the west, utilizing approximately 5.1 miles of existing US 113 as the northbound roadway. This section of the alignment intersected with Castle Hill Road, Snow Hill Road (MD 12), Washington Street/Brick Kiln Road, and Public Landing Road (MD 365), and passed over Purnell Branch, intersected with the Maryland and Delaware Railroad, Market Street (MD 394N) and Timmons Road. Approximately 600 linear feet of southbound Market Street would have been reconstructed to meet the proposed dualized roadway. No substantive change in the cross street vertical alignments would have been planned. As shown on **Draft EIS/Section 4(f) Evaluation** Appendix A, Figures 8, 9 and 10, the majority of the right-of-way for this dualization was already in place.

The alignment then curved to the east, 3,600 feet north of Timmons Road, passed to the south of Snow Hill Mennonite Church, and slightly improved the horizontal alignment. Approximately 2,200 linear feet of mainline would have been reconstructed to flatten the curve at this location.

Continuing in a northeasterly direction to 1,300 feet south of Cedartown Road, the alignment paralleled the existing roadway to the west, utilizing approximately 1,300 feet of existing US 113 as the northbound roadway. The alignment then curved to the north, intersecting with Cedartown Road. To reduce the horizontal curve, approximately 1,400 linear feet of mainline would have been reconstructed up to Cedartown Road.

Continuing in an northeasterly direction, the alignment paralleled the existing roadway on the west, utilizing approximately 8,800 feet of existing roadway as northbound US 113. This section of the alignment crossed over both Poorhouse Branch and Five Mile Branch, and intersected with Porters Crossing Road, Central Site Lane and Five Mile Branch Road. Approximately 200 linear feet of Five Mile Branch Road would have been reconstructed to improve its intersection with US 113.

The alignment then curved to the east and transitioned from the west side to the east side of the existing US 113 roadway. To accomplish this transition, approximately 1,600 linear feet of the existing roadway would have been reconstructed.

Continuing in an easterly then northeasterly direction, the alignment paralleled the existing roadway to the east, utilizing approximately 4.45 miles of existing roadway as southbound US 113. This section of the alignment intersected with Basket Switch Road, Newark Road, the Maryland and Delaware Railroad track, Langmaid Road, Newark Road/Gunning Club Lane, and passed over Massey Branch and Porter Creek. Approximately 300 feet of the east side of Newark Road at the MD and Delaware Railroad crossing would have been reconstructed, providing improved intersection sight distance and improving the horizontal alignment of Newark Road.

Continuing in a northeasterly direction, the alignment transitioned from the east side to the west side of the existing roadway between Gunning Club Lane and Croppers Island Road. Approximately 800 linear feet of mainline have would been reconstructed to flatten the curve at this location.

The alignment continued in a northeasterly direction, paralleling the existing roadway to the west, utilizing approximately 3.6 miles of existing US 113 as the northbound roadway. This section of the alignment intersected with Croppers Island Road, Downs Road, Goody Hill Road, Bays End Lane, both ends of Shire Drive, Ironshire Station/Mason Road and Harrison Road, and crossed over Goody Hill Branch and Poplartown Branch. The proposed dualization of the existing two-lane portion of US 113 met the existing dualized US 113 at Hayes Landing Road.

◆ **Summary of Alternative 3S-20' Median:**

- Alternative 3S would typically have been adjacent to the existing two-lane US 113; shifts would have occurred so as to avoid/minimize displacements and sensitive environmental features (streams and wetlands). The existing pavement section would have been utilized for either the northbound or southbound lanes. Two travel lanes would have been provided per direction.

- Design Speed would have been 60 mph.

- Median width would have provided 8 feet of recovery area for vehicles that leave the roadway toward the center.

- The paved outside shoulders would have been 10-feet wide and 20-feet of safety grading would have been provided. In sensitive areas (such as a wetland or stream crossing), guardrail would have been provided in place of the roadside grading to minimize impacts.

- Left turn lanes and median breaks would have been provided at the following intersections:

  - Castle Hill Road
  - Snow Hill Road (MD 12)
  - Brick Kiln Road/Washington Street
  - Public Landing Road (MD 365)
  - Market Street (MD 394N) (T intersection)
  - Timmons Road (T intersection)
  - Cedartown Road (T intersection)
  - Porters Crossing Road (T intersection)
  - Central Site Lane (T intersection)
  - Five Mile Branch Road (T intersection)
  - Basket Switch Road (T intersection)
  - Newark Road
  - Langmaid Road
  - Gunning Club Lane/Newark Road
  - Croppers Island Road (T intersection)
  - Downes Road (T intersection)
  - Goody Hill Road (T intersection)
  - Bays End Lane (T intersection)
  - Shire Road (south) T intersection)
  - Mason Road/Ironshire Station Road
  - Shire Road (north) (T intersection)

- Driveways and minor service roads would have been provided with a right-in/right-out only.

- Drivers from driveways that needed to access the other side of the road would have had to turn right and travel to the nearest intersection to make a U-turn (i.e., a driver entering US 113 from a driveway on the northbound side of the road that wants to travel southbound would turn right heading northbound, go to the next intersection, and use the left turn lane for a U-turn).

- The estimated cost for Alternative 3S-20' Median was:

Right of Way	$ 1.6 M
Engineering & Construction	$64.2 M
TOTAL (1997 $)	$65.8 M

- **DECISION:** *Alternative 3S-20' Median is not preferred because it would have resulted in difficult left turns at cross streets and U-turns.*

  34' Median is preferred over 20' Median:

  The 34-foot wide median will provide more room for all vehicles at the intersections and greater amount of recovery area for vehicles in areas where impacts are not too significant. The narrow 20' median, however, could be expected to increase the number of fixed object collisions due the proximity of the guardrail in the median. A reduced median provides less of a recovery area for vehicles that leave the roadway. The narrower median would also affect the operations of the roadway. Most intersections in the study area are unsignalized and adequate room for turning movements is desirable.

- **Summary of Alternative 3S - 34' Median:**

  - **Except for the 34-foot wide median, all other features of Alternative 3S-34' Median would have been identical to the previously described Alternative 3S-20' Median.**

  - The entire 34 foot median would have been available as a recovery area for vehicles that leave the roadway toward the center. Recovery area suggested by FHWA roadside design guidelines is 30 feet (minimum).

  - The estimated cost for Alternative 3S-34' Median was:

Right of Way	$ 1.7 M
Engineering & Construction	$62.0 M
TOTAL (1997 $)	$63.7 M

- **DECISION:** *Alternative 3S-34' Median is preferred for the Southern Study Area. As discussed in Section II.E. of this document, minimization studies to reduce median width and roadside grading in environmentally sensitive areas have been evaluated and are included as part of the Southern Preferred Alternative.*

7. Dualization Alternatives Along the Existing Alignment in the Northern Study Area

The typical roadway section for these alternatives consisted of two 12-foot travel lanes in each direction, a median, 10-foot outside shoulders, and 20-feet of safety grading on both sides of the roadway where appropriate. This alternative was evaluated for both a 50 MPH and a 60 MPH design speed with two alternative median widths and safety grading treatments. The 50 MPH design speed alignment basically paralleled the existing US 113 roadway and was located either immediately to the east or west of existing US 113. Variation in this condition occurred at the three (3) locations where the existing horizontal curvature is too sharp. The 60 MPH design speed alignment, while also basically paralleling existing US 113, deviated from a parallel condition at many locations in order to provide more desirable horizontal geometry or avoid impacts to properties or environmental resources located on the **inside** edge of a curve when the new roadway lanes are located on the **outside** edge of the curve. The proposed typical sections for Alternative 3N are shown on Figure II-6 for 3N-20' Median and on Figure II-7 for 3N-34' Median. ***Except where highlighted in the following paragraphs in bold italics, the centerlines of the 50 MPH and 60 MPH alignments for the dualization alternatives along the existing US 113 alignment were essentially the same.***

From south to north, the dualization for Alternative 3N with a 20-foot or 34-foot median began as an extension of existing dualized US 113 near Deer Park Drive, approximately 0.8 mile north of US 50. Through the first curve, the median transitioned from a width of 110 feet, matching the existing dualized section, to the proposed median section. Continuing in a northeasterly direction, the alignments paralleled the existing roadway to the east, utilizing approximately 0.4 mile of the existing roadway.

The alignments continued in northeasterly direction intersecting with MD 452 (Friendship Road) and Carey Road/Jones Road. Approximately 300 linear feet of Friendship Road would have been reconstructed to improve the intersection design by creating a perpendicular intersection at this location. No substantive change in the vertical alignments would have been made to the cross streets of Carey Road/Jones Road. Approximately 1,000-feet north of Carey Road/Jones Road, ***the 60 MPH alignment transitioned slightly west to flatten a horizontal curve. Approximately 1,800-feet of new dual roadways would have been constructed. The 50 MPH alignment stayed along existing US 113, constructing only new southbound lanes west of the existing US 113 (which would have become the northbound lanes).***

Continuing in a northerly direction, the alignments passed beneath MD 90, requiring a new bridge for MD 90 to accommodate the widened US 113 roadways. The existing loop and outer ramps in the northeast quadrant of the MD 90 interchange would have been reconstructed and new loop and outer ramps would have been constructed in the southeast quadrant, resulting in a half cloverleaf interchange configuration.

Continuing in a northerly direction, the alignments followed existing US 113 for approximately 0.6 mile ***where the 60 MPH alignment shifted to an entirely new dual highway east of US 113 and crossed MD 589 (Racetrack Road) approximately 150 feet east of the existing***

intersection. Horizontal improvements to the MD 589 intersection included the addition of a separate turn lane from southbound US 113 to eastbound MD 589. No substantive change in the MD 589 vertical alignment were planned. Approximately 0.4 mile of existing US 113 would have been retained and utilized as a service road fronting two private residences, Rancho Fiesta Estate subdivision and the historic Saint Martin's Episcopal Church.

The 50 MPH alignment would have continued along existing US 113, with new northbound lanes constructed along the east side of US 113. Existing US 113 would have become the southbound lanes. The previously referenced private residences, Rancho Fiesta Estate subdivision and historic Saint Martin's Episcopal Church would have been along the southbound lanes of dualized US 113.

The alignments continued in a northwesterly direction to the town of Showell, crossing Church Branch, ***where the 60 MPH alignment intersected Pitts Road approximately 100 feet west of the existing intersection, displacing Tony's Country Store (the historic Showell Store) and one residence. No substantive changes in the Pitts Road horizontal or vertical geometry were planned. Approximately 0.5 mile of existing US 113 would have been retained and utilized as a service road for several residences and businesses, including the Showell Post Office, Showell Volunteer Fire Department, and the Lemuel Showell House. Continuing in a northerly direction, the alignment crossed Middle Branch, intersected with Peerless/ Shingle Landing roads in approximately the same location as existing, and paralleled the existing roadway to the east. No substantive changes in the horizontal or vertical geometry were planned for Peerless or Shingle Landing roads.***

The 50 MPH alignment through Showell would have stayed along existing US 113, also displacing Tony's Country Store (the historic Showell Store) and one residence plus another business (Used Furniture & Collectibles) and a residence immediately north of the Middle Branch crossing plus another residence south of Peerless Road (but avoiding a residence along Shingle Landing Road which would have been taken by the 60 MPH alignment).

The alignments continued on a tangent in a northerly direction and cross Birch Branch, ***where the 60 MPH alignment left existing US 113 to the west, approximately 0.4 mile north of Shingle Landing Road and returned to the existing alignment approximately 0.3 mile north of Jarvis Road.*** SHA is currently planning to reconfigure the existing intersection to improve sight distances. Both the 50 MPH and 60 MPH alignment plans would have been compatible with the proposed intersection improvements. ***The 50 MPH alignment stayed generally along existing US 113, constructing new southbound lanes along the west side of US 113.***

Continuing in a northwesterly direction, the alignment paralleled existing US 113 to the east, intersecting Kepler Lane, Old Stage Road and MD 367 (Bishopville Road), retaining approximately 1.0 mile of the existing roadway as the southbound roadway. No improvements were planned for Kepler Lane and no substantive changes improvements were planned for Old Stage Road or MD 367. The alignment displaced one of the two existing warehouses south of Old Stage Road. Relocation of the displaced Delmarva Veterinarian Hospital parking lot was planned north of the existing building.

The alignment continued in a northwesterly direction crossing the Maryland and Delaware Railroad at approximately the same location as the existing crossing. The alignment eliminated the existing triple reversing curves and returned to the existing alignment approximately 300 feet south of MD 610 (Whaleyville Road). The alignment continued in a northwesterly direction, paralleling the existing roadway to the west and crossing MD 610. No substantive changes in the MD 610 horizontal or vertical geometry were planned.

Continuing in a northwesterly direction, the alignment tied into the existing dualized roadway and ended at the Delaware state line, crossing Morris and Hotel roads. The proposed 34-foot median transitioned to meet the existing 90-foot median through the last horizontal curve. No substantive changes in the horizontal or vertical geometry were planned for Morris or Hotel roads.

◆ **Summary of Alternative 3N-20' Median & 50 MPH:**

- Alternative 3N would have typically been adjacent to the existing two-lane US 113; shifts would have occurred so as to avoid/minimize displacements and sensitive environmental features (streams and wetlands). The existing pavement section would have been utilized for either the northbound or southbound lanes. Two travel lanes would have been provided per direction.

- Design Speed would have been 50 mph.

- Median width would have provided 8 feet of recovery area for vehicles that leave the roadway toward the center.

- The paved outside shoulders would have been 10 feet wide and 9-feet of roadside grading would have been provided. In sensitive areas (such as a wetland or stream crossing), guardrail would have been provided in place of the roadside grading to minimize impacts.

- Left turn lanes and median breaks would have been provided at the following intersections:

  - Friendship Road (MD 452) (T intersection)
  - Carey Road/Jones Road
  - Eastbound MD 90 interchange ramps (T intersection)
  - Westbound MD 90 interchange ramps (T intersection)
  - East side service road north of MD 90 (T intersection)
  - Racetrack Road (T intersection)
  - Pitts Road (T intersection)
  - Peerless Road (T intersection)
  - Shingle Landing Road (T intersection)

- relocated Jarvis Road (T intersection)
- Bishopville Road (MD 367)
- Whaleyville Road (MD 610)/Hammond Road

- Driveways and minor service roads would have been provided with a right-in/right-out only.

- Drivers from driveways that needed to access the other side of the road would have had to turn right and travel to the nearest intersection to make a U-turn (i.e., a driver entering US 113 from a driveway on the northbound side of the road that wants to travel southbound would turn right heading northbound, go to the next intersection, and use the left turn lane for a U-turn).

- The estimated cost for Alternative 3N-20' Median (50 MPH) was:

Right of Way	$11.4 M
Engineering & Construction	$51.9 M
TOTAL (1997 $)	$63.3 M

◆ **DECISION:** ***Alternative 3N-20' Median (50 MPH)*** *is not preferred because it would have resulted in difficult left turns at cross streets and U-turns. In addition, the 50 MPH alternative had narrower safety grading than provided for in the majority of the study area. Also, due to the substantial adverse residential impacts in the Friendship community, this alignment between Deer Park Road and Racetrack Road is not preferred.*

Combination Alternative 3N/4N - 34' Median (60 MPH) is preferred over Alternative 3N-20' Median (50 MPH): *please see text at the end of Section II.D.9. in this document for explanation.*

◆ **Summary of Alternative 3N - 34' Median & 50 MPH:**

- **Except for the 34-foot wide median, all other features of Alternative 3N-34' Median (50 MPH) would have been identical to the previously described Alternative 3N-20' Median (50 MPH).**

- The entire 34 foot median would have been available as a recovery area for vehicles that leave the roadway toward the center. Recovery area suggested by FHWA roadside design guidelines is 30 feet (minimum).

- The estimated cost for Alternative 3N-34' Median (50 MPH) was:

Right of Way	$12.8 M
Engineering & Construction	$59.7 M
TOTAL (1997 $)	$72.5 M

◆ **DECISION:** ***Alternative 3N-34' Median (50 MPH) is not preferred because of the less than desirable safety grading provided for the majority of the study area. Also, due to the substantial adverse residential impacts in the Friendship community, this alignment between Deer Park Road and Racetrack Road is not preferred.***

Combination Alternative 3N/4N - 34' Median (60 MPH) is preferred over Alternative 3N-34' Median (50 MPH): please see text at the end of Section II.D.9. in this document for explanation.

◆ **Summary of Alternative 3N-20' Median & 60 MPH:**

- Alternative 3N would have typically been adjacent to the existing two-lane US 113; shifts would have occurred so as to avoid/minimize displacements and sensitive environmental features (streams and wetlands). The existing pavement section would have been utilized for either the northbound or southbound lanes. Two travel lanes would have been provided per direction.

- Design Speed would have been 60 mph.

- Median width would have provided 8 feet of recovery area for vehicles that leave the roadway toward the center.

- The paved outside shoulders would have been 10 feet wide and 20-feet of safety grading would have been provided. In sensitive areas (such as a wetland or stream crossing), guardrail would have been provided in place of the roadside grading to minimize impacts.

- Left turn lanes and median breaks would have been provided at the following intersections:

  - Friendship Road (MD 452) (T intersection)
  - Carey Road/Jones Road
  - Eastbound MD 90 interchange ramps (T intersection)

- Westbound MD 90 interchange ramps (T intersection)
- East side service road north of MD 90 (T intersection)
- Racetrack Road
- Pitts Road
- Peerless Road/Shingle Landing Road
- relocated Jarvis Road (T intersection)
- Bishopville Road (MD 367)
- Whaleyville Road (MD 610)/Hammond Road

- Driveways and minor service roads would have been provided with a right-in/right-out only.

- Drivers from driveways that needed to access the other side of the road would have had to turn right and travel to the nearest intersection to make a U-turn (i.e., a driveway on the northbound side of the road that wants to travel southbound would turn right heading northbound, go to the next intersection, and use the left turn lane for a U-turn).

- The estimated cost for Alternative 3N-20' Median (60 MPH) was:

Right of Way	$12.8 M
Engineering & Construction	$51.6 M
TOTAL (1997 $)	$64.4 M

◆ **DECISION:** ***Alternative 3N-20' Median (60 MPH) is not preferred because it would have resulted in difficult left turns at cross streets and U-turns. Also, due to the substantial adverse residential impacts in the Friendship community, this alignment between Deer Park Road and Racetrack Road is not preferred.***

Combination Alternative 3N/4N - 34' Median (60 MPH) is preferred over Alternative 3N-20' Median (60 MPH): please see text at the end of Section II.D.9. in this document for explanation.

◆ **Summary of Alternative 3N - 34' Median & 60 MPH:**

- **Except for the 34-foot wide median, all other features of Alternative 3N-34' Median (60 MPH) would have been identical to the previously described Alternative 3N-20' Median (60 MPH).**

- The entire 34 foot median would have been available as a recovery area for vehicles that leave the roadway toward the center. Recovery area suggested by FHWA roadside design guidelines is 30 feet (minimum).

- The estimated cost for Alternative 3N-34' Median (60 MPH) was:

Right of Way	$14.2 M
Engineering & Construction	$59.5 M
TOTAL (1997 $)	$73.7 M

◆ **DECISION:** ***Alternative 3N-34' Median (60 MPH) is not preferred because of the substantial adverse residential impacts in the Friendship community.***

Combination Alternative 3N/4N - 34' Median (60 MPH) is preferred over Alternative 3N-34' Median (60 MPH): please see text at the end of Section II.D.9. in this document for explanation.

8. Dualization Alternatives On New Alignment in the Northern Study Area

The typical roadway section for these alternatives consisted of two 12-foot travel lanes in each direction, a median, 10-foot outside shoulders, and 20-feet of safety grading on both sides of the roadway where appropriate. This alternative was designed for a 60 MPH design speed with two alternative median widths and treatments. The proposed typical sections for Alternative 4N Modified are shown on Figure II-8 for 4N-20' Median and for 4N-34' Median.

The dualization on new location would have involved the construction of a new four-lane divided roadway away from the existing facility. The roadway would have been constructed on new location to minimize impacts to residential and commercial properties.

The preliminary new location alternatives (Alternatives 4N Option A, and 4N Option B) were combined and revised to create the Alternative 4N Modified which was retained for detailed study. Although Alternative 4N Modified generally followed the same alignment as the previous new location alternatives, the modifications resulted in fewer impacts to the natural and socioeconomic environments.

The Alternative 4N Modified alignment began as an extension of existing dualized US 113, approximately 0.8 mile north of US 50, near Deer Park Drive. The alignment left existing US 113 on a tangent and headed in a northerly direction on the west side of the existing roadway in the Friendship area. The existing 110-foot median transitioned to the proposed median through the first curve. Existing US 113 north of the new alignment would have been relocated to a new "T" intersection in order to provide access along old US 113 to the north.

Continuing in a northeasterly direction, the alignments crossed Carey Road approximately 0.5 mile west of existing US 113. No substantive changes in the horizontal or vertical geometry were planned for the Carey Road intersection. The alignments then continued in a northerly direction through the graded area, reserved for the previously planned US 113/MD 90

interchange, and passed beneath MD 90, approximately 0.4 mile west of the existing US 113/ MD 90 interchange. A full diamond interchange configuration was planned, with consideration for the addition of loop ramps in the future. No additional improvements would have been required for MD 90, and the existing bridge previously constructed would have been used.

Continuing in a northerly direction, the alignments intersected existing US 113, approximately 0.8 mile north of MD 90. Existing US 113 north of MD 90 would have been relocated to intersect with the new location alignment at a T-intersection (existing US 113 north of this point would have had access at Racetrack Road (MD 589)). These alignments then paralleled the existing roadway approximately 150 feet to the east intersecting MD 589 (Racetrack Road). Horizontal improvements to the MD 589 intersection included the addition of a second left turn lane from southbound US 113 to eastbound MD 589. No substantive change in the MD 589 profile were planned.

Approximately 2.3 miles of existing US 113 would have been retained as a local road through Jones and Friendship, serving several residences and businesses located along the existing roadway. The existing roadway tied into the relocated alignment approximately 0.3 mile north of Deer Park Drive and approximately 0.3 mile south of MD 589. The existing US 113/MD 90 interchange ramps would have been removed.

From MD 589, the alignments continued north bypassing the Town of Showell to the east. Alternative 4N Modified rejoined and paralleled the existing roadway to the east for approximately 0.2 mile to north of Shingle Landing Road. Horizontal improvements included the realignment of Shingle Landing Road and the extension of Peerless Road to create a four-legged intersection replacing the two existing T-intersections. No substantive changes in the profiles of Shingle Landing or Peerless Roads were planned.

Approximately 1.4 miles of existing US 113 would have been retained as a local road through the Town of Showell, serving several residences, businesses located along the existing roadway. Existing US 113 tied into the relocated alignments at MD 589 and at Peerless Road.

The alignments continued on a tangent in a northerly direction leaving the existing roadway to the west, approximately 0.4 mile north of Shingle Landing Road and returning to the existing alignment approximately 0.3 mile north of Jarvis Road. SHA's plans to reconfigure the existing intersection were compatible with this relocation.

Alternative 4N Modified followed the Alternative 3N alignment, continuing in a northwesterly direction, where the alignment paralleled existing US 113 to the east crossing Kepler Lane and Old Stage Road, retaining approximately 0.8 mile of the existing roadway as southbound US 113. No improvements were planned for Kepler Lane and only minor adjustments in the horizontal and vertical geometry were planned for Old Stage Road. The alignments displaced one of the two existing warehouses south of Old Stage Road. Relocation of the existing Delmarva Veterinarian Hospital parking lot was planned north of the existing building.

The Alternative 4N Modified alignments left the existing roadway at MD 367 (Bishopville Road) 0.1 mile west of the existing intersection. No substantive change in the horizontal or vertical geometry were planned for MD 367 or MD 610. Approximately 1.0 mile of existing US 113 would have been retained as a local road through Bishop, serving several residences and businesses located along the existing roadway. Existing US 113 would have been terminated approximately 0.2 mile north of MD 367 and approximately 0.3 mile north of MD 610, utilizing MD 610 as a tie to the relocated alignment. The new location alignments continued in a northerly direction and rejoined the existing alignment approximately 0.2 mile south of Hotel Road, paralleling the existing roadway to the west. The alignments tied into the existing dualized roadway and ended at the Delaware state line, near the intersections with Morris and Hotel roads. The proposed median transitioned to meet the existing 90-foot wide median in Delaware through the last horizontal curve. No substantive changes in the horizontal or vertical geometry were planned for at-grade intersections with Morris or Hotel roads.

◆ **Summary of Alternative 4N-20' Median (60 MPH):**

- Alternative 4N would typically be on new location away from the existing two-lane US 113. Two travel lanes would have been provided per direction.

- Design Speed would have been 60 mph.

- Median width would have provided 8 feet of recovery area for vehicles that leave the roadway toward the center.

- The paved outside shoulders would have been 10 feet wide and 20-feet of safety grading would have been provided. In sensitive areas (such as a wetland or stream crossing), guardrail would have been provided in place of the roadside grading to minimize impacts.

- Left turn lanes and median breaks would have been provided at the following intersections:

  - Old US 113 near Deer Park Drive (T intersection)
  - Carey Road
  - Eastbound MD 90 interchange ramps
  - Westbound MD 90 interchange ramps
  - Racetrack Road
  - Shingle Landing Road/Peerless Road
  - relocated Jarvis Road (T intersection)
  - Bishopville Road (MD 367)
  - Whaleyville Road (MD 610)

- Access to the new location portions of this alternative would have only been provided at public roads (i.e., no private driveways).

- Minor service roads (and driveways along portions of US 113 used for this alignment) would have been provided with a right-in/right-out only. Drivers from driveways that needed to access the other side of the road would have had to turn right and travel to the nearest intersection to make a U-turn (i.e., a driver entering US 113 from a driveway on the northbound side of the road that wants to travel southbound would turn right heading northbound, go to the next intersection, and use the left turn lane for a U-turn).

- The estimated cost for Alternative 4N-20' Median (60 MPH) was:

Right of Way	$ 9.4 M
Engineering & Construction	$59.5 M
TOTAL (1997 $)	$68.9 M

◆ **DECISION:** ***Alternative 4N-20' Median is not preferred because it would have resulted in difficult left turns at cross streets and U-turns. Also, this alternative had adverse environmental impacts (primarily wetlands) north of Racetrack Road.***

Combination Alternative 3N/4N - 34' Median (60 MPH) is preferred over Alternative 4N-20' Median: please see text at the end of Section II.D.9. in this document for explanation.

◆ **Summary of Alternative 4N - 34' Median (60 MPH):**

- **Except for the 34-foot wide median, all other features of Alternative 4N-34' Median (60 MPH) would have been identical to the previously described Alternative 4N-20' Median (60 MPH).**

- The entire 34 foot median would have been available as a recovery area for vehicles that leave the roadway toward the center. Recovery area suggested by FHWA roadside design guidelines is 30 feet (minimum).

- The estimated cost for Alternative 4N-34' Median (60 MPH) was:

Right of Way	$10.4 M
Engineering & Construction	$60.1 M
TOTAL (1997 $)	$70.5 M

- **DECISION:** *Alternative 4N-34' Median is not preferred due to adverse environmental impacts (primarily wetlands) north of Racetrack Road. Portions of this alternative between Deer Park Road and Racetrack Road and between north of Church Branch to Shingle Landing Road were retained.*

  Combination Alternative 3N/4N - 34' Median (60 MPH) is preferred over Alternative 4N-34' Median: *please see text at the end of Section II.D.9. in this document for explanation.*

9. Dualization Alternatives Along a Combination of Existing and New Alignments in the Northern Study Area

A Combination Alternative which used portions of Alternative 3N and Alternative 4N Modified was also considered. The typical sections and alignments for the Combination Alternative would have been the same as those used for Alternatives 3N and 4N Modified. This alternative was designed for a 60 MPH design speed with two alternative median widths and treatments. The Combination Alternative followed the Alternative 4N Modified alignment from US 50 through the previously graded MD 90 interchange area across existing US 113 at MD 589 and bypassed the Town of Showell to the east. Like Alternative 4N Modified, the Combination Alternative tied back into existing US 113 just north of Showell, but then followed Alternative 3N along the existing alignment of US 113 to the northern project terminus at the Delaware state line.

The alignment of the Combination Alternative (following the Alternative 4N Modified alignment) began as an extension of existing dualized US 113, approximately 0.8 mile north of US 50, near Deer Park Drive. The alignment left existing US 113 on a tangent and headed in a northerly direction on the west side of the existing roadway in the Friendship area. The existing 110-foot median transitioned to the proposed median through the first curve. Existing US 113 north of the new alignment would have been relocated at a new T intersection, in order to provide access along old US 113 to the north.

Continuing in a northeasterly direction, the alignments crossed Carey Road approximately 0.5 mile west of existing US 113. No substantive changes in the horizontal or vertical geometry were planned for the Carey Road intersection. The alignments then continued in a northerly direction through the graded area, reserved for the previously planned US 113/MD 90 interchange, and passed beneath MD 90, approximately 0.4 mile west of the existing US 113/ MD 90 interchange. A full diamond interchange configuration was planned, with consideration for the addition of loop ramps in the future. No additional improvements would have been required for MD 90, and the existing bridge previously constructed would have been used.

Continuing in a northerly direction, the alignment intersected existing US 113, approximately 0.8 mile north of MD 90. Existing US 113 north of MD 90 would have been relocated to intersect with the new location alignment at a T intersection (existing US 113 north of this

point would have had access at Racetrack Road (MD 589)). These alignments then paralleled the existing roadway approximately 150 feet to the east intersecting MD 589 (Racetrack Road). Horizontal improvements to the MD 589 intersection included the addition of a second left turn lane from southbound US 113 to eastbound MD 589. No substantive change in the MD 589 profile were planned.

Approximately 2.3 miles of existing US 113 would have been retained as a local road through the communities of Jones and Friendship, serving several residences and businesses located along the existing roadway. The existing roadway tied into the relocated alignment approximately 0.3 mile north of Deer Park Drive and approximately 0.3 mile south of MD 589. The existing US 113/MD 90 interchange ramps would have been removed.

From MD 589, the alignments continued north bypassing the Town of Showell to the east. The Combination Alternative (still following the Alternative 4N Modified alignment) rejoined and paralleled the existing roadway to the east for approximately 0.2 mile to north of Shingle Landing Road. Horizontal improvements included the realignment of Shingle Landing Road and the extension of Peerless Road to create a four-legged intersection replacing the two existing T intersections. No substantive changes in the profiles of Shingle Landing or Peerless Roads were planned.

Approximately 1.4 miles of existing US 113 would have been retained as a local road through the Town of Showell, serving several residences and businesses located along the existing roadway. Existing US 113 would have tied into the relocated alignments at MD 589 and at Peerless Road.

The alignments continued on a tangent in a northerly direction leaving the existing roadway to the west, approximately 0.4 mile north of Shingle Landing Road and returning to the existing alignment approximately 0.3 mile north of Jarvis Road. SHA's plans to reconfigure the existing intersection were compatible with this relocation.

The Combination Alternative then followed the Alternative 3N alignment, continuing in a northwesterly direction, where the alignment paralleled existing US 113 to the east crossing Kepler Lane and Old Stage Road, retaining approximately 0.8 mile of the existing roadway as southbound US 113. No improvements were planned for Kepler Lane and only minor adjustments in the horizontal and vertical geometry would have been planned for Old Stage Road. The alignments displaced one of the two existing warehouses south of Old Stage Road. Relocation of the existing Delmarva Veterinarian Hospital parking lot was planned north of the existing building.

The alignment continued in a northwesterly direction, crossing the Maryland and Delaware Railroad at approximately the same location as the existing US 113 crossing. These alignments eliminated the existing triple reversing curves and returned to the existing US 113 alignment approximately 300 feet south of MD 610 (Whaleyville Road). The alignments then continued in a northwesterly direction, paralleling the existing roadway to the west and crossing MD 610. No substantive changes in the MD 610 horizontal or vertical geometry were planned.

Continued in a northwesterly direction, the alignments tied into the existing dualized roadway and ended at the Delaware state line, crossing Morris and Hotel roads. The proposed median transitioned to meet the existing 90-foot wide median in Delaware through the last horizontal curve. No substantive changes in the horizontal or vertical geometry were planned for Morris or Hotel roads.

◆ **Summary of Combination Alternative 3N/4N Modified - 20' Median (60 MPH):**

- This alternative represented a combination of previously discussed Alternatives 3N-20' Median and 4N Modified -20' Median. Two travel lanes would have been provided per direction.

- Design Speed would have been 60 mph.

- Median width would have provided 8 feet of recovery area for vehicles that leave the roadway toward the center.

- The paved outside shoulders would have been 10 feet wide and 20-feet of safety grading would have been provided. In sensitive areas (such as a wetland or stream crossing), guardrail would have been provided in place of the roadside grading to minimize impacts.

- Left turn lanes and median breaks would have been provided at the following intersections:

  - Old US 113 near Deer Park Drive (T intersection)
  - Carey Road
  - Eastbound MD 90 interchange ramps
  - Westbound MD 90 interchange ramps
  - Racetrack Road
  - Shingle Landing Road/Peerless Road
  - relocated Jarvis Road (T intersection)
  - Bishopville Road (MD 367)
  - Whaleyville Road (MD 610)

- Access to the new location portions of this alternative would have only been provided at public roads (i.e., no private driveways).

- Minor service roads (and driveways along portions of US 113 used for this alignment) would have been provided with a right-in/right-out only. Drivers from these driveways that needed to access the other side of the road would have had to turn right and travel to the nearest intersection to make a U-turn (i.e., a driver entering US 113 from a driveway on the northbound side of the road that wants to travel southbound would turn right heading northbound, go to the next intersection, and use the left turn lane for a U-turn).

- The estimated cost for Combination Alternative 3N/4N Modified-20' Median (60 MPH) was:

	Right of Way	$ 8.8 M
$56.6 M	Engineering & Construction	
	TOTAL (1997 $)	$65.4 M

◆ **DECISION:** ***Combination Alternative 3N/4N Modified - 20' Median*** *is not preferred because it would have resulted in difficult left turns at cross streets and U-turns.*

Combination Alternative 3N/4N - 34' Median (60 MPH) is preferred over Combination Alternative 3N/4N Modified-20' Median: *please see text at the end of Section II.D.9. in this document for explanation.*

◆ **Summary of Combination Alternative 3N/4N Modified - 34' Median (60 MPH):**

- **Except for the 34-foot wide median, all other features of Combination Alternative 3N/4N Modified-34' Median (60 MPH) would have been identical to the previously described Combination Alternative 3N/4N Modified-20' Median (60 MPH).**

- The entire 34 foot median would have been available as a recovery area for vehicles that leave the roadway toward the center. A minimum recovery area suggested by FHWA roadside design guidelines is 30 feet.

- The estimated cost for Combination Alternative 3N/4N Modified-34' Median (60 MPH) was:

Right of Way	$ 9.8 M
Engineering & Construction	$57.0 M
TOTAL (1997 $)	$66.8 M

◆ **DECISION:** ***Combination Alternative 3N/4N Modified - 34' Median is preferred:*** *This alternative includes a four-lane cross-section with a 34-foot median. Reduced median widths and roadside grading will be used as appropriate to minimize impacts to environmentally sensitive areas. The four-lane cross section provides an additional travel lane*

in each direction for the entire project length in order to permit traffic to safely pass slower moving vehicles (including farm equipment). This alternative also has an overwhelming amount of public support. The 34-foot median provides more room for all vehicles at the intersections and greater amount of recovery area for vehicles in areas where impacts are not too significant. The cross-section provides continuity throughout the entire US 113 corridor.

Combination Alterative 3N/4N Modified - 34' Median is preferred over the 3N Alternatives for the following reasons:

- *It would cause less impacts to historic resources. Alternative 3N requires taking right-of-way from three National Register Eligible historic sites while the Preferred Alternative would cause adverse effect to only one property due to changes in visual setting in front of the St. Martin's Church.*

- *The Preferred Alternative would cause less impacts to homes and businesses than Alterative 3N which would displace 24 homes and 6 businesses. The Preferred Alternative would require taking 15 homes and 4 businesses.*

- *Alternative 3N would cause more impacts to floodplains (8.5 acres) than the Preferred Alternative (2.6 acres).*

The Preferred Alternative does, however, require more impacts to wetlands. Considering a balance between these safety issues and the impacts to socio-economic and natural environmental resources within the study area, the study team preferred Combination Alternative 3N/4N Modified-34' Median study area with modifications in sensitive areas to reduce wetland impacts.

Alterative 3N/4N Modified -34' Median is preferred over the 4N Modified Alternatives for the following reasons:

- *It would cause less impacts to wetlands than Alternative 4N Modified, since it would follow the existing road alignment north of Shingle Landing Road, thus avoiding crossing a large wetland area crossed by Alternative 4 Modified.*

- *The Preferred Alternative would be less costly than the 4N Modified Alternatives.*

E. Preferred Alternatives

1. Introduction

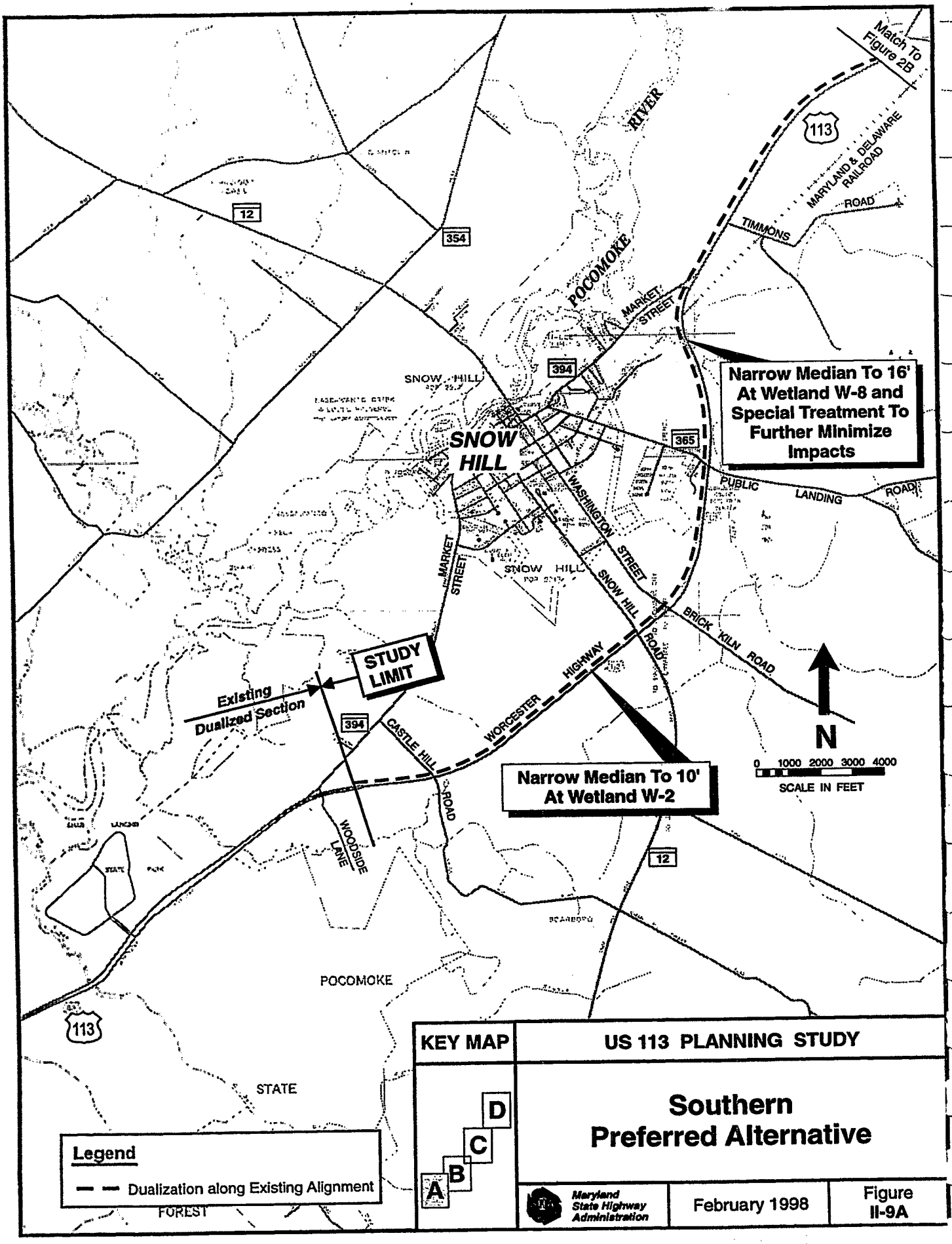
The Preferred Alternatives for the southern and northern study areas generally each consist of a dual highway with a 34' wide median and 20' of roadside safety grading including the paved shoulder. In sensitive environmental areas, both the median width and width of roadside grading will be reduced where feasible. The median width of typically 34' is preferred because of the separation afforded to opposite directions of traffic as well as the ability to "shadow" (i.e., shelter) turning and cross traffic automobiles and small trucks at intersection cross-overs. In addition, the 34' wide median will consist of two paved shoulders each 4-feet in width and 26 feet of grass - a substantial reduction in impervious areas in comparison to the narrower and paved medians evaluated in the **Draft EIS/Section 4(f) Evaluation.** Double faced W-beam guardrail will typically be placed within the center of this grass median to positively separate vehicles along the opposite direction roadways.

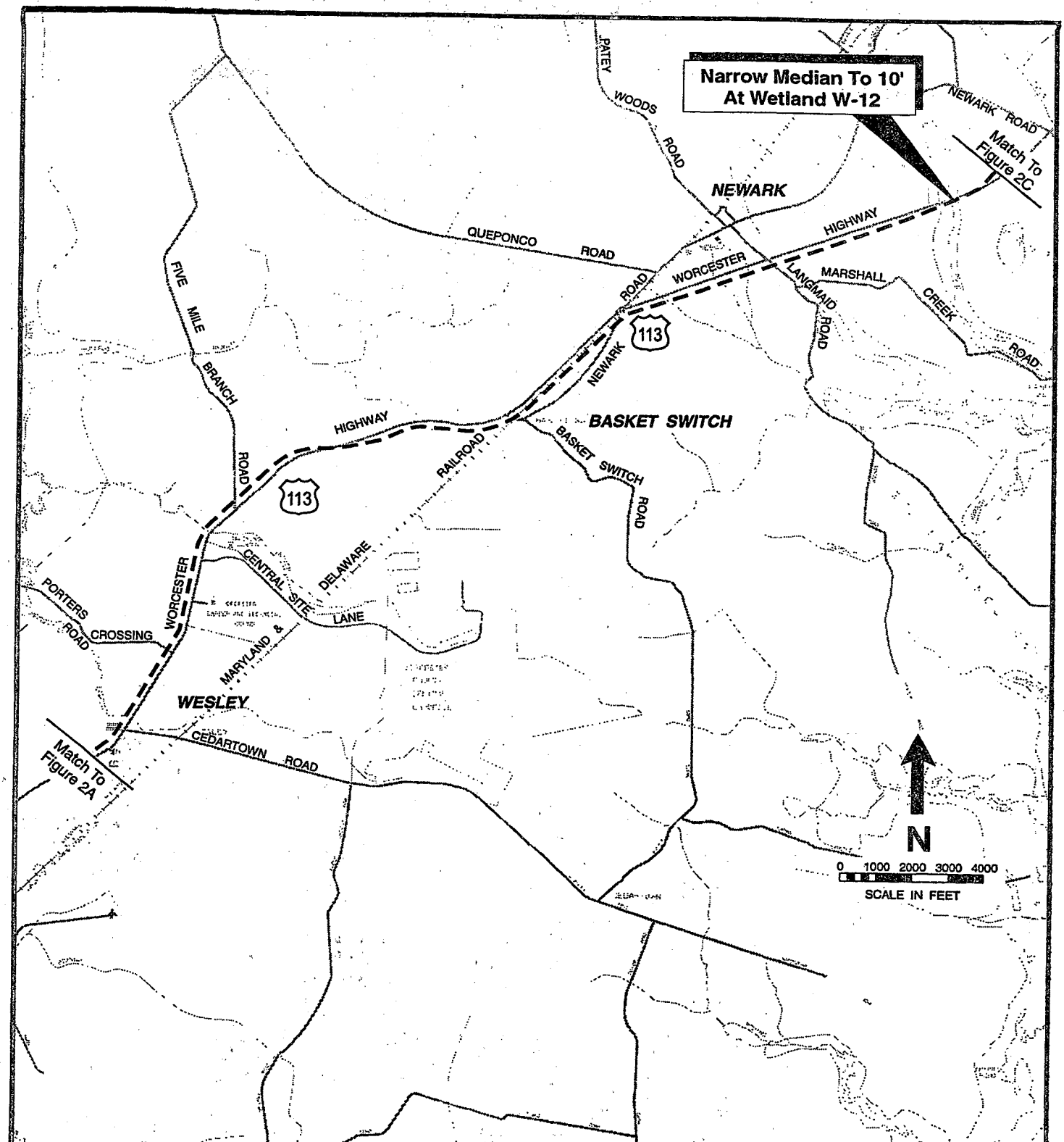
Working closely with Worcester County representatives, Maryland SHA has developed an access management strategy for both the southern and northern study areas. In the south, access management will be primarily directed to monitoring future development and requiring that all property being redeveloped may only access US 113 via public roads. In the north, between Deer Park Road and Shingle Landing Road/Peerless Road, the Preferred Alternative is entirely on new location - and access will be fully controlled except at the intersections with old US 113 near Deer Park Drive/Three Penny Lane; Cary Road; old US 113 south of Racetrack Road; Racetrack Road; old US 113 north of Racetrack Road; and Shingle Landing Road/Peerless Road. Between Shingle Landing Road/Peerless Road and the Delaware state line, access management will be primarily directed to monitoring future development and requiring that all property being redeveloped may only access US 113 via public roads. In addition, the Preferred Alternative includes some frontage roads to serve existing development adjacent to the new roadway.

2. Southern Preferred Alternative

◆ Overview

Except where modified by reduced median width and/or roadside grading widths in sensitive wetland areas, the Southern Preferred Alternative ***is essentially Draft EIS/Section 4(f) Evaluation Alternative 3S-34' Median (60 MPH).*** The Southern Preferred Alternative consists primarily of the construction of a new two-lane roadway adjacent to the existing facility and the retention of the existing two-lane roadway as either the northbound or southbound roadway to the extent possible. The Southern Preferred Alternative primarily uses existing right-of-way. Shown graphically on Figures II-9A, -9B, and -9C, the detailed 1" = 400' scale mapping for the Southern Preferred Alternative is presented in Appendix A, Figures 1 through 7.

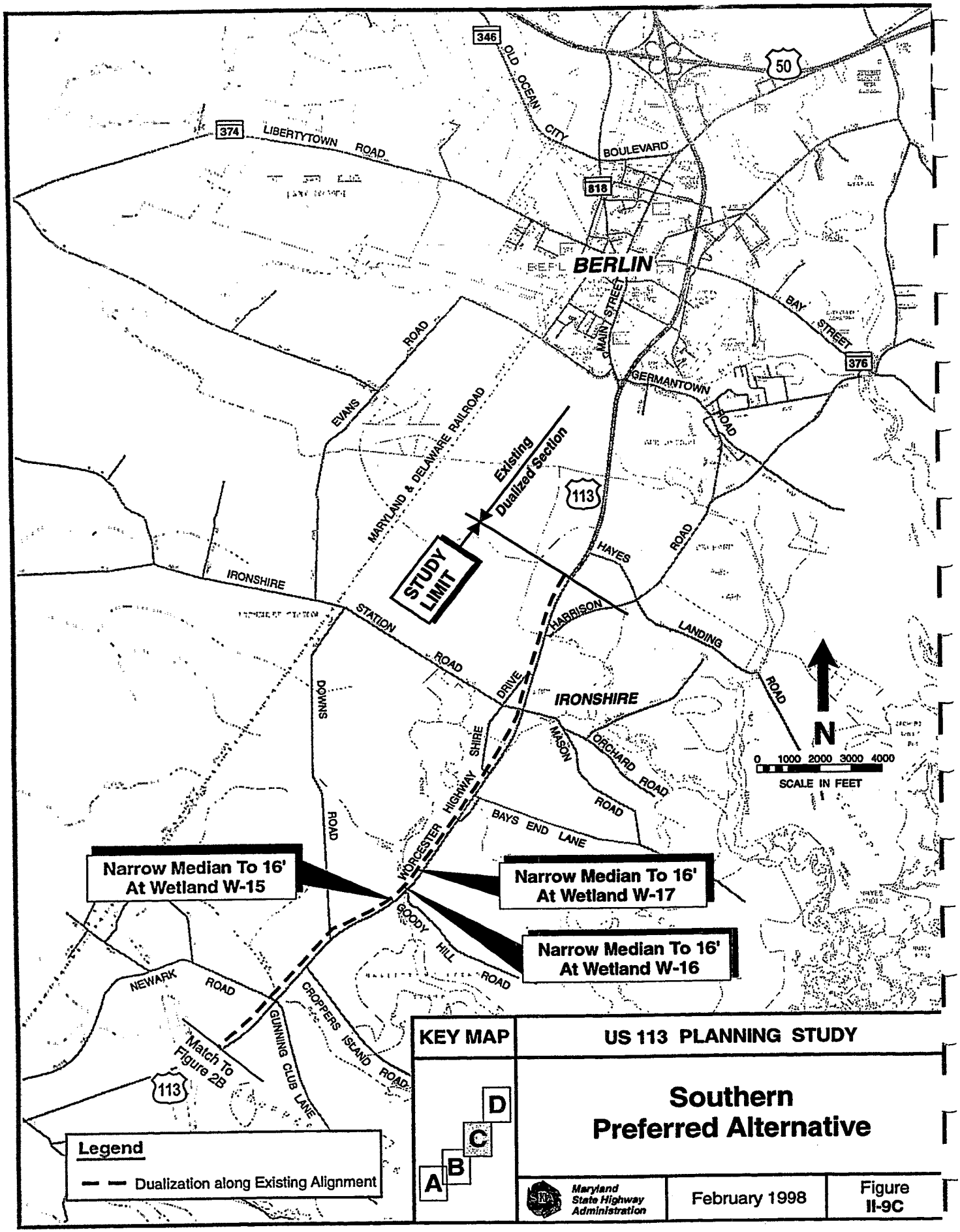

Match To Figure 2B
113
MARYLAND & DELAWARE RAILROAD
ROAD
TIMMONS
RIVER
POCOMOKE
MARKET STREET
12
354
394
SNOW HILL
SNOW HILL
365
Narrow Median To 16' At Wetland W-8 and Special Treatment To Further Minimize Impacts
PUBLIC LANDING ROAD
WASHINGTON STREET
MARKET STREET
SNOW HILL
SNOW HILL ROAD
BRICK KILN ROAD
STUDY LIMIT
Existing Dualized Section
394
CASTLE HILL ROAD
WORCESTER HIGHWAY
Narrow Median To 10' At Wetland W-2
N
0 1000 2000 3000 4000
SCALE IN FEET
WOODSIDE LANE
12
POCOMOKE
113
STATE
FOREST
Legend
Dualization along Existing Alignment
KEY MAP
A
B
C
D
US 113 PLANNING STUDY
Southern Preferred Alternative
Maryland State Highway Administration
February 1998
Figure II-9A

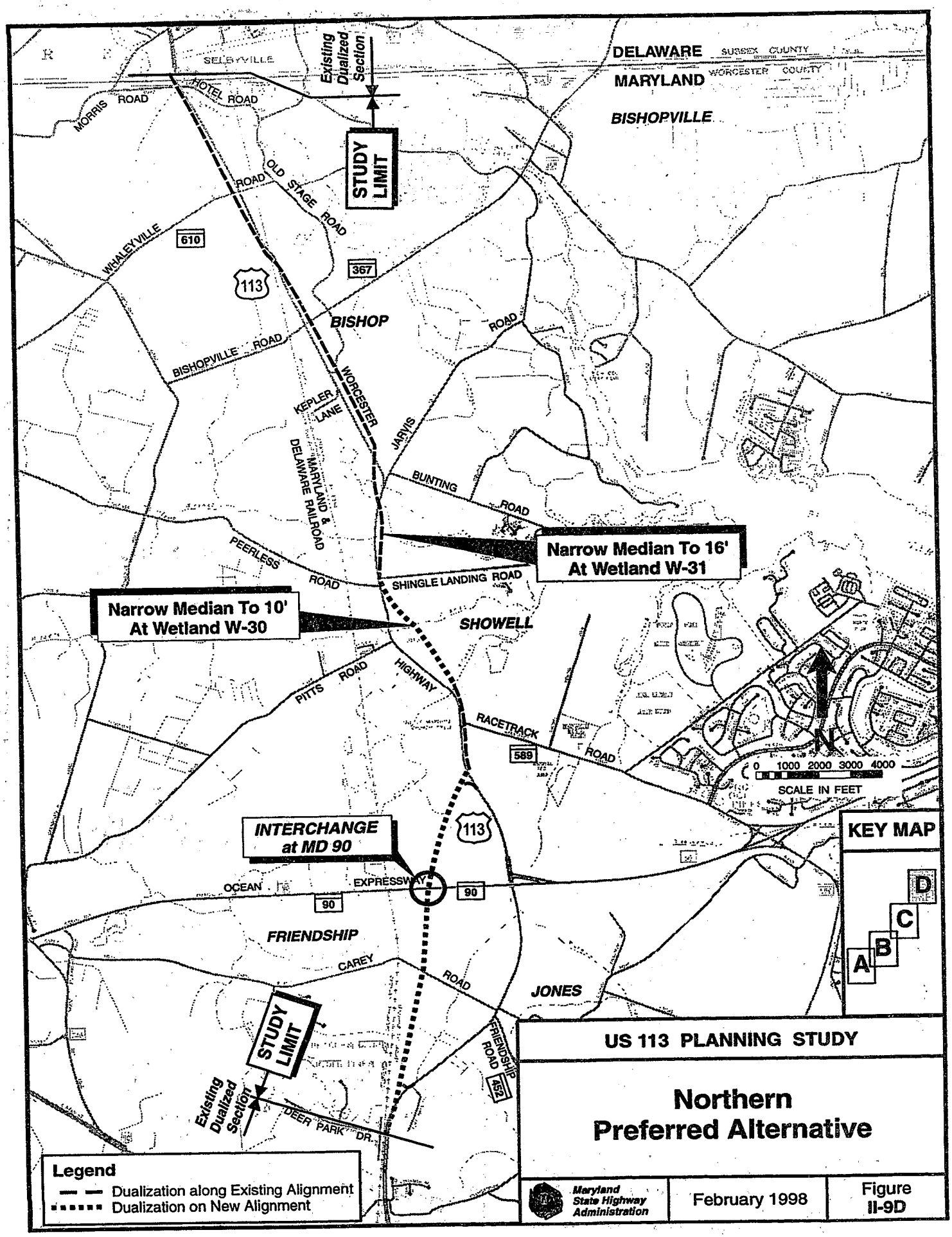


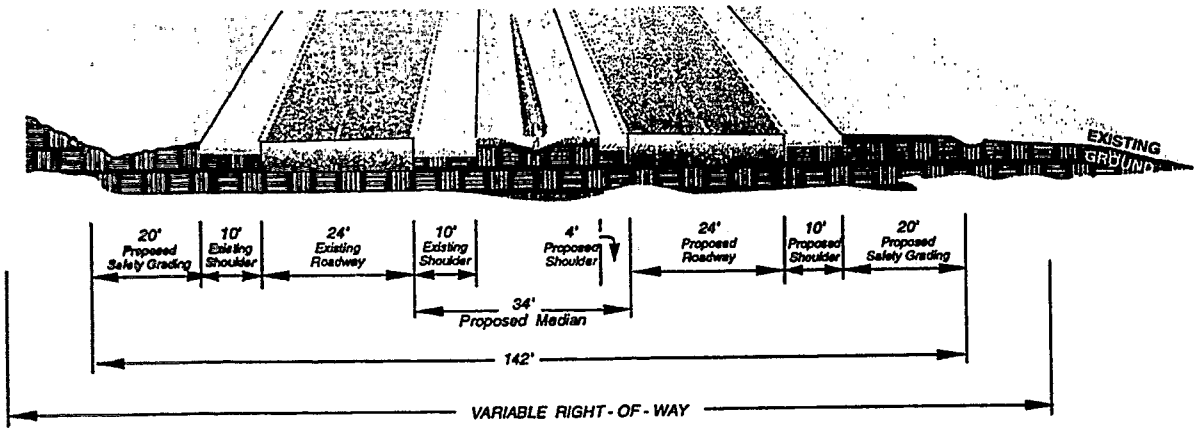
Legend

— — Dualization along Existing Alignment

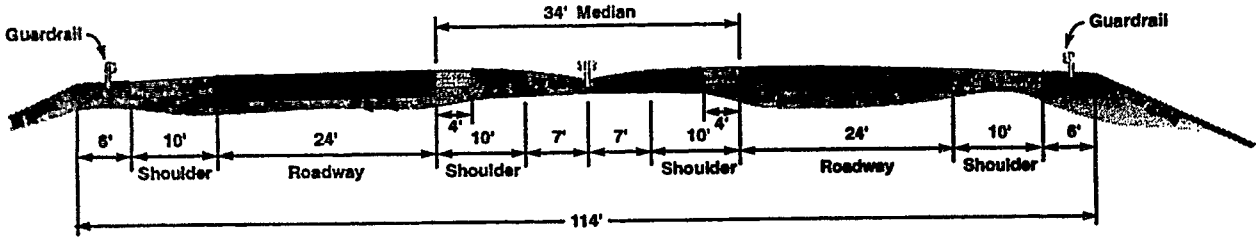
KEY MAP	US 113 PLANNING STUDY	
A B C D	**Southern Preferred Alternative**	
	Maryland State Highway Administration	February 1998	Figure II-9B


346
OLD OCEAN CITY BOULEVARD
50
374
LIBERTYTOWN ROAD
818
BERLIN
MAIN STREET
BAY STREET
376
GERMANTOWN ROAD
EVANS ROAD
MARYLAND & DELAWARE RAILROAD
Existing Dualized Section
113
STUDY LIMIT
HAYES ROAD
IRONSHIRE
STATION ROAD
HARRISON DRIVE
LANDING ROAD
DOWNS ROAD
IRONSHIRE
MASON ROAD
ORCHARD ROAD
WORCESTER HIGHWAY
SHIRE
BAYS END LANE
N
0 1000 2000 3000 4000
SCALE IN FEET
Narrow Median To 16' At Wetland W-15
Narrow Median To 16' At Wetland W-17
Narrow Median To 16' At Wetland W-16
GOODY HILL ROAD
NEWARK ROAD
CROPPERS ISLAND ROAD
GUNNING CLUB LANE
Match To Figure 2B
113
Legend
Dualization along Existing Alignment
KEY MAP
A
B
C
D
US 113 PLANNING STUDY
Southern Preferred Alternative
Maryland State Highway Administration
February 1998
Figure II-9C

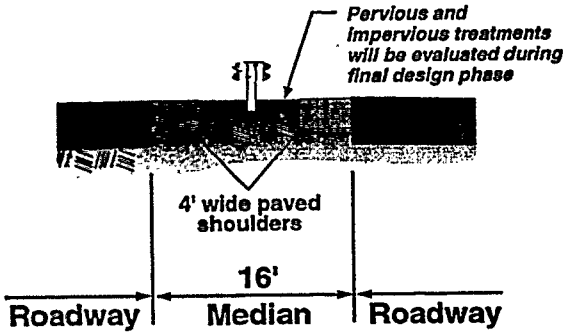

DELAWARE
SUSSEX COUNTY
MARYLAND
WORCESTER COUNTY
BISHOPVILLE
SELBYVILLE
Existing Dualized Section
STUDY LIMIT
MORRIS ROAD
HOTEL ROAD
OLD STAGE ROAD
WHALEYVILLE ROAD
610
367
113
BISHOP
BISHOPVILLE ROAD
WORCESTER ROAD
KEPLER LANE
JARVIS
MARYLAND & DELAWARE RAILROAD
BUNTING ROAD
PEERLESS ROAD
SHINGLE LANDING ROAD
Narrow Median To 16' At Wetland W-31
Narrow Median To 10' At Wetland W-30
SHOWELL
PITTS ROAD
HIGHWAY
RACETRACK ROAD
589
N
0 1000 2000 3000 4000
SCALE IN FEET
KEY MAP
A
B
C
D
INTERCHANGE at MD 90
OCEAN EXPRESSWAY
90
FRIENDSHIP
CAREY ROAD
JONES
FRIENDSHIP ROAD
452
DEER PARK DR.
Legend
Dualization along Existing Alignment
Dualization on New Alignment
US 113 PLANNING STUDY
Northern Preferred Alternative
Maryland State Highway Administration
February 1998
Figure II-9D



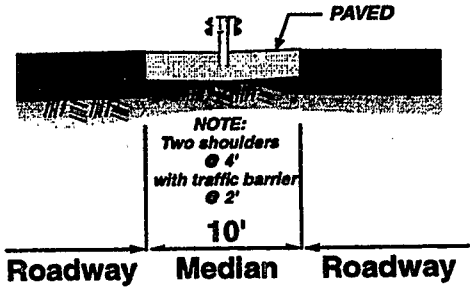
NORMAL TYPICAL SECTION
DUALIZATION ALONG EXISTING US 113



REDUCED TYPICAL SECTION AT SENSITIVE AREAS
DUALIZATION ALONG EXISTING US 113
(See 16' and 10' median options below)



SPECIAL 16' MEDIAN
AT WETLANDS W-8, W-15, W-16, AND W-17



SPECIAL 10' MEDIAN
AT WETLANDS W-2 AND W-12

The dimensions shown are for the purpose of determining cost estimates and environmental impacts and are subject to change during the final design phase.

US 113 PLANNING STUDY		
Typical Sections **Southern Preferred Alternative**		
Maryland State Highway Administration	February 1998	Figure II-10

◆ **Detailed Description**

The typical roadway section for the Southern Preferred Alternative consists of two 12-foot travel lanes in each direction, a 34-foot wide median, 10-foot outside shoulders, and 20-feet of road side grading where appropriate. Typical sections are shown on Figure II-10. The Southern Preferred Alternative will be designed for a 60 MPH design speed.

Beginning at the south, the dualization for the Southern Preferred Alternative begins as an extension of the existing dualized US 113, approximately 450 feet east of Market Street (MD 394) and Woodside Lane intersection. Through the first curve, the median transitions from a width of 75-feet ± to the proposed 34' median section, and shifts the alignment to the west of the existing roadway. Approximately 2,300 feet of mainline roadway up to 800' south of Castle Hill Road would be reconstructed.

Continuing north, the new roadway will be constructed parallel to the existing roadway to the west, utilizing approximately 5.1 miles of existing US 113 as the northbound roadway. This section of the Southern Preferred Alternative intersects with Castle Hill Road, Snow Hill Road (MD 12), Washington Street/Brick Kiln Road, and Public Landing Road (MD 365), and passes over Purnell Branch, intersects with the Maryland and Delaware Railroad, Market Street (MD 394N) and Timmons Road. Approximately 600 linear feet of southbound Market Street will be reconstructed to meet the proposed dualized roadway. No substantive change in the cross street vertical alignments are planned. As shown in Appendix A, Figures 1, 2 and 3, the majority of the right-of-way for this dualization is already owned by SHA.

Special mitigation measures are included in the Southern Preferred Alternative for sensitive wetlands crossings. For a detailed description of avoidance and minimization alternatives considered for each wetland, please refer to Chapter IV, Section I of this Document.

Wetland W-1 (Sta. 1043±)

- Use 2:1 side slopes with guardrail along new southbound roadway to reduce fill in wetland.

Wetland W-2 (Sta. 1099±)

- Transition southbound roadway to reduce median width to 10-feet (paved, with guardrail).
- Use 2:1 side slopes with guardrail along new southbound roadway to reduce fill in wetland.

Wetland 3 (Sta. 1113±)

- Use 2:1 side slopes with guardrail along new southbound roadway to reduce fill in wetland.

Wetland 5 (Sta. 1148±)

- Use 2:1 side slopes with guardrail along new southbound roadway to reduce fill in wetland.

Wetland 5A (Sta. 1171±)

- Use 2:1 side slopes with guardrail along new southbound roadway to reduce fill in wetland.

Wetland 6 (Sta. 1186±)

- Use 2:1 side slopes with guardrail along new southbound roadway to reduce fill in wetland.

Wetlands W-8 @ Purnell Branch (Sta. 1221±)

- Transition southbound roadway to reduce median width to 16-feet (accommodating two paved shoulders each 4-feet in width with guardrail in center of remaining 8-feet (during final design, both pervious and impervious treatments will be evaluated for this 8-foot area) see Figure II-10).

- Place 815± linear feet of epoxy coated sheet pile wall along southbound roadway to reduce fill in wetland.

The Southern Preferred Alternative then curves to the east, 3,600 feet north of Timmons Road, passing to the south of Snow Hill Mennonite Church, and slightly improving the horizontal alignment. Approximately 2,200 linear feet of mainline will be reconstructed to flatten the curve at this location.

Continuing in a northeasterly direction to 1,300 feet south of Cedartown Road, the Southern Preferred Alternative parallels the existing roadway to the west, utilizing approximately 1,300 feet of existing US 113 as the northbound roadway. The Southern Preferred Alternative then curves to the north, intersecting with Cedartown Road. To reduce the horizontal curve, approximately 1,400 linear feet of mainline will be reconstructed up to Cedartown Road.

Continuing in an northeasterly direction, the Southern Preferred Alternative parallels the existing roadway on the west, utilizing approximately 8,800 feet of existing roadway as northbound US 113. This section of the Southern Preferred Alternative crosses over both Poorhouse Branch and Five Mile Branch, and intersects with Porters Crossing Road, Central Site Lane and Five Mile Branch Road. Approximately 200 linear feet of Five Mile Branch Road will be reconstructed to improve its intersection with US 113.

Special mitigation measures are included in the Southern Preferred Alternative for sensitive wetlands crossings. For a detailed description of avoidance and minimization alternatives considered for each wetland, please refer to Chapter IV, Section I of this Document.

Wetland W-9 @ Poorhouse Branch (Sta. 1352±)

- Use 2:1 side slopes with guardrail along new southbound roadway to reduce fill in wetland.

Wetland W-10 @ Five Mile Branch (Sta. 1412±)

- Use 2:1 side slopes with guardrail along new southbound roadway to reduce fill in wetland.

The Southern Preferred Alternative then curves to the east and transitions from the west side to the east side of the existing US 113 roadway. To accomplish this transition, approximately 1,600 linear feet of the existing roadway would be reconstructed.

Continuing in an easterly then northeasterly direction, the Southern Preferred Alternative parallels the existing roadway to the east, utilizing approximately 4.45 miles of existing roadway as southbound US 113. This section of the Southern Preferred Alternative intersects with Basket Switch Road, Newark Road, the Maryland and Delaware Railroad tracks, Langmaid Road, Newark Road/Gunning Club Lane, and passes over Massey Branch and Porter Creek. Approximately 300 feet of the east side of Newark Road at the Maryland and Delaware Railroad crossing will be reconstructed, providing improved intersection sight distance and improving the horizontal alignment of Newark Road.

Special mitigation measures are included in the Southern Preferred Alternative for sensitive wetlands crossings. For a detailed description of avoidance and minimization alternatives considered for each wetland, please refer to Chapter IV, Section I of this Document.

Wetland W-11 @ Marshall Creek (Sta. 1578±)

- Use 2:1 side slopes with guardrail along new northbound roadway to reduce fill in wetland.

Wetland W-12 @ Massey Branch (Sta. 1643±)

- Transition northbound roadway to reduce median width to 10-feet (paved, with guardrail).
- Use 2:1 side slopes with guardrail along new northbound roadway to reduce fill in wetland.

Wetland 13@ Porters Creek (Sta. 1685±)

- Use 2:1 side slopes with guardrail along new northbound roadway to reduce fill in wetland.

Continuing in a northeasterly direction, the Southern Preferred Alternative transitions from the east side to the west side of the existing roadway between Gunning Club Lane and Croppers Island Road. Approximately 800 linear feet of mainline would be reconstructed to flatten the curve at this location.

The Southern Preferred Alternative continues in a northeasterly direction, paralleling the existing roadway to the west, utilizing approximately 3.6 miles of existing US 113 as the northbound roadway. This section of the Southern Preferred Alternative intersects with Croppers Island Road, Downs Road, relocated Goody Hill Road (existing intersection with US 113 closed; 2,400± LF of new frontage road to new intersection with US 113 near station

1756±), Bays End Lane, both ends of Shire Drive, Ironshire Station/Mason Road and Harrison Road, and crosses over Goody Hill Branch and Poplartown Branch. The Southern Preferred Alternative meets the existing dualized US 113 at Hayes Landing Road.

Special mitigation measures are included in the Southern Preferred Alternative for sensitive wetlands crossings. For a detailed description of avoidance and minimization alternatives considered for each wetland, please refer to Chapter IV, Section I of this Document.

Wetlands W-15, 16 and 17 @ Goody Hill Branch (Sta. 1740±)

- Transition southbound roadway to reduce median width to 16-feet (accommodating two paved shoulders each 4-feet in width with guardrail in center of remaining 8-feet (during final design, both pervious and impervious treatments will be evaluated for this 8-foot area) see Figure II-10).
- Close Goody Hill Road intersection with US 113 and construct 2,400± linear feet of frontage road along east side of US 113 to connect with US 113 near Station 1756±.
- Use 2:1 side slopes with guardrail along new southbound roadway to reduce fill in wetland.

Wetland W-18 @ Catbird Creek (Sta. 1775±)

- Use 2:1 side slopes with guardrail along new southbound roadway to reduce fill in wetland.

Wetland W-22 @ Popularlown Branch (Sta. 1833±)

- Use 2:1 side slopes with guardrail along new southbound roadway to reduce fill in wetland.

◆ **Summary of Southern Preferred Alternative:**

- The Southern Preferred Alternative is typically adjacent to the existing two-lane US 113; shifts occur so as to avoid/minimize displacements and impacts to sensitive environmental features (streams and wetlands). The existing pavement section will be utilized for either the northbound or southbound lanes. Two travel lanes will be provided per direction.
- Design Speed is 60 mph.
- The typical median width provides 4 feet of paved and 12 feet of grass recovery area for vehicles that leave the roadway toward the center. At the crossing of Purnell Branch (Wetland W-8), a narrower 16-foot wide median and an epoxy coated sheet pile wall will be provided along the west side of the roadway to minimize wetland impacts. At Wetlands W-15, W-16 and W-17, a 16-foot wide median is also provided. At Wetlands W-2 and W-12, the median further narrows to paved 10-feet, also to minimize wetland impacts.

- The paved outside shoulders are 10-feet wide and 20-feet of safety grading will be provided. In sensitive areas (such as a wetland or stream crossing), guardrail will be provided in place of the roadside grading to minimize impacts.

- Left turn lanes and median breaks are provided at the following intersections:

  - Castle Hill Road
  - Snow Hill Road (MD 12)
  - Brick Kiln Road/Washington Street
  - Public Landing Road (MD 365)
  - Market Street (MD 394N) (T intersection)
  - Timmons Road (T intersection)
  - Cedartown Road (T intersection)
  - Porters Crossing Road (T intersection)
  - Central Site Lane (T intersection)
  - Five Mile Branch Road (T intersection)
  - Basket Switch Road (T intersection)
  - Newark Road
  - Langmaid Road
  - Gunning Club Lane/Newark Road
  - Croppers Island Road (T intersection)
  - Downes Road (T intersection)
  - relocated Goody Hill Road (T intersection)
  - Bays End Lane (T intersection)
  - Shire Road (south) T intersection)
  - Mason Road/Ironshire Station Road
  - Shire Road (north) (T intersection)

- Driveways and minor service roads will be provided with a right-in/right-out only.

- Drivers from driveways that need to access the other side of the road will have to turn right and travel to the nearest intersection to make a U-turn (i.e., a driver entering US 113 from a driveway on the northbound side of the road that wants to travel southbound would turn right heading northbound, go to the next intersection, and use the left turn lane for a U-turn).

- The estimated cost for the Southern Preferred Alternative is:

1.	Right of Way	$ 1.4 M
2.	Engineering	$ 3.7 M
3.	Construction	$61.5M
	TOTAL (1997 $)	$66.6 M

3. Northern Preferred Alternative

◆ Overview

Except where modified by reduced median width and/or roadside grading widths in sensitive wetland areas, and a minor realignment in the vicinity of Racetrack Road/Wetland W-28, the Northern Preferred Alternative ***is essentially DRAFT EIS/Section 4(F) Evaluation Combination Alternative 3N/4N Modified - 34' Median (60 MPH).*** The Northern Preferred Alternative constructs a new 4-lane divided highway in new location from north of US 50 north to the previously graded interchange at MD 90, then across US 113 near MD 586 (Racetrack Road) before bypassing the town of Showell to the east. The Northern Preferred Alternative then ties back into existing US 113 just north of Shingle Landing Road/Peerless Road, and follows existing US 113 to the northern project terminus at the Delaware state line. Shown graphically on Figure II-9D, the detailed 1" = 400' scale mapping for the Northern Preferred Alternative is presented in Appendix A, Figures 8 through 10.

◆ Detailed Description

The typical roadway section for the Northern Preferred Alternative consists of two 12-foot travel lanes in each direction, a 34-foot wide median, 10-foot outside shoulders, and 20-feet of roadside grading where appropriate. Typical sections are shown on Figure II-11. The Northern Preferred Alternative will be designed for a 60 MPH design speed.

Beginning as an extension of existing dualized US 113, approximately 0.8 mile north of US 50, near Deer Park Drive, the Northern Preferred Alternative leaves existing US 113 on a curve and heads in a northerly direction on the west side of the existing roadway in the Friendship area. The existing 110-foot median along the currently dualized portion of US 113 transitions to the proposed 34' wide median prior to Wetland W-23 (in order to minimize impacts at this wetland, approximately 1,800 LF of the existing northbound US 113 roadway would be removed). Existing US 113 north of the Northern Preferred Alternative will be relocated at a new "T" intersection, in order to provide access along old US 113 to the north.

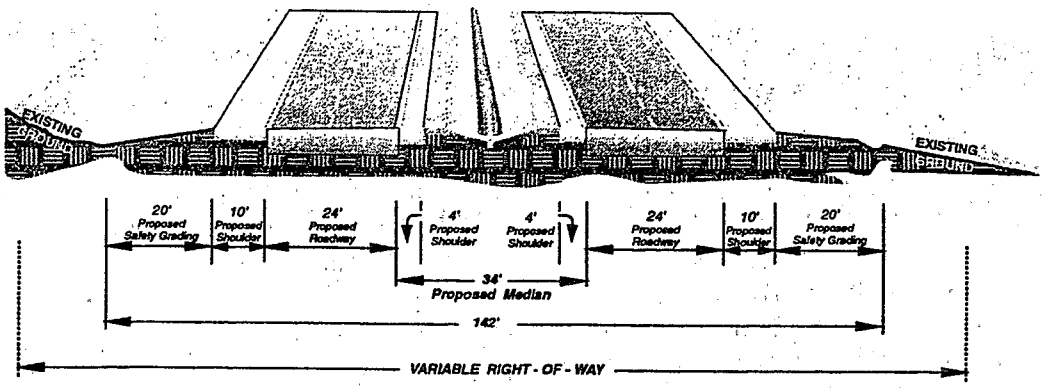
Special mitigation measures are included in the Northern Preferred Alternative for sensitive wetlands crossings. For a detailed description of avoidance and minimization alternatives considered for each wetland, please refer to Chapter IV, Section I of this document.

Wetland W-23 (Sta. 2007±)

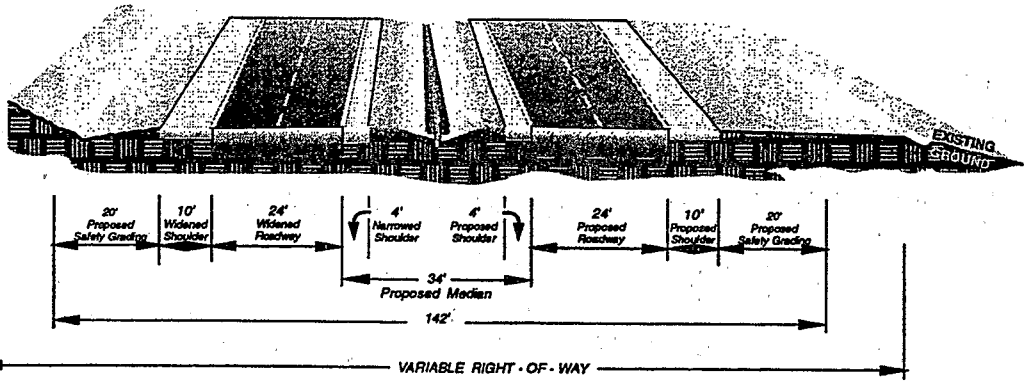
- Use 2:1 side slopes with guardrail along new southbound and northbound roadways to reduce fill in wetland.

Wetland W-26 (Sta. 2018±)

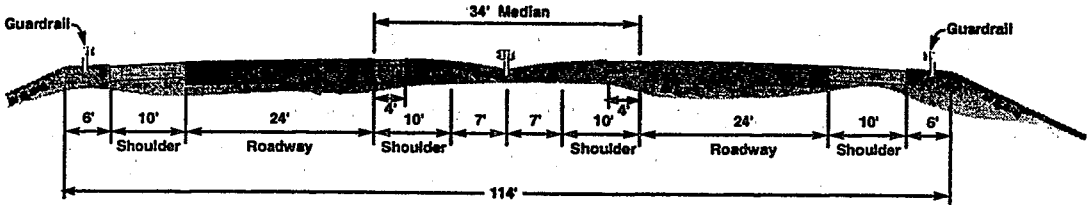
- Use 2:1 side slopes with guardrail along new southbound and northbound roadways to reduce fill in wetland.



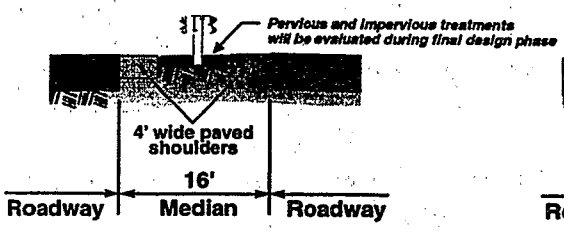
NORMAL TYPICAL SECTION
DUALIZATION ON NEW ALIGNMENT
(Deer Park Drive to Shingle Landing Road)



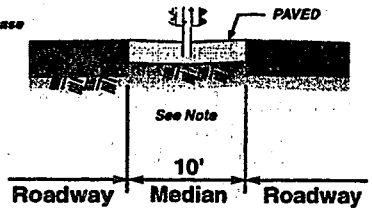
NORMAL TYPICAL SECTION
DUALIZATION ALONG EXISTING US113
(Shingle Landing Road to Delaware State Line)



REDUCED TYPICAL SECTION AT SENSITIVE AREAS
DUALIZATION ALONG EXISTING US 113 AND NEW ALIGNMENT
(See 16' and 10' median options below)



SPECIAL 16' MEDIAN
AT WETLANDS W-31



SPECIAL 10' MEDIAN
AT WETLAND W-30

NOTE:
Two shoulders @ 4'
with traffic barrier @ 2'

The dimensions shown are for the purpose of determining cost estimates and environmental impacts and are subject to change during the final design phase.

US 113 PLANNING STUDY

Typical Sections
Northern Preferred Alternative

Maryland State Highway Administration	February 1998	Figure II-11

Continuing in a northeasterly direction, the Northern Preferred Alternative crosses Carey Road approximately 0.5 mile west of existing US 113. No substantive changes in the horizontal or vertical geometry are planned for the Carey Road intersection (at some point in the future, an overpass may be considered at this intersection). The Northern Preferred Alternative then continues in a northerly direction through the graded area reserved for the previously planned US 113/MD 90 interchange and passes beneath existing MD 90, approximately 0.4 mile west of the existing US 113/MD 90 interchange. A full diamond interchange configuration is planned, with consideration for the addition of loop ramps in the future. No additional improvements are required for MD 90, and the existing bridge previously constructed will be used.

Special mitigation measures are included in the Northern Preferred Alternative for sensitive wetlands crossings. For a detailed description of avoidance and minimization alternatives considered for each wetland, please refer to Chapter IV, Section I of this document.

Wetland W-27 (Sta. 2065±)

- Use 2:1 side slopes with guardrail along new southbound and northbound roadways to reduce fill in wetland.

Continuing in a northerly direction, the Northern Preferred Alternative intersects existing US 113, approximately 0.8 mile north of MD 90. Existing US 113 north of MD 90 would be relocated to intersect with the Northern Preferred Alternative at a T intersection (existing US 113 north of this point would have access at Racetrack Road (MD 589)). The Northern Preferred Alternative then closely parallels the existing eastside of the US 113 roadway and intersects MD 589 (Racetrack Road). Horizontal improvements to the MD 589 intersection include the addition of a second left turn lane from southbound US 113 to eastbound MD 589. No substantive change in the MD 589 profile is planned.

Approximately 2.3 miles of existing US 113 will be retained as a local road through the communities of Jones and Friendship, serving several residences and businesses located along the existing roadway. The existing roadway ties into the relocated alignment approximately 0.3 mile north of Deer Park Drive and approximately 0.3 mile south of MD 589. The existing US 113/MD 90 interchange ramps will be removed.

From MD 589, the Northern Preferred Alternative follows existing US 113 adjacent to Old St. Martins Church (no property impacts) and across Church Branch, using a portion of the existing box culvert. The Northern Preferred Alternative then curves east and bypasses the town of Showell to the east. The Northern Preferred Alternative rejoins and parallels the existing roadway to the east for approximately 0.2 mile north of Shingle Landing Road. Horizontal improvements include the realignment of Shingle Landing Road and the extension of Peerless Road to create a four-legged intersection replacing the two existing T intersections. No substantive changes in the profiles of Shingle Landing Road or Peerless Road are planned.

Approximately 1.2 miles of existing US 113 is retained as a local road through the town of Showell, serving several residences and businesses located along the existing roadway. Existing US 113 ties into the relocated alignment north of Church Branch and just north of Shingle Landing Road/Peerless Road.

Special mitigation measures are included in the Northern Preferred Alternative for sensitive wetlands crossings. For a detailed description of avoidance and minimization alternatives considered for each wetland, please refer to Chapter IV, Section I of this document.

Wetland W-28 @ Church Branch (Sta. 2151±)

- Use 2:1 side slopes with guardrail along new southbound and northbound roadways to reduce fill in wetland.

- Retain, to the maximum extent possible, the existing culvert under US 113 at Church Branch.

Wetland W-29 (Sta. 2157±)

- Use 2:1 side slopes with guardrail along northbound roadways to reduce fill in wetland.

Wetland W-30 @ Middle Branch (Sta. 2176±)

- Transition southbound and northbound roadways to reduce median width to 10-feet (paved, with guardrail).

- Use 2:1 side slopes with guardrail along new southbound and northbound roadways to reduce fill in wetland.

The Northern Preferred Alternative continues on a tangent in a northerly direction leaving the existing roadway to the west, approximately 0.4 mile north of Shingle Landing Road to flatten a sharp horizontal curve in existing US 113 and returns to the existing alignment approximately 0.3 mile north of Jarvis Road. SHA's plans to reconfigure the existing intersection are compatible with the Northern Preferred Alternative.

Special mitigation measures are included in the Northern Preferred Alternative for sensitive wetlands crossings. For a detailed description of avoidance and minimization alternatives considered for each wetland, please refer to Chapter IV, Section I of this document.

Wetland W-31 @ Birch Branch (Sta. 2212±)

- Transition southbound and northbound roadways to reduce median width to 16-feet (accommodating two paved shoulders each 4-feet in width with guardrail in center of remaining 8-feet (during final design, both pervious and impervious treatments will be evaluated for this 8-foot area) see Figure II-11).

- Use 2:1 side slopes with guardrail along new northbound roadways to reduce fill in wetland.

The Northern Preferred Alternative then continues in a northwesterly direction, where the alignment parallels existing US 113 to the east crossing Kepler Lane and Old Stage Road, retaining approximately 0.8 mile of the existing roadway as southbound US 113. No improvements are planned for Kepler Lane and only minor adjustments in the horizontal and vertical geometry are planned for Old Stage Road. The Northern Preferred Alternative displaces one of the two existing warehouses south of Old Stage Road. Relocation of the existing Delmarva Veterinarian Hospital parking lot is planned north of the existing building.

Special mitigation measures are included in the Northern Preferred Alternative for sensitive wetlands crossings. For a detailed description of avoidance and minimization alternatives considered for each wetland, please refer to Chapter IV, Section I of this document.

Wetland W-36 (Sta. 2274±)

- Use 2:1 side slopes with guardrail along new northbound roadway to reduce fill in wetland.

The Northern Preferred Alternative continues in a northwesterly direction, crossing the Maryland and Delaware Railroad at approximately the same location as the existing US 113 crossing. The Northern Preferred Alternative eliminates the existing triple reversing curves and returns to the existing US 113 alignment approximately 300 feet south of MD 610 (Whaleyville Road). The Northern Preferred Alternative then continues in a northwesterly direction, paralleling the existing roadway to the west and crosses MD 610. No substantive changes in the MD 610 horizontal or vertical geometry are planned.

Special mitigation measures are included in the Northern Preferred Alternative for sensitive wetlands crossings. For a detailed description of avoidance and minimization alternatives considered for each wetland, please refer to Chapter IV, Section I of this document.

Wetland W-37 (Sta. 2325±)

- Use 2:1 side slopes with guardrail along southbound roadway to reduce fill in wetland.

Wetland W-40 (Sta. 2373±)

- Use 2:1 side slopes with guardrail along southbound roadway to reduce fill in wetland.

Continuing in a northwesterly direction, the Northern Preferred Alternative ties into the existing dualized roadway and ends at the Delaware state line, crossing Morris and Hotel roads. The proposed 34' wide median transitions to meet the existing 90-foot wide median in Delaware through the last horizontal curve. No substantive changes in the horizontal or vertical geometry are planned for Morris or Hotel roads.

◆ **Summary of Northern Preferred Alternative:**

- Two travel lanes are provided per direction.

- Design Speed is 60 mph.

- The typical median width provides 4 feet of paved and 12 feet of grass recovery area for vehicles that leave the roadway toward the center. At Wetland W-30, the dualized roadway will be separated by a 10-foot wide paved median to minimize impacts. At Wetland W-31, a median 16-feet wide in width will be provided.

- The paved outside shoulders are 10 feet wide and 20-feet of safety grading will be provided. In sensitive areas (such as a wetland or stream crossing), guardrail will be provided in place of the roadside grading to minimize impacts.

- Left turn lanes and median breaks are provided at the following intersections:

  - Old US 113 near Deer Park Drive (T intersection)
  - Carey Road
  - Eastbound MD 90 interchange ramps
  - Westbound MD 90 interchange ramps
  - Racetrack Road
  - Old US 113 north of Church Branch crossing
  - Shingle Landing Road/Peerless Road
  - relocated Jarvis Road (T intersection)
  - Bishopville Road (MD 367)
  - Whaleyville Road (MD 610)

- Access to the new location portions of this alternative will only be provided at public roads (i.e., no private driveways).

- Minor service roads (and driveways along portions of US 113 used for this alignment) are provided with a right-in/right-out only. Drivers from these driveways that need to access the other side of the road will have to turn right and travel to the nearest intersection to make a U-turn (i.e., a driver entering US 113 from a driveway on the northbound side of the road that wants to travel southbound would turn right heading northbound, go to the next intersection, and use the left turn lane for a U-turn).

- The estimated cost for the Northern Preferred Alternative is:

1.	Right of Way	$10.2 M
2.	Engineering	$ 3.2 M
3.	Construction	$51.9 M
	TOTAL (1997 $)	$65.3 M

III.
AFFECTED ENVIRONMENT

US 113 Planning Study
Snow Hill, Maryland to Delaware State Line

Office of Planning and Preliminary Engineering
Maryland State Highway Administration

III. AFFECTED ENVIRONMENT

The general setting within which the Draft EIS alternatives for improvements to US 113 were developed are described in this chapter. This information provides an inventory of the resources that may be affected by the Draft EIS alternatives and the Preferred Alternatives. The Draft EIS alternatives and the Preferred Alternatives as presented in Chapter II are anticipated to have a variety of direct and indirect impacts on the natural, manmade (built) and socioeconomic environments within the study area. The primary focus of this chapter is to provide a baseline condition against which to assess the location and magnitude of anticipated impacts. The environmental consequences of the Draft EIS alternatives and the Preferred Alternatives are presented in Chapter IV.

A. Social, Economic and Land Use

1. Social Environment

a. Population Characteristics

County

Statistical data regarding population demographics was gathered primarily from 1990 US Census data for the project area and Worcester County. An interview with Worcester County Planning Permits, and Inspections (WCPPI) office staff (Hagar, 1996) was conducted to ascertain additional information regarding the study area. The observations provided by WCPPI were then compared with 1990 US Census data and county planning documents and field verified along the US 113 corridor, as appropriate. The only incorporated areas in Worcester County are the towns of Berlin, Snow Hill, Ocean City and Pocomoke City, the latter two are located beyond the project limits.

At the time of the 1990 US Census, Worcester County had a population of 35,028. The estimated 1995 population for the county is 41,200 (US Census Bureau, 1996). Worcester County's population is projected to be approximately 46,000 by the year 2000; 58,000 by the year 2010; and 67,000 by the year 2020 (Hagar, 1997). The population growth will be primarily from the in-migration of people to the county. Population growth is expected to be driven by a continued increase in retirees, moving in from the Baltimore/Washington DC area, and residents who commute to jobs outside of the county. The recent population growth has not been evenly distributed throughout the county. The historical and projected population growth rates for the county are identified on Table III-1.

Table III-1: Worcester County Population Growth, 1940-2020

Decade	1940-50	1950-60	1960-70	1970-80	1980-90	1990-00	2000-10	2010-20
% Increase	8.9 %	2.5 %	2.9 %	26.4 %	13.4 %	23.6 %*	11.3 %*	6.6 %*

* Projected

Sources: Maryland State Data Center
1990 US Census
Maryland Office of Planning

Worcester County has a large number of seasonal residents. This is primarily due to the county's tourism industry, which generates seasonal employment opportunities and attracts vacationers to the county's Atlantic Ocean beaches and other area attractions. Identified on Table III-2 are the average daily seasonal population estimates in Ocean City for the months of January and August for the years 1980 and 1993 (the latest available figures). The daily summer population in Ocean City in the year 2000 is projected to be 345,400 (Ocean City Department of Planning and Community Development, 1994).

Table III-2: Average Daily Seasonal Population of Ocean City

Month	1980	1993	Percentage Change
January	11,500	80,000	+695 %
August	199,700	313,000	+156 %

Source: Ocean City Dept. Of Planning and Community Development

Census Tract and Election Districts

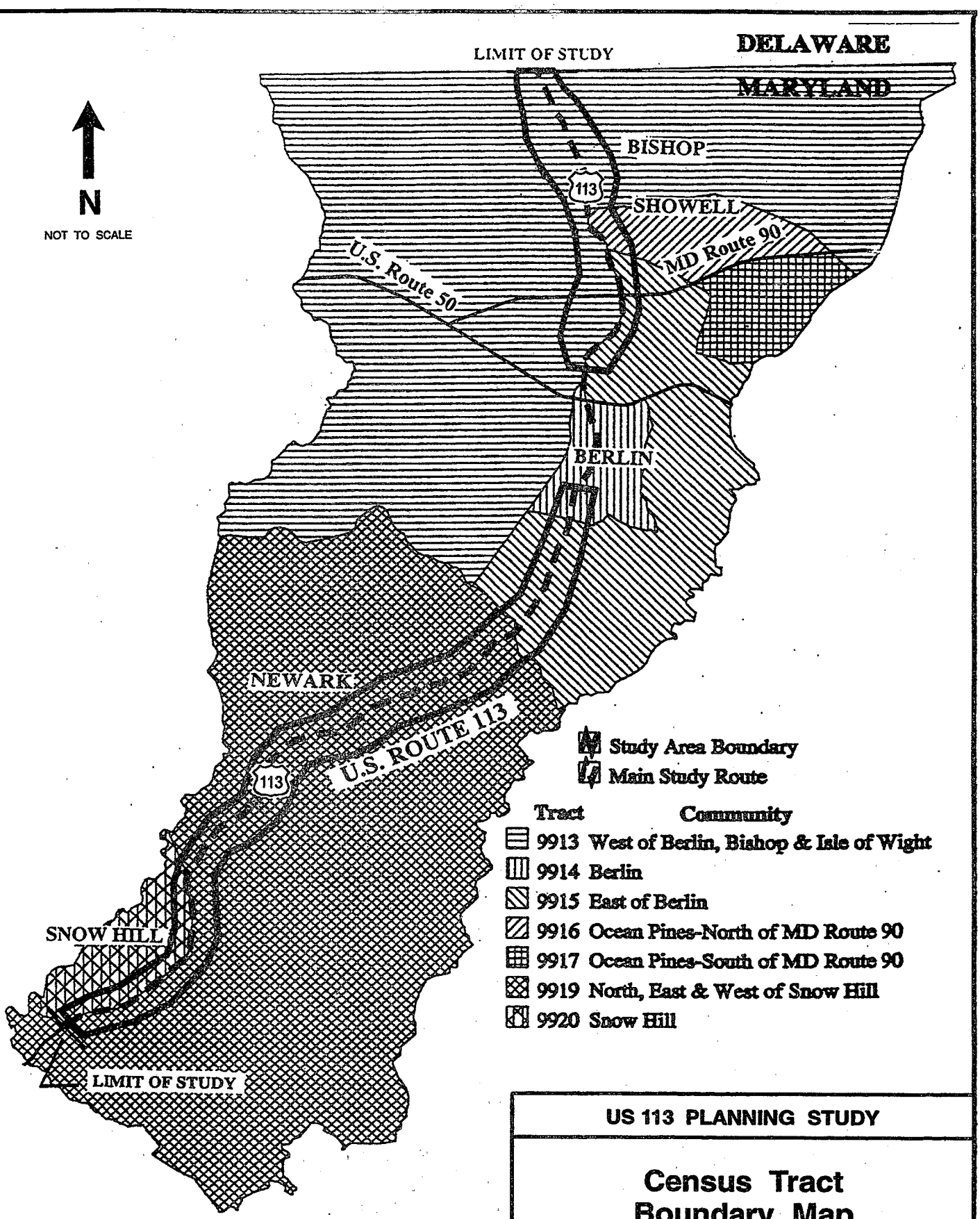
The boundaries for Worcester County census tracts are presented on Figure III-1. Typically, a census tract covers a geographic area which is similar in size to a municipality. Worcester County, however, consists primarily of non-incorporated land. Table III-3 shows the census tract information for the tracts located within the study area.

Table III-3: Worcester County Census Tract Population Information

Census Tract	9913	9914	9915	9916	9917	9919	9920
Population	3,709	3,409	1,759	2,609	1,781	2,780	2,777

Source: 1990 US Census

Local demographic information and population projections were gathered from planning documents published by Worcester County.



US 113 PLANNING STUDY

Census Tract Boundary Map

Maryland State Highway Administration | February 1998 | Figure III-1

Local population growth information is available based on election districts and is presented in Table III-4. A map showing the election districts at a scale comparable to the scale of this document was unavailable.

Table III-4: Local Population Growth by Election District in Worcester County, 1985 - 1995

1985-1995	Election District				
	Ocean City	Berlin	St. Martins	Newark	Snow Hill
Population Increase	2,925	1,985	486	265	296
Growth Rate	27.7 %	22.6 %	27.7 %	27.7 %	6.0 %

Source: Worcester County Planning Permits and Inspections Office

Election districts within the study area experienced an increase in population between 1985 and 1995. The greatest numerical increase in population occurred in the northeastern part of the county, namely Ocean City, Berlin and St. Martins. This is largely due to an influx of retirees into the communities in and around Ocean City and the development of suburban-style "bedroom communities" for residents who commute to jobs outside the county (i.e., southern Delaware and Salisbury, Wicomico County). The county is attractive due to inexpensive housing costs and a low cost of living.

Age Distribution

According to the WCPPI office, Worcester County has a higher number of older residents relative to most counties on the lower Eastern Shore, and a lower number of young adult residents. The high number of older residents is due to the large number of retirees who live full time in the communities in and around Ocean City. Many of these retirees are former government employees over age 55 who previously worked and lived in the Baltimore/Washington DC area. According to the 1990 US Census, 29.8 percent (6,383) of Worcester County residents are age 55 and older. Approximately 18.2 percent of the county residents are 65 years old or older. The low number of young adult residents is due to the lack of non-seasonal entry level employment opportunities within the county. Young adults who wish to pursue skilled positions or employment which requires a college education typically must move out of the county or work in neighboring counties and commute.

The age distribution in the study area census tracts is shown in Table III-5. According to the 1990 US Census, Census Tract 9916 had the highest percentage of people age 65 and over (21.7). Census Tract 9919 had the lowest percentage (14.2).

Table III-5: Age Distribution In Study Area Census Tracts

Age	Tract 9913		Tract 9914		Tract 9915		Tract 9916		Tract 9917		Tract 9919		Tract 9920	
<5	213	6%	279	8%	118	7%	168	6%	141	8%	173	6%	200	7%
5-13	398	11%	466	14%	219	12%	206	8%	214	12%	381	14%	322	12%
14-21	320	9%	276	8%	182	10%	173	7%	130	7%	252	9%	305	11%
22-44	1,340	36%	1,086	32%	617	35%	816	31%	622	35%	952	34%	923	33%
45-54	438	12%	310	95	196	11%	241	9%	160	9%	379	14%	282	10%
55-64	407	11%	299	9%	173	10%	437	17%	237	13%	248	9%	267	10%
65 + over	593	16%	693	20%	254	14%	568	22%	277	16%	396	14%	478	17%
TOTAL	3,709	100%	3,409	100%	1,759	100%	2,609	100%	1,781	100%	2,781	100%	2,777	100%

Source: 1990 US Census

Income

According to the WCPPI, low, middle and high income households are intermingled throughout the county, and there is no singular concentration of low or high income households. The 1990 median household income for the State of Maryland was $39,386, while it was $27,586 for Worcester County (Table III-6). The study area census tracts with the highest median household incomes are North Ocean Pines (tract 9916) and South Ocean Pines (tract 9917), with median household incomes of $40,740 and $36,884, respectively. The study area census tract with the lowest median household income is Berlin (tract 9914) with a median income of $21,835.

Table III-6 shows the percentage of persons under the US Department of Health and Human Services poverty level standard ($6,310 for one person) as of the 1990 census. Worcester County's rate of persons below poverty (11.0%) was higher than the state's rate (8.3%). Half of the census tracts (tracts 9914, 9915, 9919 and 9920) in the study area had a rate higher than the state. Only two tracts (tracts 9914 and 9915) in the study area had a higher rate that the Worcester County rate.

Table III-6: State, County, and Census Tract Economic Information

Category	MD	Worcester County	Tract 9913	Tract 9914	Tract 9915	Tract 9916	Tract 9917	Tract 9919	Tract 9920
Median Household Income ($1,000)	39.4	27.6	31.5	21.8	26.8	40.7	36.9	31.4	25.2
% Persons Under Poverty Level	8.3	11.0	7.3	17.6	15.1	2.6	4.6	10.2	10.3

Note: The annual poverty income standard for one person in 1989 was $6,310. As of March 10, 1997, the US Department of Health and Human Services annual poverty income standard for one person was $7,890.

Source: 1990 US Census

Racial Characteristics

The WCPPI office has indicated that the only sizable racial groups within the county are African-Americans and Caucasians. The African-American population (1,602 as of the 1990 census) is distributed throughout the county, and does not constitute a majority in any census tract (see Table III-7). According to the 1990 census, the racial breakdown for Worcester County was 21.2 percent African-American and 78.4 percent Caucasian, with other ethnic groups averaging less than 1 percent. The census tracts with the highest percentage of African-Americans were in the vicinity of Snow Hill (tract 9920) with 40.7 percent, and Berlin (tract 9914) with 43.4 percent. The census tracts with the lowest amount of African-American populations were located in Ocean Pines (tracts 9916 and 9917) with 1.1 percent and 1.6 percent, respectively. This grouping suggests that the African-American population is more prevalent in the established communities, primarily in the southern portion of the study area.

The only predominant minority community observed in the study area is located just south of Bishop adjacent to US 113 near Old Stage Road. The community consists of twelve houses inhabited by African-American residents.

Table III-7: Racial Population Characteristics

Category	MD	Worcester County	Tract 9913	Tract 9914	Tract 9915	Tract 9916	Tract 9917	Tract 9919	Tract 9920
	Percentage								
Caucasian	71.0	78.4	83.9	54.2	71.2	98.4	98.4	75.2	58.6
African-American	24.9	21.2	15.6	43.4	28.4	1.1	1.6	24.1	40.7
Other Minorities (American Indian, Eskimo, Aleut, and Asian or Pacific Islander)	4.1	0.4	0.5	2.3	0.4	0.5	0.0	0.8	0.7

Source: 1990 US Census

b. Environmental Justice

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations issued on February 11, 1994, requires federal agencies "to identify and address as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations..." Minority is defined as "individual(s) who are members of the following population groups: American Indian or Alaskan Native, Asian or Pacific Islander, Black, not of Hispanic origin, or Hispanic". Also, low income populations should be identified as the median income below the Department of Health and Human Services poverty guidelines. These populations are to be provided access to public information and an opportunity to participate in matters relating to the environment.

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

To identify minority and low income populations, a census tract analysis was first conducted. Census tract 9914 has the highest percentage of minorities (43.4) and the highest percentage of individuals (17.6) under the poverty level. Census tract 9920 has the second highest percentage of minorities (40.7) and 10.3 percent of the population under the poverty level. Census tract 9915 has the third highest percentage of minorities (28.4) and the second highest percentage of persons below the poverty level (15.1). Based on this analysis, it can be

generally concluded that the highest concentrations of the minority population and lower income groups are located in the older, established communities such as Berlin and Snow Hill, with the newer, more affluent communities such as Ocean Pines having fewer minority and lower income populations.

In a public outreach effort to supplement the census tract information, the SHA sent correspondence to area churches requesting their assistance in informing their members of the project and helping identify minority and low income concentrations in the project area. SHA also offered to meet with the churches to discuss the project.

c. Neighborhoods

The study area for the US 113 corridor is rural in nature with much of the land being used for agriculture. Within the project corridor are several communities and two urban centers. Ironshire, Basket Switch, and Wesley in the southern study area and Jones, Friendship, Showell and Bishop in the northern study area are small, predominantly residential crossroad communities located along US 113. One and two story single family detached houses are the dominant housing types in these communities. In Showell, there is a Perdue Chicken poultry processing facility and a hatchery. In Bishop, there are several neighborhood businesses, including two restaurants, a veterinarian hospital and a boat repair business. Other industries near Bishop include a poultry processing and feed mill operation and an asphalt plant.

Newark in the southern study area is the only community with village zoning. As a village, Newark displays the architectural and development history characteristics of the county. New development is to be carefully considered for its impact on the existing community character.

Ocean Pines, located east of study area, is a residential development. This private community, located along the central coastal bay area of the county, was opened in 1968. Current population at this development fluctuates between 8,200 residents during the winter months and 14,000 residents during the summer months. The community expects this population to increase to its capacity of 14,000 residents during the winter months and 20,000 to 22,000 residents during the summer months by the year 2008 (Gross, 1997). Some retail businesses and fueling stations are located near this community at the MD 589/MD 90 interchange.

Berlin and Snow Hill are the two urban centers in the US 113 corridor where most of the community facilities and services, and retail businesses in the US 113 study area are located. Residential densities range from low density single family units to high density, multi-family housing in these two towns. In addition, Snow Hill is the county seat for Worcester County. Many of the offices of the Federal, state and county governments are located here.

The Town of Ocean City, located east of the project area, is a popular tourist attraction with ten miles of public beaches along with amusements, lodging, restaurants and other entertainment and recreational opportunities. The resident population of this ocean resort is currently about 5,500 and is projected to increase to 7,550 by the year 2020. The resident and visitor populations combined swells to over 300,000 during the summer months. The Ocean City officials base their planning efforts to accommodate this larger combined resident and visitor population, which has been fairly stable since 1985 (Houston, 1997). Currently there are approximately 40,000 housing units in Ocean City. This includes owner occupied units, rental units, and hotel units (rooms). The City's Department Planning and Community Development consider a full build out situation to include approximately housing 48,800 units. The Ocean Pines, Cape Isle of Wight, St. Martin's Neck and West Ocean City are experiencing increases in residential and commercial development as land available for development in Ocean City becomes scarcer and more costly to develop.

There appears to be little pedestrian and bicycle activity in the study area outside of Berlin and Snow Hill. The View Trail 100 is a scenic bike route, which uses a network of rural county roads, and crosses US 113 just south of Newark.

d. Community Facilities and Services

A field visit to the study area and a review of Worcester County mapping were conducted to identify community facilities and services in the study area. Community facilities and services located in the study area are shown on Figures III-2A through 2D and discussed in greater detail in this section. Some of these facilities are located outside of the project limits but still serve the citizens of the area.

Places of Worship

There are numerous existing and planned places of worship within the study area. Temple Bat Yam (currently under construction), the Calvary Chapel and the future site of Trinity Charismatic Episcopal Church are located near the US 113/MD 90 interchange. The congregation of Trinity Charismatic Episcopal Church currently meets on Sundays at the Showell Elementary School. Friendship United Methodist Church is in the crossroad community of Jones. In the crossroad community of Showell is the Showell United Methodist Church. The St. Matthews Baptist Church and the Calvary Pentecostal Church. are located just north of Bishop. St. Martin's Church, located at the intersection of US 113 and MD 589 does not appear to have an active congregation, but is undergoing historic preservation. St. John Neumann Catholic Church is located to the east of the project area along MD 589, near Ocean Pines. In Newark there are two United Methodist Churches. The Snow Hill Mennonite Church is located along US 113 just north of Snow Hill. Located in Snow Hill are the Mt. Zion Baptist Church, Bates Methodist Church, Makemie Memorial

United Presbyterian Church, Snow Hill Church of God, Whatcoat Methodist Church and Snow Hill Christian Church. The location of these places of worship are shown on Figures III-2A through 2D.

e. Emergency Services

Law Enforcement

Barrack V of the Maryland State Police, located on US 50 just west of Berlin, and the Worcester County Sheriff's Department, with stations in Isle of Wight and Snow Hill, are the law enforcement agencies responsible for patrolling the unincorporated areas of the county. Ocean Pines and Snow Hill each have their own police force to patrol within their respective municipality. The Worcester County Detention Center is located on Joyner Road just west of US 113 near Snow Hill. The location of these police services are shown on Figures III-2A through III-2D.

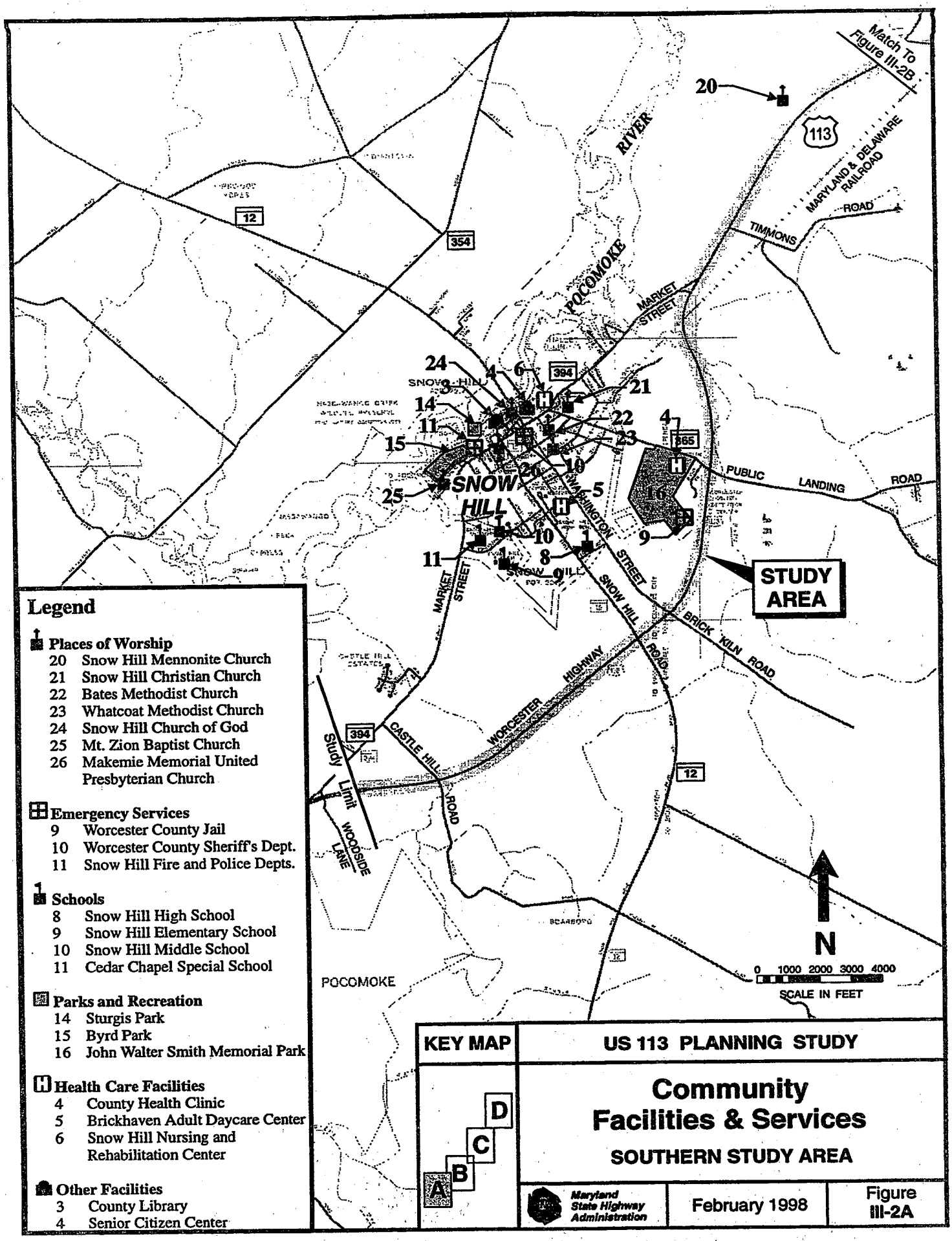
Fire and Rescue

All of the fire companies within the county are volunteer. The fire companies in the study area are located in Bishopville, Showell, Newark, Ocean Pines, and Snow Hill. The Showell Fire Station is the only station located along US 113. Paid emergency medical service personnel are located at the Bishopville and Snow Hill stations. The Worcester County Fire Training Center trains fire department personnel and is located on Central Site Lane north of Snow Hill adjacent to the county's Career and Technology Center (Taylor, 1997). The location of these fire and rescue facilities are shown on Figures III-2A through III-2D.

f. Health Care Facilities

Atlantic General Hospital, the county's only hospital, is a 56-bed facility located in Berlin at the US 113/US 50 interchange (Worcester County Dept. of Economic Development, 1994).

The Worcester County government operates health clinics at various locations primarily for those without health insurance. The Snow Hill clinic is adjacent to the County Detention Center near US 113. A new county clinic is being constructed adjacent to Atlantic General Hospital (Pruitt, 1997). The County Commission on Aging operates the Brickhaven Adult Daycare Center in Snow Hill. The elderly are transported by the Commission on Aging from their residence to and from the facility to receive medical treatment and social services. As of January 1997, the facility has 50 clients (Voss, 1997). Adjacent to the facility is the Pleasant Manor Elderly Housing complex. This is a private 31-apartment residential community for the elderly.



Legend

Places of Worship
- 20 Snow Hill Mennonite Church
- 21 Snow Hill Christian Church
- 22 Bates Methodist Church
- 23 Whatcoat Methodist Church
- 24 Snow Hill Church of God
- 25 Mt. Zion Baptist Church
- 26 Makemie Memorial United Presbyterian Church

Emergency Services
- 9 Worcester County Jail
- 10 Worcester County Sheriff's Dept.
- 11 Snow Hill Fire and Police Depts.

Schools
- 8 Snow Hill High School
- 9 Snow Hill Elementary School
- 10 Snow Hill Middle School
- 11 Cedar Chapel Special School

Parks and Recreation
- 14 Sturgis Park
- 15 Byrd Park
- 16 John Walter Smith Memorial Park

Health Care Facilities
- 4 County Health Clinic
- 5 Brickhaven Adult Daycare Center
- 6 Snow Hill Nursing and Rehabilitation Center

Other Facilities
- 3 County Library
- 4 Senior Citizen Center

KEY MAP

A B C D

US 113 PLANNING STUDY

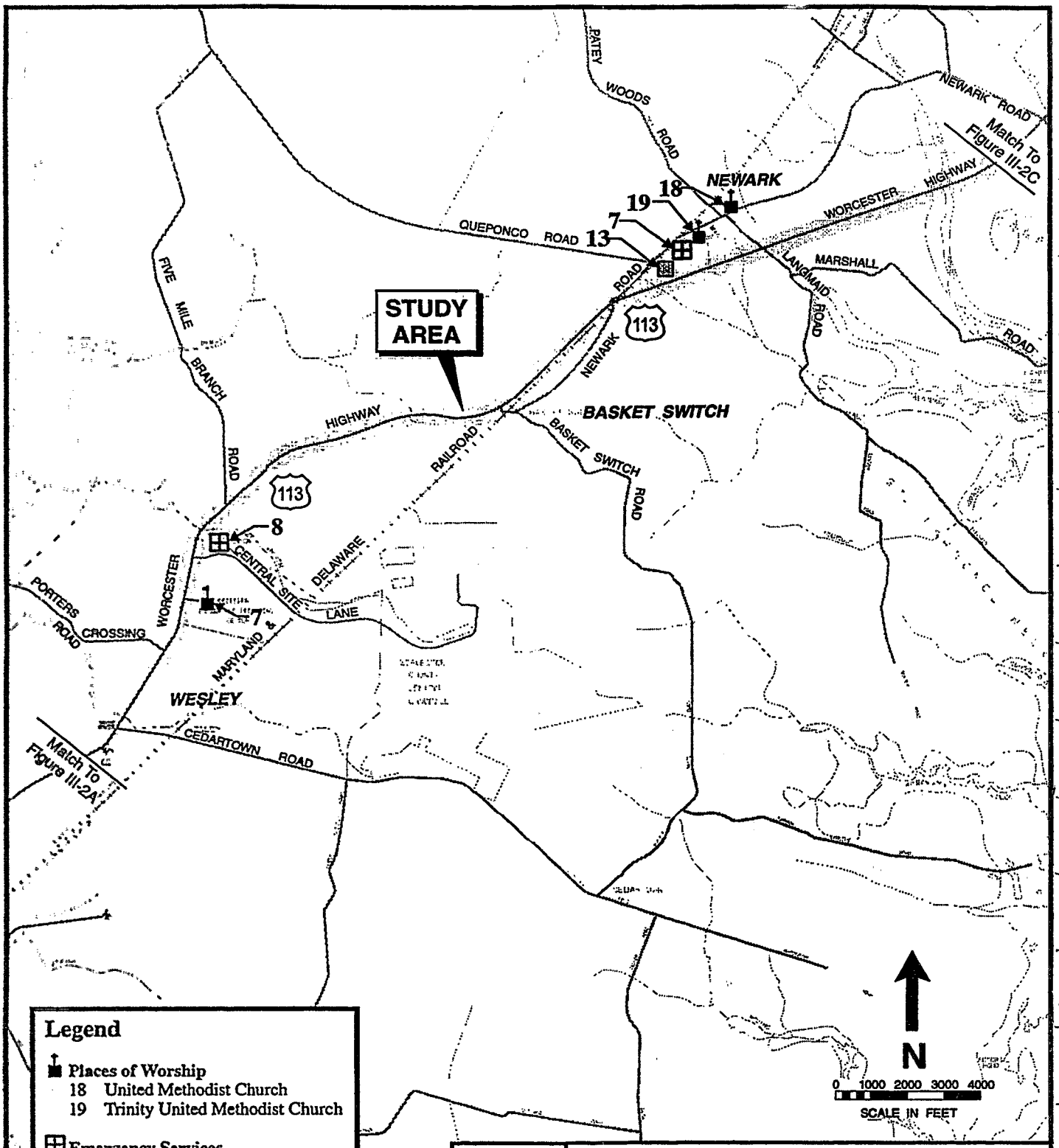
Community Facilities & Services

SOUTHERN STUDY AREA

Maryland State Highway Administration

February 1998

Figure III-2A



Legend

Places of Worship
- 18 United Methodist Church
- 19 Trinity United Methodist Church

Emergency Services
- 7 Newark Volunteer Fire Dept.
- 8 Worcester County Fire Training Center

Schools
- 7 Worcester County Career and Technology Center

Parks and Recreation
- 13 Site, new county park

KEY MAP

A B C D

US 113 PLANNING STUDY

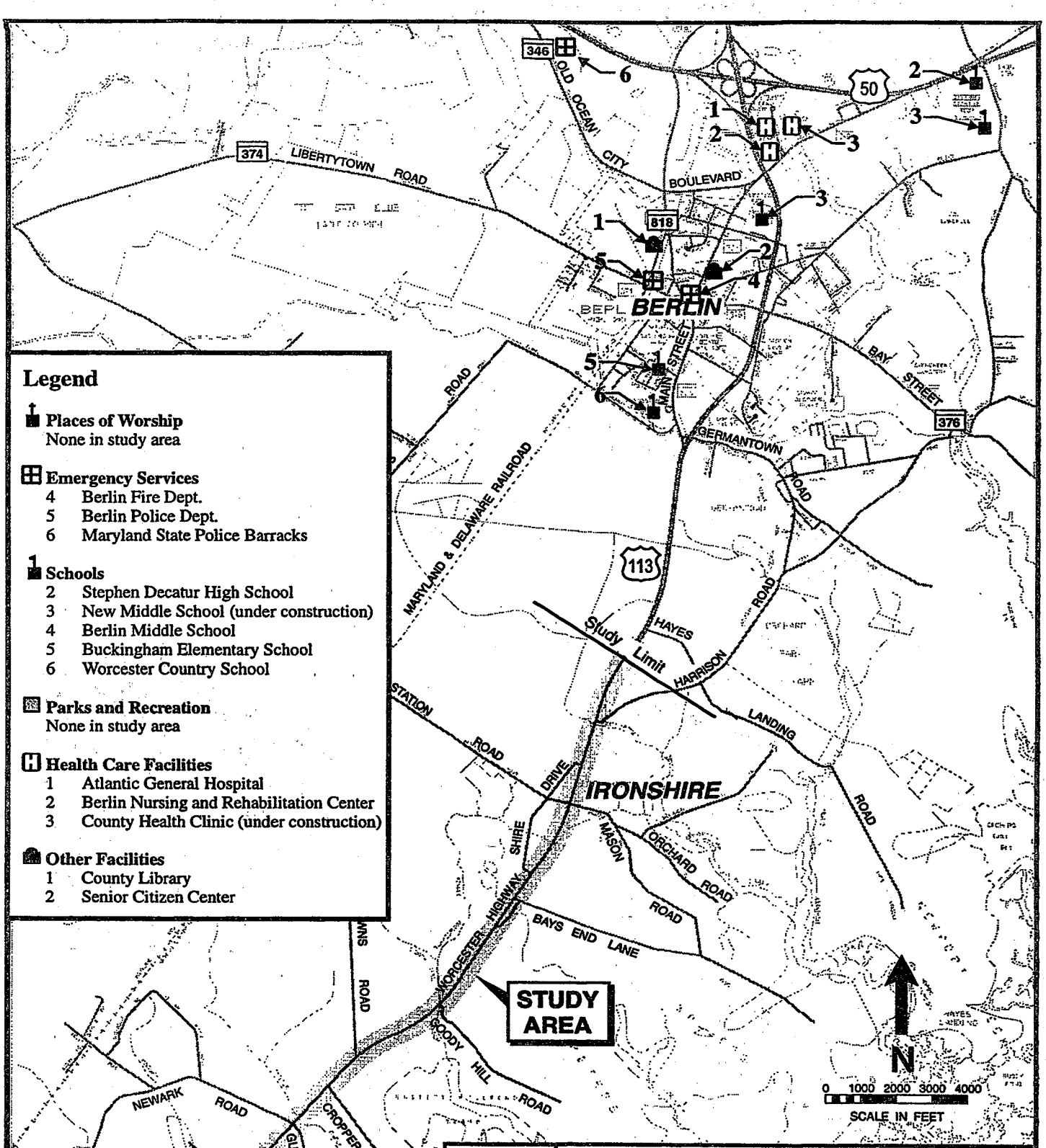
Community Facilities & Services

SOUTHERN STUDY AREA

Maryland State Highway Administration

February 1998

Figure III-2B



KEY MAP

A B C D

US 113 PLANNING STUDY

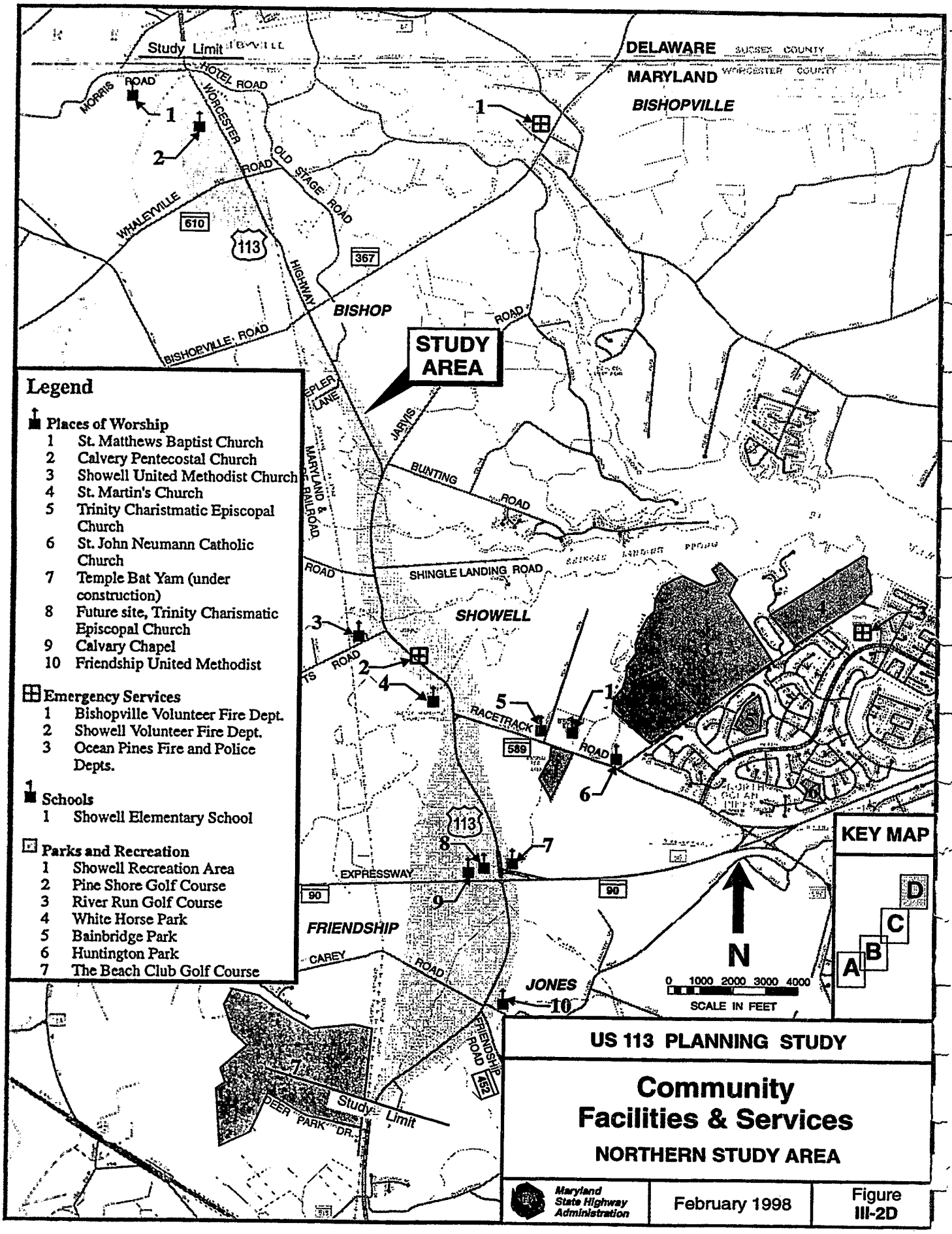
Community Facilities & Services

SOUTHERN STUDY AREA

Maryland State Highway Administration

February 1998

Figure III-2C



US 113 PLANNING STUDY

Community Facilities & Services

NORTHERN STUDY AREA

Maryland State Highway Administration | February 1998 | Figure III-2D

The Snow Hill Nursing and Rehabilitation Center in Snow Hill is the only nursing center in the study area. The facility has a capacity for 62 residents (Snow Hill Nursing and Rehabilitation Center, 1997). The location of these health care facilities are shown on Figures III-2A through III-2D.

g. Schools

Worcester County operates one high school, one middle school, two elementary schools, one special education school, and a career and technical center within the project area. Snow Hill High School, Snow Hill Middle School and Snow Hill Elementary School are located in the City of Snow Hill. The Cedar Chapel Special School, located next to Snow Hill Middle School, is a county school for handicapped students. Just north of Snow Hill along US 113 is the Worcester County Career and Technology Center. This facility specializes in educating students in trades and technologies. Located between Showell and Ocean Pines along MD 589 (Racetrack Road) is Showell Elementary School. Forty-five school buses operate along US 113 during the course of a school day. Currently, there are twenty-eight bus stops along US 113. School buses operate along US 113 from 7 AM until 4:30 PM. The peak periods of operation for the buses are between 7 AM and 8:15 AM and 2:45 PM and 4:30 PM. (McNabb, 1997). The location of these schools are shown on Figures III-2A through III-2D.

As extensively discussed by many speakers during the June 17,1997 Combined Location Design Public Hearing, school bus operations and safety are a major public concern along US 113.

There are no private schools within the study area.

h. Recreation Opportunities

There are numerous public and private recreational opportunities located throughout Worcester County (see Figures III-2A through 2D). There are 16 public boat ramps located throughout the county. The Worcester County View Trail 100 is a scenic bike route, which is a network of county roads used by bicyclists to traverse rural areas of the county. This is not a dedicated bike trail for use solely by bicyclists but a shared use of the local county road system. The Worcester County Tourism Office does not keep statistics on usage of the View Trail 100. County public recreational facilities include the John Walter Smith Memorial Park, located between Snow Hill and US 113. The facility has baseball and multipurpose fields. The Recreation Area in Showell has tennis courts, a basketball court, three baseball fields, a playground and a picnic pavilion. A new county park has been planned for the Newark community adjacent to the fire department.

The public schools have outdoor recreational facilities open to the public. Snow Hill Elementary School has playground equipment. Snow Hill Middle School has playground equipment, a basketball court, tennis courts and a multipurpose field. Snow Hill High School has basketball courts, tennis courts and a football field. Showell Elementary School has playground equipment and a multipurpose field.

Public recreational facilities in Snow Hill include Sturgis Park and Byrd Park. These are waterfront parks located along the Pocomoke River with picnic tables and pavilions. There is a public boat ramp located at Byrd Park. The location of these recreation opportunities are shown on Figures III-2A through III-2D.

i. Utilities

Electricity to the towns and major road corridors is supplied by Delmarva Power and Light. Choptank Electric Cooperative supplies electricity to the rural areas of the county. Pipeline liquid propane gas service is supplied by Eastern Shore Gas Company. Newark and Snow Hill have municipal water and sewer systems. Local telephone service is provided by Bell Atlantic (Maryland Dept. of Business and Economic Development, 1995-96). Cable television is supplied by TCI Cablevision of the Eastern Shore.

j. Other Community Facilities

Worcester County operates a public library and a senior citizens center within the study area in Snow Hill. The Worcester County Commission on Aging operates the senior citizens centers which offer programs in education, crafts, exercise, wellness and entertainment in addition to providing a noontime meal at the centers. The Commission provides transportation for seniors to and from the centers (Mower, 1997). The location of these other community facilities are shown on Figures III-2A through III-2D.

2. Economic Environment

a. Employment Characteristics

The largest sectors of employment in Worcester County are retail (34.7%), service (26.5%) and government (11.6%). The major industrial employers in the county are Perdue Farms (650 employees), Hudson Foods (600 employees) and Mid-Atlantic Foods (80 employees) (Worcester County Dept. Of Economic Development, 1996). In 1993, tourism generated over $775 million in annual sales, making it the largest industry by sales in the county. Poultry growing and processing followed with $173 million in annual sales. Wood products was the third largest industry in the county, accounting for $7 million in sales (Worcester County Dept. Of Economic Development, 1994). According to the Worcester County Comprehensive Plan, the largest employment opportunities in the year 2000 for the county are projected to be in recreation-oriented industries. Sectors with the greatest projected

growth since 1980 are F.I.R.E. (Finance, Insurance and Real Estate) with a 56 percent increase, construction with a 50 percent increase and wholesale/retail trade with a 46 percent increase. Sectors with the least projected growth since 1980 are agriculture with no increase and transportation/utilities with a 20 percent decrease.

As of January 1997, Worcester County's unemployment rate was 19.0 percent, which reflects seasonal conditions of the beach resort area. The state unemployment rate was 4.8 percent and the nation's unemployment rate was 5.9 percent (Maryland Department of Labor, 1997). Worcester County experiences low unemployment during the summer months and high unemployment during the remainder of the year. To illustrate this, the unemployment rate for the county in January 1996 was 17.5 percent while in August 1996, the unemployment rate was 3.4 percent. This is a reflection of the seasonal employment that occurs within the county's tourism industry. In January 1996, the county's civilian work force was 20,085. By August 1996, the county's civilian work force was 31,812.

The need for businesses to employ seasonal employees increases during the late spring and summer months as more lodging, eating establishments, retail merchants and other businesses open their doors to vacationers. US 113 provides access to Ocean City by intersecting with MD 90 and US 50, roadways which link Ocean City to the mainland. Traditionally a summer vacationing spot, Ocean City is becoming more of a year-round tourist destination as more retail, eating, entertainment and lodging establishments are staying open during the winter months. Ocean City is also host to numerous conventions held at its convention center, which is currently being expanded to 125,000 square feet. Completed in Fall 1997 it is expected to host over 110 events and serve over 380,000 people (Town of Ocean City, Maryland, 1996).

Projected employment growth in Worcester County is projected to be 13.8 percent between the years 2000 and 2010. The employment sectors with the largest projected growth are Services (23.71%), F.I.R.E. (15.38%) and Retail Trade (13.68%) (Maryland Office of Planning, 1995).

b. Commercial and Industrial Facilities

The towns and communities in the study area are dependent on farming and farming-related industries for their livelihoods. According to the Delmarva Poultry Industry, a trade organization, growth in the poultry industry is expected to occur in western Worcester County, outside of the study area. Perdue Chickens operates a feed mill in Bishop, and a hatchery and processing facilities in Showell. Tyson Foods operates a feed mill in Snow Hill. These businesses contract with local farmers to raise chickens and grow crops to be processed for chicken feed. Trucks frequently use US 113 to travel to the farms to retrieve the crops and chickens for processing.

Berlin and Snow Hill are the towns in the study area where most of the commercial establishments, shopping areas and community facilities and services are located. In Bishop, there are several neighborhood businesses, including two restaurants, a veterinary hospital and a boat repair business. Some retail businesses and facility stations are also located in Ocean Pines near the MD 589/MD 90 interchange.

There is a state enterprise zone in Snow Hill. Businesses located in the enterprise zone can qualify for economic incentives and tax credits by achieving certain landmarks in capital investment and/or job creation.

The corporate state income tax rate is 7 percent. The state sales tax rate is 5 percent. The state personal income tax rate varies between 2 and 5 percent. The county personal income tax rate is 1.5 percent. (Worcester County Department of Economic Development, 1996).

Real property tax rates in the county are $0.76 per $100 of assessed value. The real property tax rates for Berlin, Ocean City and Snow Hill are $1.44, $1.24 and $1.48, respectively, per $100 of assessed value (Worcester Co. Dept. Of Economic Development, 1996).

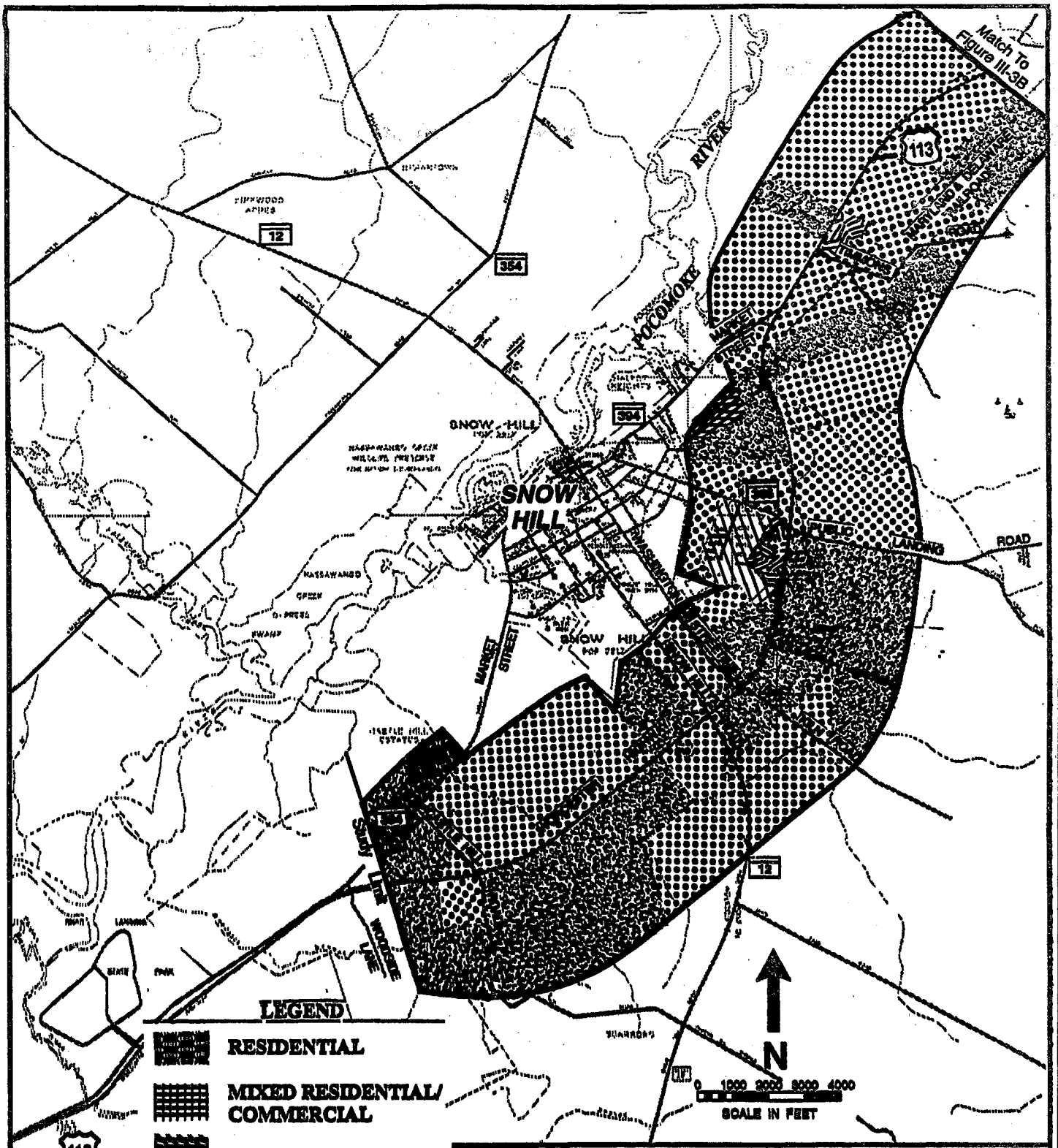
c. Land Use

Existing Land Use

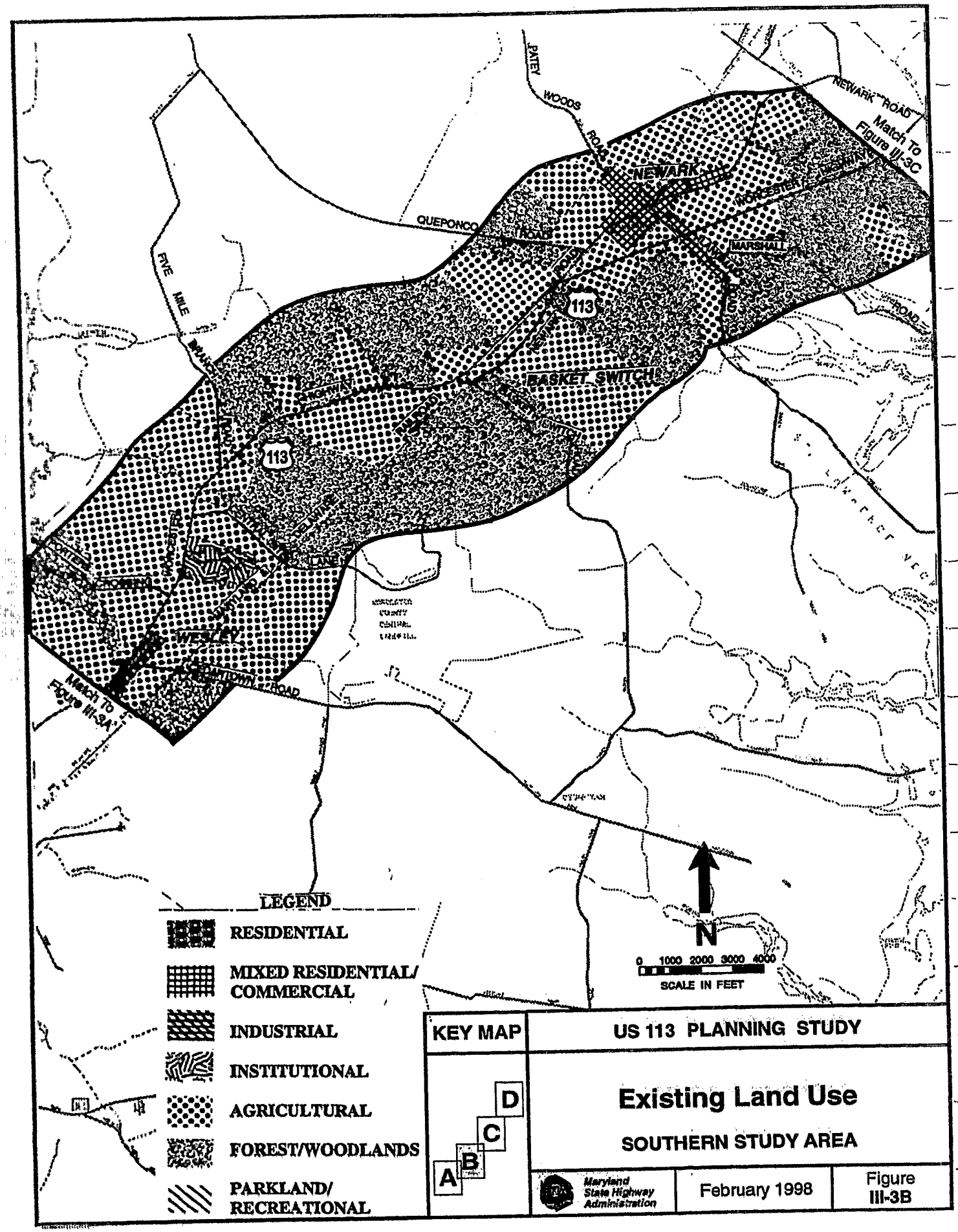
Several communities are located within the US 113 study area. Ironshire, Basket Switch, and Wesley in the southern study area and Jones, Friendship, Showell and Bishop in the northern study area, are small, predominantly residential crossroad communities located along US 113. One and two story single family detached housing are the dominant housing types in these communities. In Showell, Perdue Chickens operates a hatchery and a processing facility. In Bishop, there are several neighborhood businesses, including two restaurants, a veterinary hospital and a boat repair business. Other industries in Bishop include a poultry processing and feed mill operation and an asphalt plant. As the only community in the study area with village zoning, Newark displays the architectural and development history characteristics of the county. New development is to be carefully considered for its impact on the existing community character.

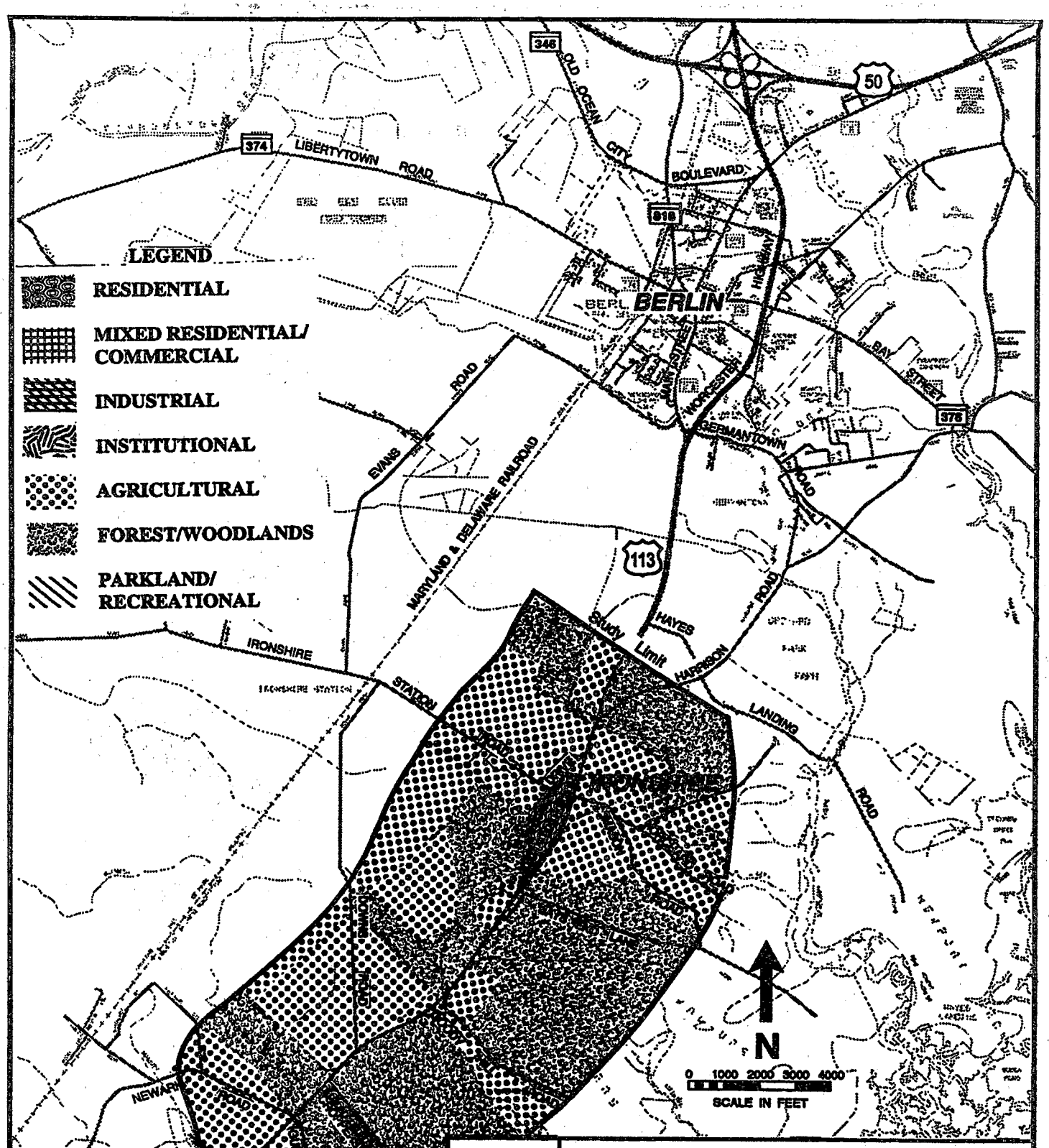
Ocean Pines is a private residential community located east of the study area along the coastal bay. The dominant housing type in this area is a single family detached dwelling unit. Some retail businesses and fueling stations are located near this community near the MD 589/MD 90 interchange.

To regulate and guide land use, Worcester County has adopted a zoning ordinance, subdivision regulations and a comprehensive development plan. The existing land use in the study area is shown on Figures III-3A through 3D. Figures III-4A through 4D show the zoning classifications of the land in the study area. Most of the land in the study area is

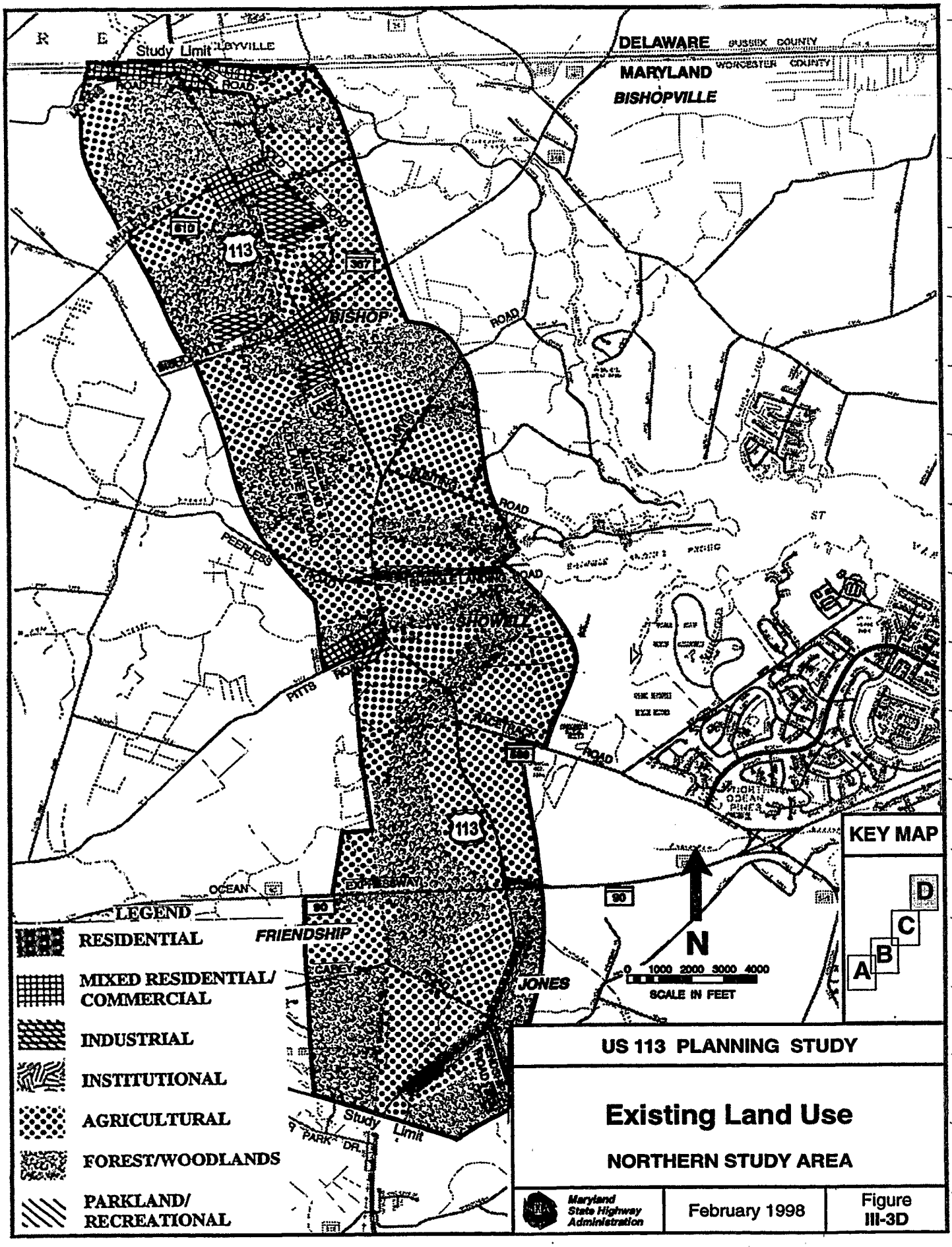


KEY MAP	US 113 PLANNING STUDY		
A B C D	Existing Land Use SOUTHERN STUDY AREA		
	Maryland State Highway Administration	February 1998	Figure III-3A


PATTY WOODS ROAD
NEWARK ROAD
Match To Figure III-3C
NEWARK
WORCESTER
MARSHALL
QUEPONCO ROAD
FIVE MILE BRANCH
113
BASKET SWITCH
WESLEY
Match To Figure III-3A
LEGEND
RESIDENTIAL
MIXED RESIDENTIAL/ COMMERCIAL
INDUSTRIAL
INSTITUTIONAL
AGRICULTURAL
FOREST/WOODLANDS
PARKLAND/ RECREATIONAL
N
0 1000 2000 3000 4000
SCALE IN FEET
KEY MAP
A
B
C
D
US 113 PLANNING STUDY
Existing Land Use
SOUTHERN STUDY AREA
Maryland State Highway Administration
February 1998
Figure III-3B



KEY MAP	US 113 PLANNING STUDY	
A B C D	**Existing Land Use** SOUTHERN STUDY AREA	
	Maryland State Highway Administration	February 1998	Figure III-3C



US 113 PLANNING STUDY

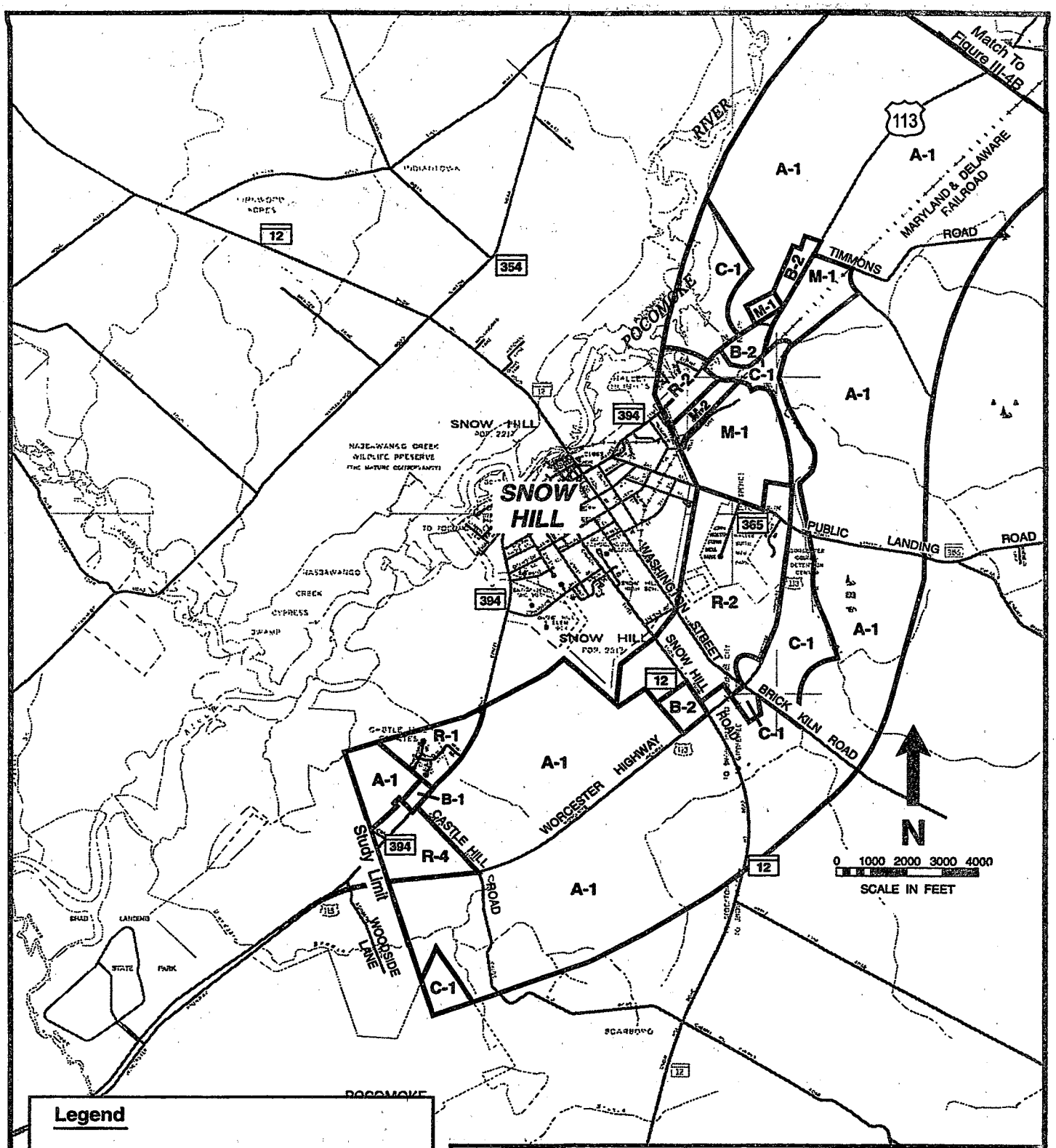
Existing Land Use

NORTHERN STUDY AREA

Maryland State Highway Administration

February 1998

Figure III-3D



Legend

A-1: Agriculture
B-1: Neighborhood Business
B-2: General Business
C-1: Conservation
E-1: Estate - Large Lot, Low Density residential
M-1: Light Industrial
M-2: Heavy Industrial
R-1: Residential - Single Family (1 dwelling per acre)
R-2: Residential - Single Family (1 dwelling per 1/2 acre)
R-3: Residential - Single Family / Multi Family
R-4: Residential - Single Family / Multi Family; Hotel and Motel
V-1: Village

KEY MAP

A B C D

US 113 PLANNING STUDY

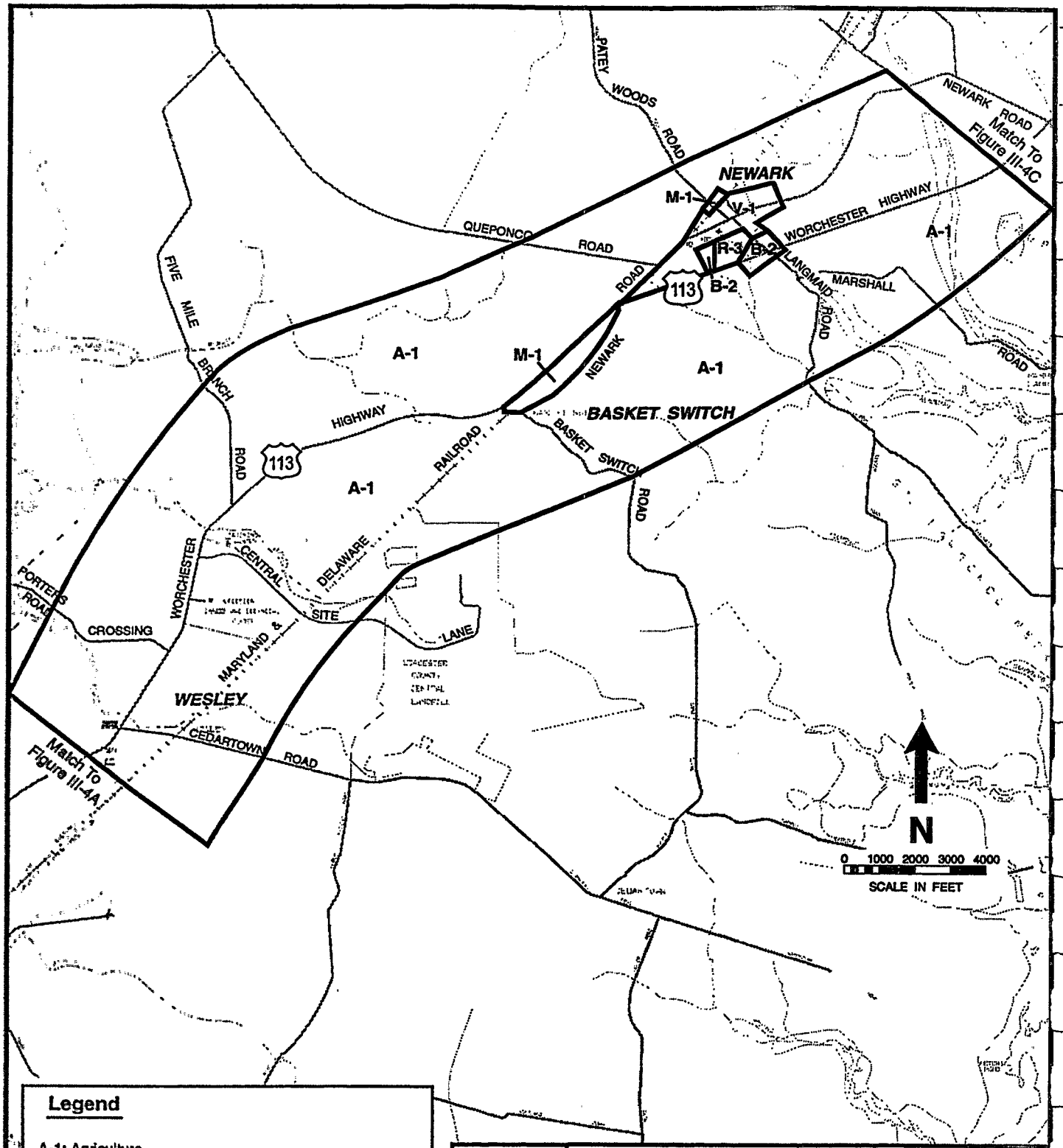
Zoning Classifications

SOUTHERN STUDY AREA

Maryland State Highway Administration

February 1998

Figure III-4A



Legend

A-1: Agriculture
B-1: Neighborhood Business
B-2: General Business
C-1: Conservation
E-1: Estate - Large Lot, Low Density residential
M-1: Light Industrial
M-2: Heavy Industrial
R-1: Residential - Single Family (1 dwelling per acre)
R-2: Residential - Single Family (1 dwelling per 1/2 acre)
R-3: Residential - Single Family / Multi Family
R-4: Residential - Single Family / Multi Family; Hotel and Motel
V-1: Village

KEY MAP

A B C D

US 113 PLANNING STUDY

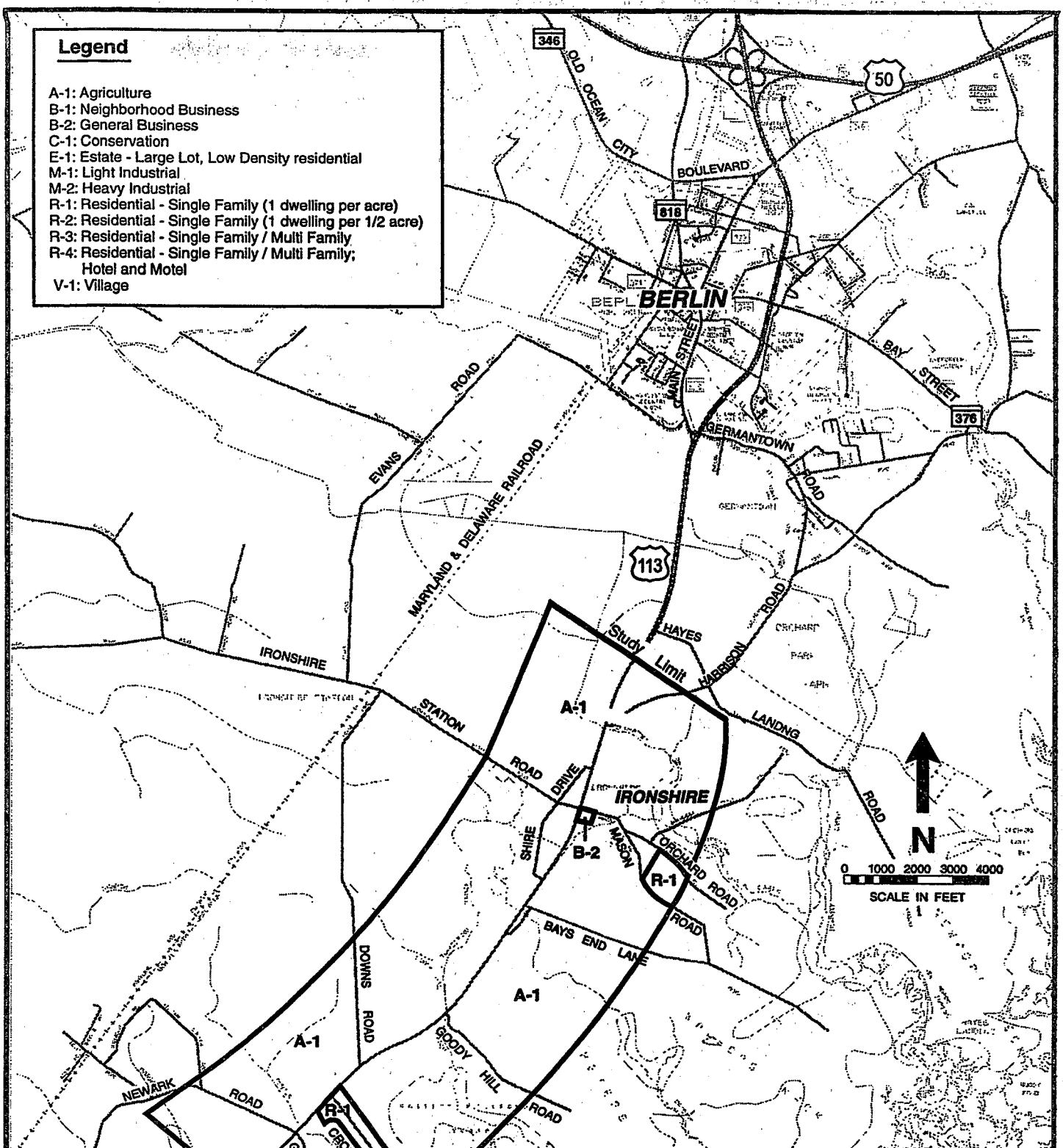
Zoning Classifications

SOUTHERN STUDY AREA

Maryland State Highway Administration

February 1998

Figure III-4B



KEY MAP

A B C D

US 113 PLANNING STUDY

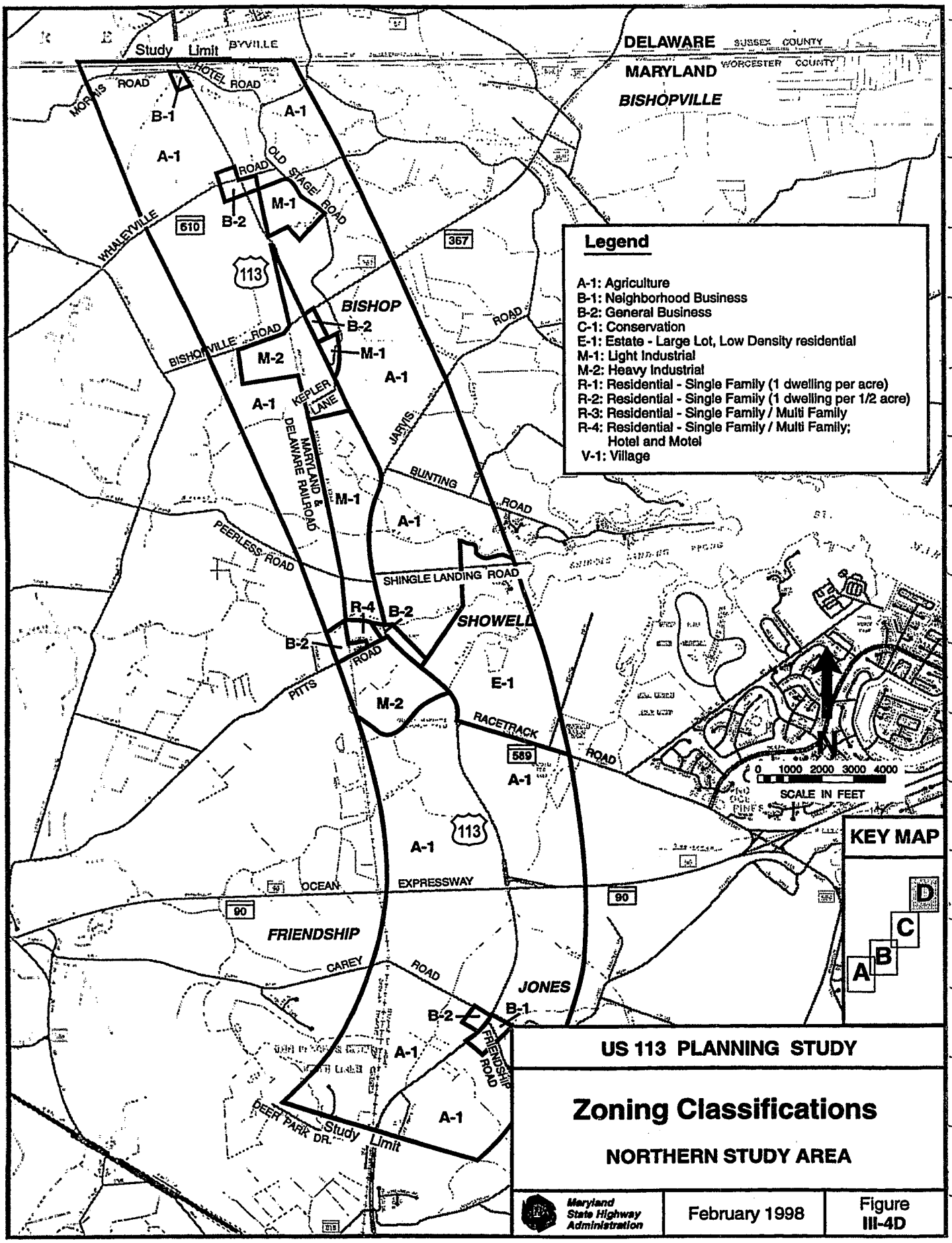
Zoning Classifications

SOUTHERN STUDY AREA

Maryland State Highway Administration

February 1998

Figure III-4C



US 113 PLANNING STUDY

Zoning Classifications

NORTHERN STUDY AREA

Maryland State Highway Administration | February 1998 | Figure III-4D

zoned for agricultural use. Farms are located throughout the project corridor with cultivated fields and chicken houses as the dominant agricultural features in the study area. Corn, wheat, barley and soybeans are the crops grown the most in the study area. Minor subdivisions of five dwelling units per parcel are permitted in agricultural-zoned land areas. In addition, in September 1997, The Worcester County Planning Commission adopted a Supplement to the 1989 Comprehensive Development Plan for Worcester County, Maryland. This document sets forth the goals, objectives, background/basic issues, concepts and recommendations for land use and planning necessary to bring Worcester County into compliance with Maryland's Economic Growth, Resource Protection and Planning Act of 1992.

Other zoning classifications in the study area include Neighborhood Business (B-1) General Business (B-2), Light Industrial (M-1), Heavy Industrial (M-2), Rural Estate (E-1), Low Density Single Family Residential (R-1 and R-2), Medium and High Density Single-Family and Multi-Family Residential (R-3 and R-4), Village (V-1) and Conservation (C-1). Descriptions of general land use permitted in these zones are shown in Table III-8.

Worcester County land use trends between 1973 and 1990 are shown in Table III-9. Between 1973 and 1990, Worcester County experienced a 33 percent increase in total development, most of which was a result of residential development. In 1973, approximately 3.7 percent of the total land area was developed. In 1990, approximately 4.9 percent of the total land area was developed.

Table III-8: Zoning Classifications

Zoning Classification	General Use Permitted
A-1	Agriculture: agriculture and forestry are preferred land uses; minor subdivision of up to five dwelling units per parcel permissible
B-1	Neighborhood Business: retail business use serving the nearby community
B-2	General Business: larger scale of retail, office and service businesses permitted
C-1	Conservation District: Sensitive environmental areas including jurisdictional wetlands, stream valleys, drainage ways and muck & alluvial soils in the Pocomoke River
E-1	Estate: large lot/low density residential development; cluster development encouraged to maintain open space and provide buffer for habitat and water quality
M-1	Light Industrial: warehousing, light manufacturing
M-2	Heavy Industrial: warehousing, heavy manufacturing
R-1	Residential: single family dwellings on at least 1 acre lots
R-2	Residential: single family dwelling on at least 0.5 acre lots
R-3	Residential: single family and multi-family residential use
R-4	Residential: single family and multi-family residential use; hotels and motels
V-1	Village: provides for and preserves the character of the existing non-incorporated population center. Mixing of land uses should not be permitted unless deemed consistent with the existing community character

Source: Worcester County Planning, Permits and Inspections office

Table III-9: Worcester County Land Use Trends, 1973-1990

Land Use Category	Land Use in Acres				Land Use Change (%)
	1973	1981	1985	1990	1973-1990
Low Density Residential	3,500	4,786	5,221	6,549	87.1
Med./High Density Residential	2,505	2,774	2,877	3,000	19.8
Commercial/ Industrial	2,507	2,705	2,840	2,982	18.9
Institutional/Open	2,181	1,753	1,830	1,879	-13.8
Bare Ground	493	557	416	542	9.9
Total Development	11,186	12,575	13,184	14,952	33.7
Agriculture	98,948	99,588	100,222	99,716	0.8
Forest	170,336	168,275	167,020	165,489	-2.8
Extractive/Barren	1,923	1,949	1,962	1,962	2.0
Wetland	21,846	21,852	21,851	21,805	-0.2
Total Resources	293,053	291,664	291,055	288,972	-1.4
Total Land	304,239	304,239	304,239	303,924*	-0.1
Water	140,310	140,310	140,310	140,625	0.2
Total Area	444,549	444,549	444,549	444,549	constant

Source: "Maryland's Land, 1973-1990, A Changing Resource."
Maryland Office of Planning Publication 91-8

Notes: Water area before 1985 was assumed constant.
*Adjusted based on 1985 and 1990 polygon data

Wetlands include forested and non-forested wetlands, including tidal flats, tidal and non-tidal marshes, upland swamps, and wet areas.

Data presented in this table is based on aerial photographs.

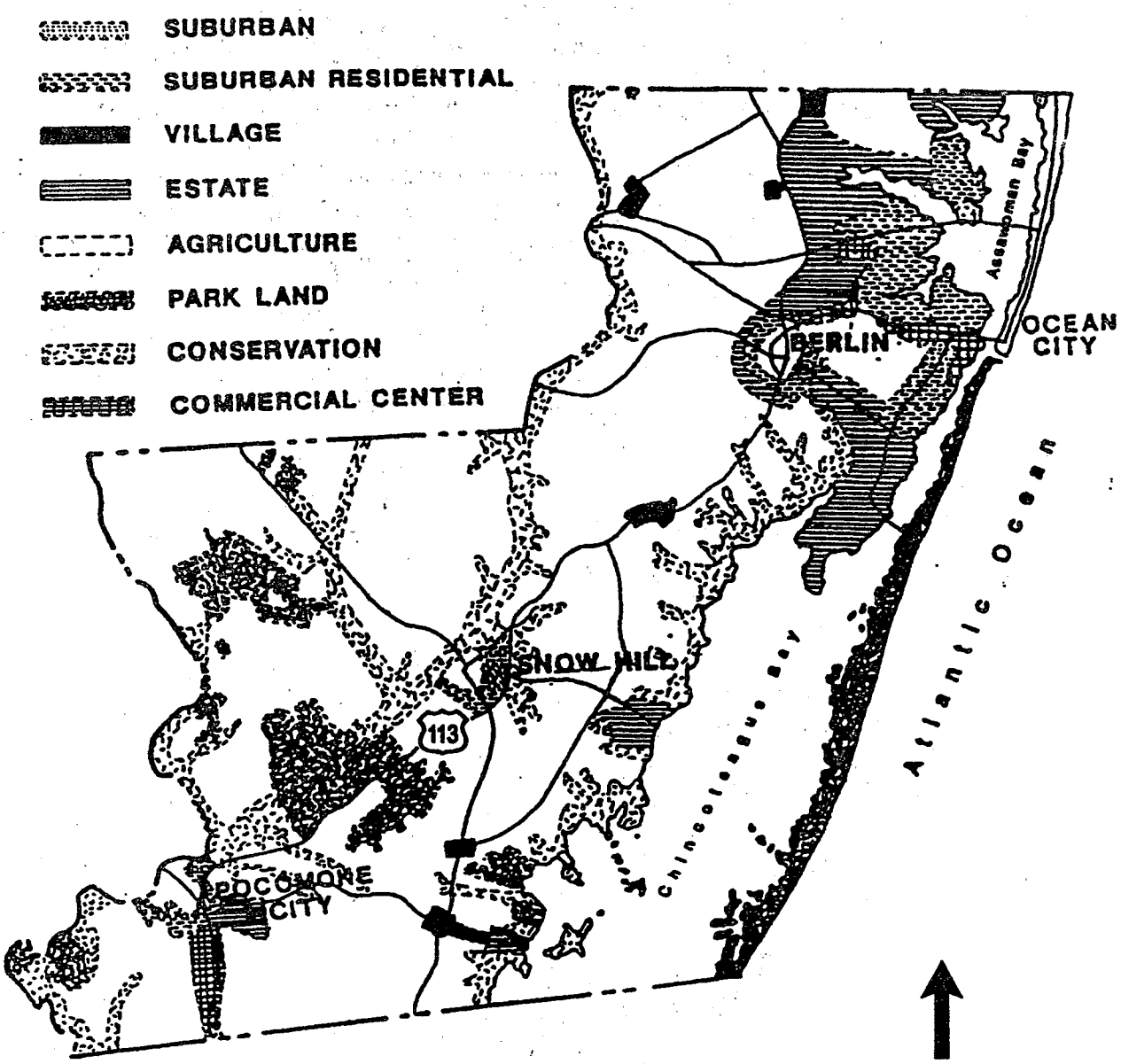
Future Land Use

The land use goal of Worcester County is to locate the major portion of the county's future population in the northern portion of the county (around Ocean City) and in existing town centers while maintaining the rural nature of the county and safeguarding its environment for future generations (Worcester County Planning Commission, 1989). As developable land in Ocean City becomes scarcer and more expensive to develop, the coastal bay areas west of Ocean City have and are projected to continue to accommodate development.

Table III-10 shows the land use forecast to the year 2020 for Worcester County. As stated earlier, the Supplemental Comprehensive Development Plan was adopted by the Worcester County Planning Commission September 16, 1997. A new land use map was not developed by WCPPI as part of the comprehensive plan update. Worcester County is developing a new Comprehensive Development Plan. It is expected to be complete in two years time. Total development is projected to increase approximately 38 percent between 1990 and 2020. Of the 303,924 acres of land area in Worcester County, only an estimated 24,364 acres of land (8 percent of the entire land area in the county) are projected to be in development by the year 2020. Figure III-5 depicts the county's comprehensive development plan, as of 1989, and the recommended pattern of land use. A general description of the land uses is listed in Table III-8. "Suburban" land use allows 6 dwelling units per acre whereas "Suburban Residential" land use allows 4 dwelling units per acre. Future growth should focus on land in and around Ocean City and existing town centers to accommodate the vacation/second home population and existing town center areas and sustain the work force for resort-related industries and businesses (Worcester County Planning Commission, 1989).

Worcester County's natural environment is its principal attraction for population and economic growth. Growth will continue in the county as long as quality natural resources can be maintained (Worcester County Planning Commission, 1989). County land use objectives include "encourage new development projects to locate in or near the existing population centers and service centers (where planned) but also discourage development of the rural areas of the county" and "maintain the rural character of Worcester and its existing population centers, small towns and villages" (Worcester County Planning Commission, 1989). The responsibility of regulating land use and development rests with the Worcester County Commission and the WCPPI office.

In the Worcester County Comprehensive Development Plan, the dualization of US 113 is designated as an Area of Critical State Concern, which is defined as one that deserves special planning attention and involves or affects more than one local jurisdiction. The plan also recommends that direct access to major roadways should be limited and directed towards local "feeder" or collector streets. Zoning controls should be carefully used to limit development to selected areas along the right-of-way (Worcester County Planning Commission, 1989). According to the 1997 Supplement to the 1989 Comprehensive Development Plan for Worcester County, Maryland, no land area surrounding the proposed



Source: Worcester County Comprehensive Plan
April 1989

US 113 PLANNING STUDY

Comprehensive Development Plan

Maryland State Highway Administration | February 1998 | Figure III-5

U.S. 113 construction zone will be subject to any new local provisions that would prevent the implementation of roadway improvements. It is also suggested that the county implement a "corridor overlay zone" along the right-of-way in cooperation with the State Highway Administration and other agencies.

The population centers of the county (Berlin, Newark, Snow Hill, Pocomoke City, Ocean City) have the infrastructure (i.e., sewerage and sewage disposal systems) in place to support existing and future development. Except in Newark, there is no public sewerage in the US 113 study area. There are no plans to expand sewerage in the study area. If a development cannot be supported by a septic system, then the developer must install the infrastructure for the development at his/her own expense (Morris, 1997). The Maryland Department of the Environment's two acre septic requirement and the necessity for on-site wastewater treatment will limit densities in areas not serviced by public sewage. (Worcester County, 1997).

Some low density, single family houses have recently been constructed or are under construction along Shingle Landing Road and Bunting Road in the northern study area adjacent to the location of a proposed new garden center. A new place of worship, Temple Bat Yam, is presently under construction just north of the MD 90/US 113 interchange. No new development is taking place in the southern study area. According to WCPPI, there has been little pressure or interest to develop large scale commercial or residential projects in the US 113 study area. Most of the people who relocate to Worcester County want to live near or on the water (Morris, 1997). For that reason, new development is occurring on the northern bayfront areas of the county. This geographical area is linked to US 113 by MD 90, Racetrack Road (MD 589), Bishopville Road (MD 367), Jarvis Road, Bunting Road and Shingle Landing Road. It is anticipated that there will be a demand for development along the southern bayfront areas and MD 611 north of its intersection with Assateague Road (Worcester County Planning Commission, 1989).

Table III-10: Worcester County Land Use Forecast, 1990-2020

Land Use Category	Land Use in Acres				Land Use Change 1990-2020 (%)
	1990	2000	2010	2020	
Very Low Density Residential (1)	2,703	3,231	3,650	3,981	47.3 %
Low Density Residential (2)	6,549	7,570	8,381	9,019	37.7 %
Med./High Density Residential (3)	3,000	3,436	3,783	4,056	35.2 %
Commercial/ Industrial	2,982	3,465	3,849	4,151	39.2 %
Institutional and Open	1,879	2,183	2,425	2,616	39.2 %
Bare Ground (4)	542	542	542	542	0.0 %
Total Development	17,655	20,427	22,630	24,364	38.0 %
Agriculture	98,700	97,657	96,829	96,177	-2.5 %
Forest	163,802	162,072	160,698	159,616	-2.5 %
Extractive and Barren (4)	1,962	1,962	1,962	1,962	0.0 %
Wetland (4)	21,805	21,805	21,805	21,805	0.0 %
Total Resources	286,269	283,497	281,294	279,560	-2.3 %
Water (4)	140,625	140,625	140,625	140,625	0.0 %
Total Area	444,549	444,549	444,549	444,549	constant

Source: "Maryland Land Use/Land Cover 1990-2020 Forecast."
Maryland Office of Planning, 1992

Notes: (1) 1 dwelling unit/5 acres to 1 dwelling unit/20 acres
(2) 0.2 dwelling unit/acre to 2 dwelling units/acre
(3) 2 dwelling units/acre to > 8 dwelling units/acre
(4) Assumed constant over forecast period

The differences Tables III-9 and III-10 for year 1990 Total Development, Agriculture and Forest categories reflect differences in Maryland Office of Planning source material. Wetlands include forested and non-forested wetlands, tidal flats, tidal and non-tidal marshes, upland swamps and wet areas.

B. Cultural Resources

Historic structures identification and evaluation studies and a Phase I archeological identification have been completed for the project. Letters from the State Historic Preservation Officer (SHPO) coordinating both historic structures and archeological resources in the study area are presented in Chapter VI. The SHPO has concurred that 6 of the 21 historic structures identified in the project's Area of Potential Effects (APE) are eligible for the National Register of Historic Places (NRHP), as described below. One additional historic site, the Maryland/Delaware State Line Marker (WO 480), listed in Table III-11, was determined by Maryland Historical Trust (MHT) to be eligible for the National Register, but is outside the project's APE. These properties are listed in Table III-11 and their locations are shown in Figure III-6.

The area of potential effects (APE), concurred upon by the Maryland Historical Trust on August 30, 1995, was defined to include the area 500 feet east and west of the existing US 113 roadway in most of the project corridor. In the northern portion of the study area, from north of the town of Berlin to the Delaware line, where relocation alternatives are also being studied, the APE width was expanded to approximately 500 feet beyond the limits of the easternmost and westernmost alternatives and included the intervening area. The western boundary of the northern study area extended to the Maryland and Delaware Railroad Corridor.

1. Significant Historic Structures

The National Register's standards for evaluating the significance of properties were developed to recognize the accomplishments of all peoples who have made a contribution to our country's history and heritage.

The quality of *significance* in American history, architecture, archeology, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:

(A) that are associated with events that have made a significant contribution to the broad patterns of our history; or
(B) that are associated with the lives of persons significant in our past; or
(C) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
(D) that have yielded, or may be likely to yield, information important in prehistory or history.

Table III-11: Historic Standing Structures in the Study Areas

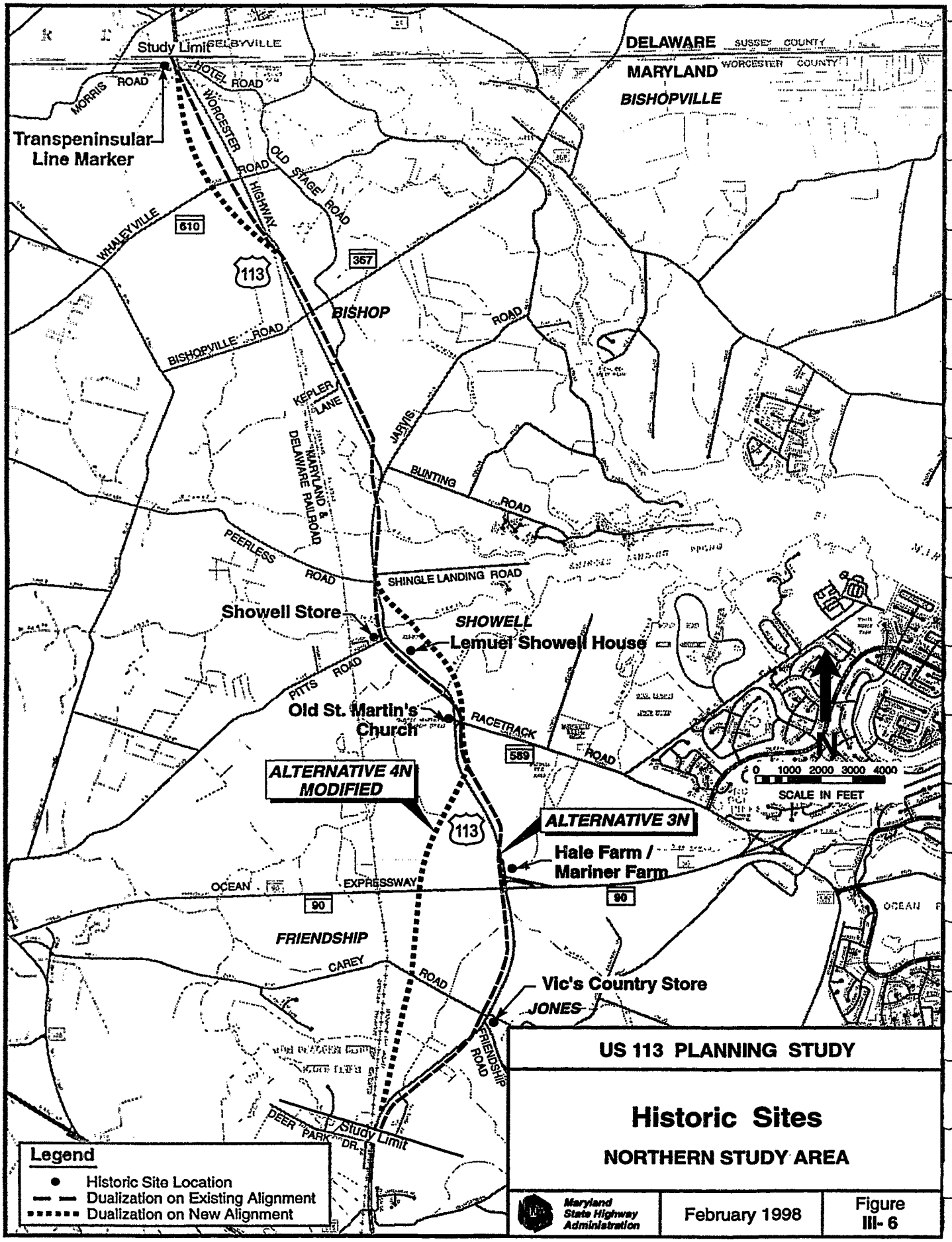
Maryland Historical Trust Inventory #	Property Name	Eligibility Determination
WO 23	St. Martin's Church	NR ‡
WO 283	Hale Farm/Mariner Farm	NRE *
WO 284	Lemuel Showell House	NRE
WO 289	Showell Store	NRE
WO 317	Rochester Farm	Not NRE
WO 462	Gibbons Farm	Not NRE
WO 463	Hensley/Amos Farm	Not NRE
WO 464	A.P. Bowen House	Not NRE
WO 465	Parker Farm	Not NRE
WO 466	Barbely Farm	Not NRE
WO 467	J.T. Mumford House	Not NRE
WO 468	Walsh House	Not NRE
WO 471	Erma and Norwood Davis House	Not NRE
WO 472	Vic's Country Store	NRE
WO 473	Calvin E. Davis House	Not NRE
WO 474	Richard J, and Ellen M. Truitt House	Not NRE
WO 475	Hall House	Not NRE
WO 476	Holloway House	Not NRE
WO 477	Virgil and Sarah Webb House	Not NRE
WO 478	Roland W. Beauchamp Feed Storage Buildings	Not NRE
WO 479	Transpeninsular Line Marker	NRE
WO 480	Maryland/Delaware State Line Marker	NRE **

Legend:

‡ Listed on the National Register

* National Register Eligible

** This resource is National Register Eligible and outside the area of potential effect.



US 113 PLANNING STUDY

Historic Sites

NORTHERN STUDY AREA

Maryland State Highway Administration | February 1998 | Figure III- 6

The following historic structures in the study area were identified as listed on or eligible for the National Register.

St. Martin's Church (WO-23). St. Martin's Church, entered on the National Register on April 13, 1977, is situated on the west side of US 113 at the intersection with Racetrack Road (MD 589), south of the community of Showell. It is also a Maryland Historical Trust easement property. The church is significant as one of the few mid-18th century structures in Maryland. It is architecturally significant under criterion C for its fine construction features and conveys a strong association with the early history of Worcester County. The present brick building was constructed in 1759 to replace an earlier Anglican structure.

Hale Farm/Mariner Farm (WO-283). The Hale Farm/Mariner Farm, determined eligible in April 1996, is located on the east side of US 113 between MD 90 and MD 589, south of Showell. The property, including a mid-19th century farmhouse, a log corncrib, and a smokehouse, provides an excellent representative example of an intact, mid-19th century farmhouse and a cohesive grouping of domestic outbuildings, and is eligible for the Register under criterion C (as a representative of a type).

Lemuel Showell House (WO-284). The Lemuel Showell House, determined eligible for the National Register of Historic Places in June 1990 under criterion B (for its association with important individuals) and C (as a representative of a type), is located on the east side of US 113 south of Pitts Road. The ca. 1830 house is the oldest in the Showell area and one of a few Federal-style houses in northern Worcester County. The house is also significant for its association with the prominent Showell family, and particularly with Lemuel Showell III, who was instrumental in financing railroad construction and development of the resort of Ocean City. The house was moved in the 1930's, but is considered of exceptional local significance, and retains sufficient integrity of setting to justify inclusion on the Register (Little 6-14-90 letter to Ege).

Showell Store (WO-289). The Showell Store, determined eligible in January 1997, is located at the northwest corner of US 113 and Pitts Road in Showell. Significant as a village store and commercial center for the surrounding area from the mid-19th century to the present, the Showell Store is considered eligible for the National Register under criterion A, as it reflects the broad patterns of local history. Archeological Site 18WO209, at this time considered potentially eligible for the Register based on its information potential (criterion D), is within the boundary of the Showell Store.

Vic's Country Store (WO-472). Vic's Country Store, determined eligible for the National Register in March 1996 under criterion C (as a representative of a type), is located on the east side of US 113 at the intersection of Carey Road, Jones Road, and Friendship Road. The building is a good, intact example of early 20th century roadside architecture, and as a store/ gas station in a small crossroads community -- once quite common, but now a dying form. Archeological site 18WO213, considered ineligible for the Register based on the results of the Phase I surveys is within the boundary of Vic's Country Store.

Transpeninsular Line Marker (WO-479). The Transpeninsular Line Marker, determined eligible in April 1996 under criterion A (for its association with important historical events), is located on the east side of US 113 at the Maryland/Delaware state line. It marks the boundary between the two states.

2. Archeological Sites

A Phase I archeological survey was performed to identify archeological sites within the project area, and to obtain preliminary information about their potential eligibility for the National Register of Historic Places. The survey identified 39 archeological sites and 47 non-site isolated artifacts or artifact scatters. All of the 39 defined archeological sites contain components dating to the historic period, and thirteen of them also contain prehistoric components. Twenty of the sites may be eligible for listing on the National Register of Historic Places, and eighteen of these are likely to be impacted by one or more of the project alternatives. The eighteen sites include three dating to the prehistoric period, two dating to both the prehistoric and historic periods, and thirteen dating exclusively to the historic period. Formal determinations of eligibility will be accomplished in a subsequent phase of archeological research, after alternative selection.

On March 7, 1997, SHA provided the Maryland State Historic Preservation Office (SHPO) with a copy of the draft archeological report for Phase I investigations. By letter dated March 18, 1997, the Maryland SHPO concurred with SHA's determination that all build alternatives will have adverse effects on historic properties, and that a reasonable and good faith effort was made to identify archeological sites within the project's APE. The SHPO was unable to concur on the adequacy of the archeological report, however, and a revised report responding to their comments was submitted on April 10, 1997. The SHPO concurred on the adequacy of the revised draft report on April 23, 1997.

Five of the recorded prehistoric sites may be eligible for the National Register of Historic Places based on their ability to provide important information about the past, and four of the five may be impacted by the undertaking. 18WO184 dates between 500 B.C. and A.D. 600, within the Woodland I period. A possible feature suggests that it may represent a periodically revisited campsite. 18WO185 contains Woodland period ceramics and a possible feature that suggests it too may represent a campsite.

Prehistoric sites 18WO193 and 18WO203, are of unknown age that have the potential to contain intact, subplowzone archeological deposits. These three sites are within areas likely to be impacted by construction of one of the alternates retained for detailed study. Further archeological work will be undertaken at the appropriate time on the prehistoric sites considered potentially eligible for the National Register and subject to impact from the project.

Site 18WO215 is a Woodland period site with evidence to suggest that it may have been a habitation site. While it may be eligible for the National Register, it is outside the project's construction limits and will not be impacted by the undertaking.

The remaining seven sites with prehistoric components located within the project's APE appear to lack the artifact density, patterned artifact distributions, or intact deposits necessary to provide significant data concerning the prehistoric occupation of the Eastern Shore. For these reasons, Phase I survey concluded that they are unlikely to be able to yield important information, and are not considered eligible for the National Register of Historic Places.

Fourteen potentially significant historic, rural/residential sites were identified within the construction limits of the undertaking, five dating to the 18th and 19th centuries (18WO183, 18WO190, 18WO194, 18WO201, and 18WO204), two dating exclusively to the 19th century (18WO181 and 18WO185), two dating between the 18th and 20th centuries (18WO191 and 18WO195), and five dating to the 19th and 20th centuries (18WO196, 18WO197, 18WO209, 18WO212, and 18WO214). Testing at these sites suggests that intact features, subplowzone deposits, or artifact distributions might be present that could yield significant sociocultural and economic information relating to early agrarian lifeways in the region. The existence of a sizable sample of potentially significant historic period sites also makes it possible to evaluate temporal differences between sites reflecting changing sociocultural or socioeconomic conditions.

Testing of historic site 18WO202 encountered the remains of a brick pier beneath the plowzone, and the landowner suggested that a blacksmith shop or foundry once stood at this location. The site may be able to provide important information about historic economic, commercial, and industrial patterns, and may be eligible for the National Register.

In all, fifteen historic period sites that may be eligible for the National Register are likely to be impacted by one of the alternates under study, and will require Phase II archeological evaluation to determine their eligibility.

Historic period sites 18WO215 and 18WO216 may be eligible for the National Register, but are outside the project's construction limits and will not be impacted by the undertaking.

The remaining 24 sites with historic period components appear to lack the artifact density, patterned artifact distributions, or intact deposits necessary to provide important information about the history of the region. For these reasons, they are unlikely to be able to yield important information, and are not considered eligible for the National Register of Historic Places.

C. Topography, Geology, and Soils

1. Topography

Worcester County is located entirely within the Coastal Plain Province where the topography of the land is generally low lying and very gently rolling. However, steep areas are encountered within the county. Slopes are found along swales and ridges, stream channels,

depressions and dunes. The highest point encountered in Worcester County is 65 feet above sea level and is located near Furnace, Maryland approximately 4 miles northwest of Snow Hill, Maryland (SCS, 1973).

2. Geology

The study area is located entirely within the Coastal Plain Physiographic Province and consists of sediments deposited in the Quaternary and Tertiary Ages (Quaternary age is from the present to two million year before the present; Tertiary age is from two million to 65 million years before the present) based upon the Geologic Map of Worcester County, Maryland, 1978. The Quaternary and Tertiary sediments consist of gravel, sand, silt, clay, and shell fragments and are generally more than one mile thick. Crystalline bedrock of the Precambrian and Paleozoic Ages underlies these sediments and dips to the southeast (Maryland Geologic Survey, 1978).

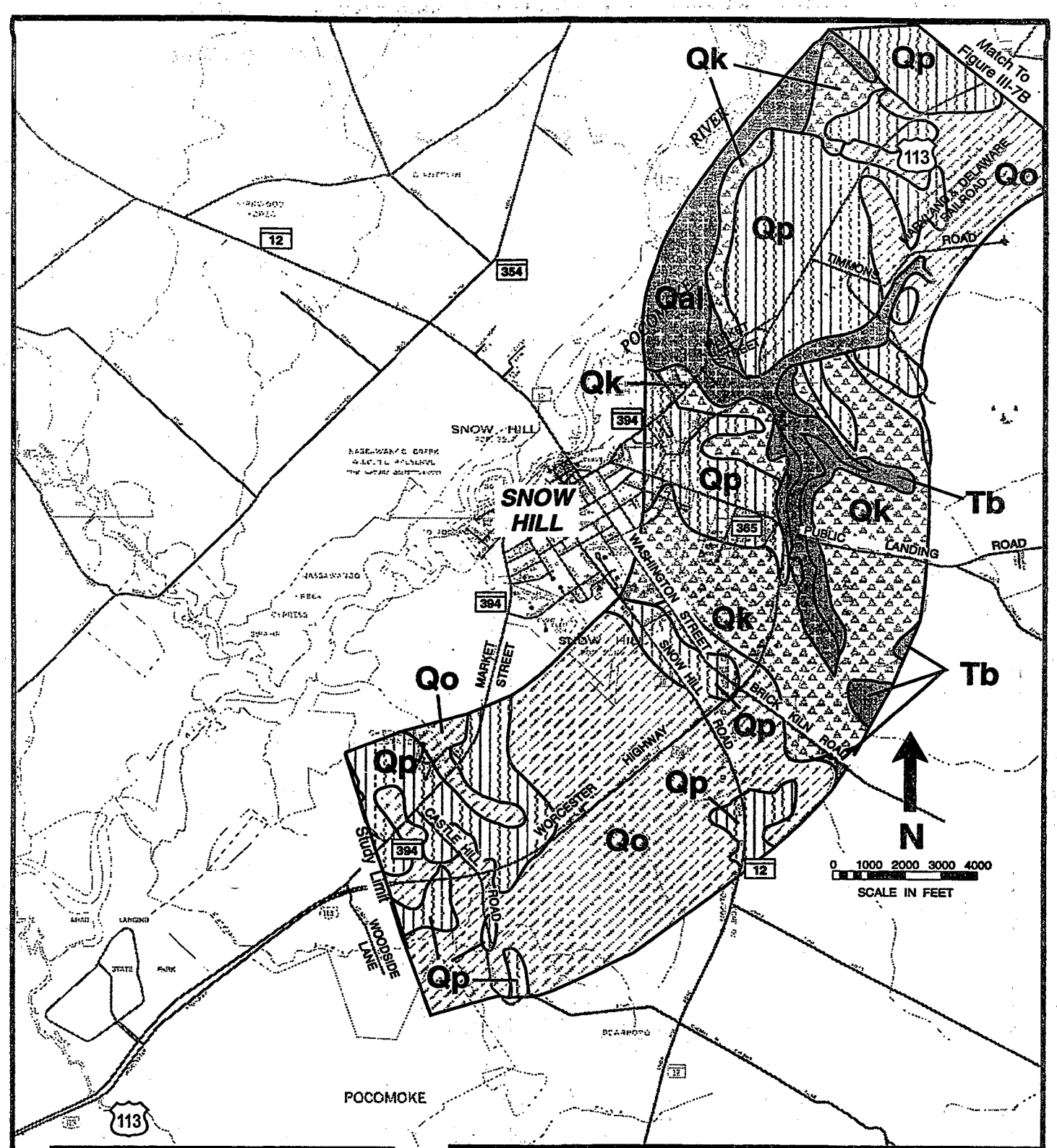
The sediments deposited in the Quaternary period consist mainly of the Omar Formation with minor amounts of the Ironshire and Parsonsburg Sand Formations. Isolated areas of the Kent Island Formation and alluvium are encountered along the alignment (Maryland Geologic Survey, 1978). The surficial geology of the study area is shown on Figures III-7A through 7D.

The Omar Formation consists of two major interstratified sediment facies: light colored sand and dark-colored sandy clay-silt or silty clay. The light colored facies are mostly medium sands, typically 15 feet thick, and the dark colored facies are interbedded silty sands, silts and silty clay varying in thickness from three to five feet. The maximum thickness of this formation is about 65 feet (Maryland Geologic Survey, 1978).

The Ironshire Formation consists of two major sediment facies: the light-colored sand facies and the light- to dark-colored silty to clayey sand and sandy silt. These facies grade into interbedded sands and clays in a northerly direction. The Parsonsburg Sand Formation consists of light colored medium to coarse grained sand on isolated ridges bordered by the Omar Formation (Maryland Geologic Survey, 1978).

The Kent Island Formation consists of interstratified clay, silt and sand and is most widespread in the Pocomoke River Valley. This formation ranges in thickness from less than three feet to in excess of 40 feet. Alluvial soils are encountered generally along streams and consist of sand, gravelly sand and clayey swamp deposits. These deposits are loosely consolidated and range in thickness from approximately three to six feet (Maryland Geologic Survey, 1978).

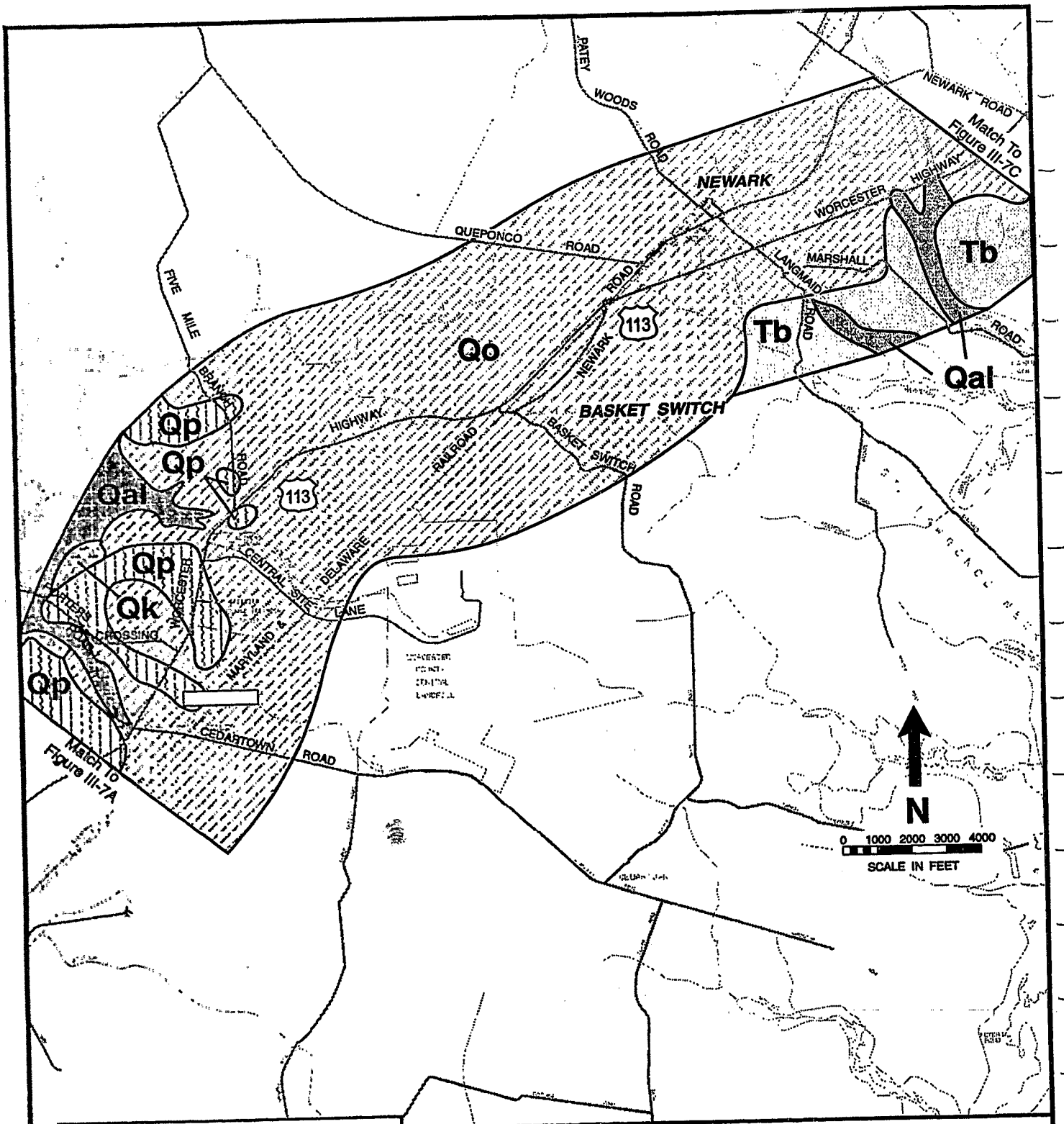
Within the project study areas, the Tertiary deposits underlying the Quaternary deposits consist of the Beaverdam Sand and Yorktown-Cohansey (?) Formations. The Beaverdam sand deposits of the Pliocene Age (from two million to five million years before the present) consist of sand and silty sand interbedded with gravelly sand and clay-silt and are exposed



Legend

- Qo Omar Formation
- Qi Ironshire Formation
- Qp Parsonsburg Sand
- Qk Kent Island Formation
- Qal Alluvium
- Tb Beaverdam Sand

KEY MAP	US 113 PLANNING STUDY	
A B C D	**Geologic Map** **SOUTHERN STUDY AREA**	
	Maryland State Highway Administration	February 1998	Figure III-7A



Legend

- Qo Omar Formation
- Qi Ironshire Formation
- Qp Parsonsburg Sand
- Qk Kent Island Formation
- Qal Alluvium
- Tb Beaverdam Sand

KEY MAP

A B C D

US 113 PLANNING STUDY

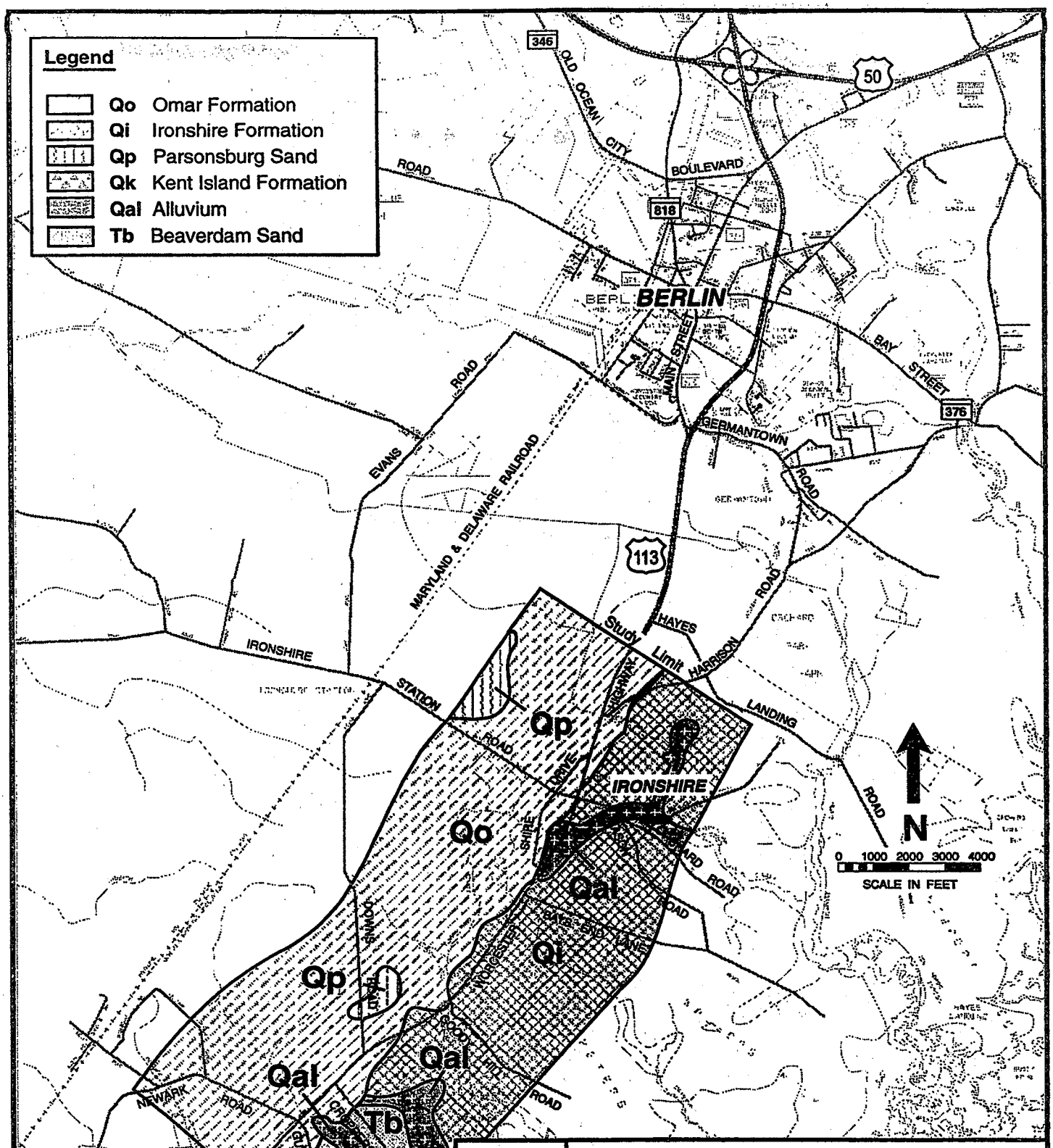
Geologic Map

SOUTHERN STUDY AREA

Maryland State Highway Administration

February 1998

Figure III-7B



KEY MAP

A B C D

US 113 PLANNING STUDY

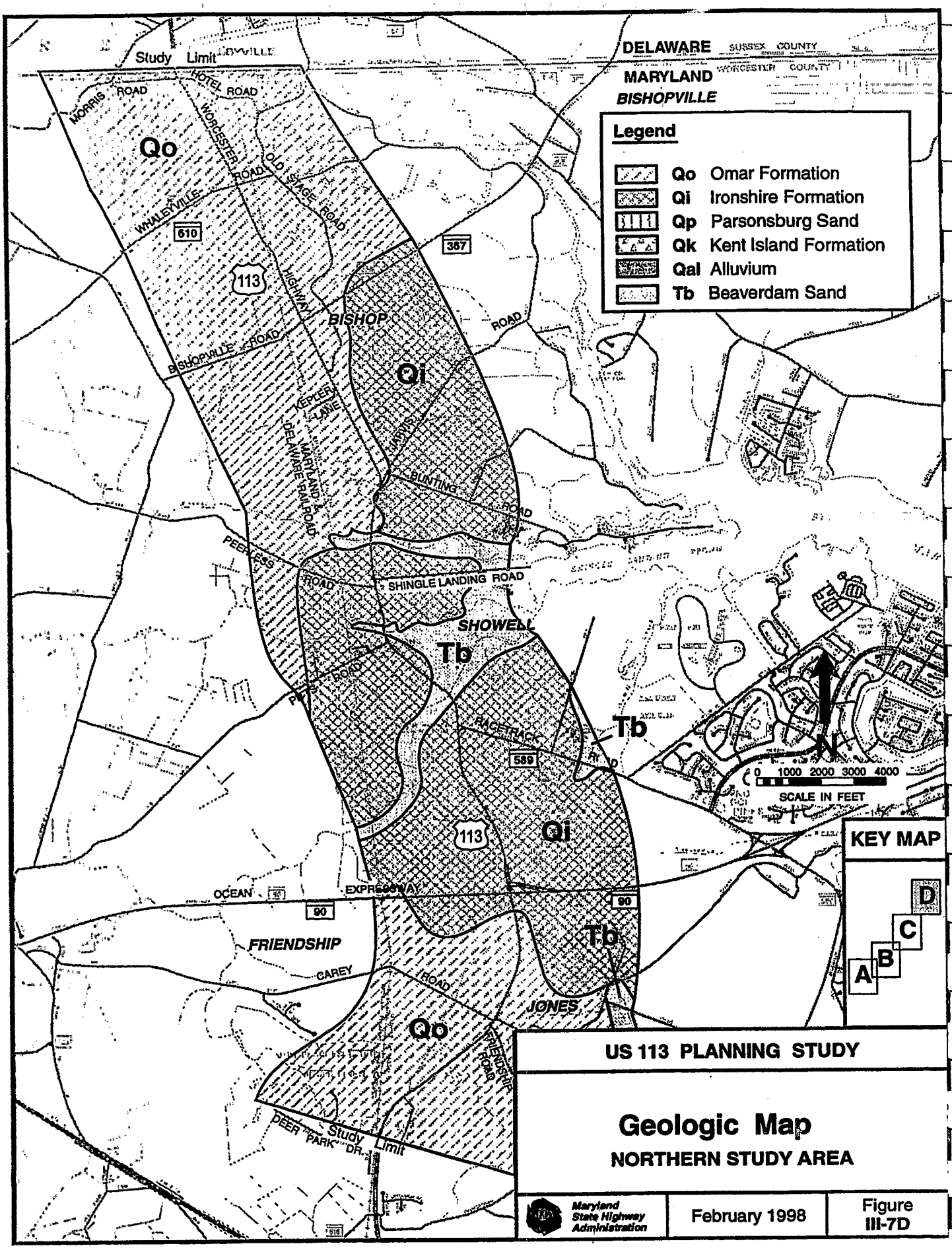
Geologic Map

SOUTHERN STUDY AREA

Maryland State Highway Administration

February 1998

Figure III-7C



US 113 PLANNING STUDY

Geologic Map

NORTHERN STUDY AREA

Maryland State Highway Administration | February 1998 | Figure III-7D

at the northern portion of the study area at deep channels. This formation is thickest north of Ocean City, Maryland where it is more than 100 feet thick (Maryland Geologic Survey, 1978).

The Yorktown-Cohansey (?) Formation of the Miocene Age (from five million to 23 million years before the present) in the Tertiary Period underlies the Beaverdam Sand and is not exposed at the surface. These sediments are predominantly interbedded clay-silt and sand or gravelly sand (Maryland Geologic Survey, 1978).

3. Soils

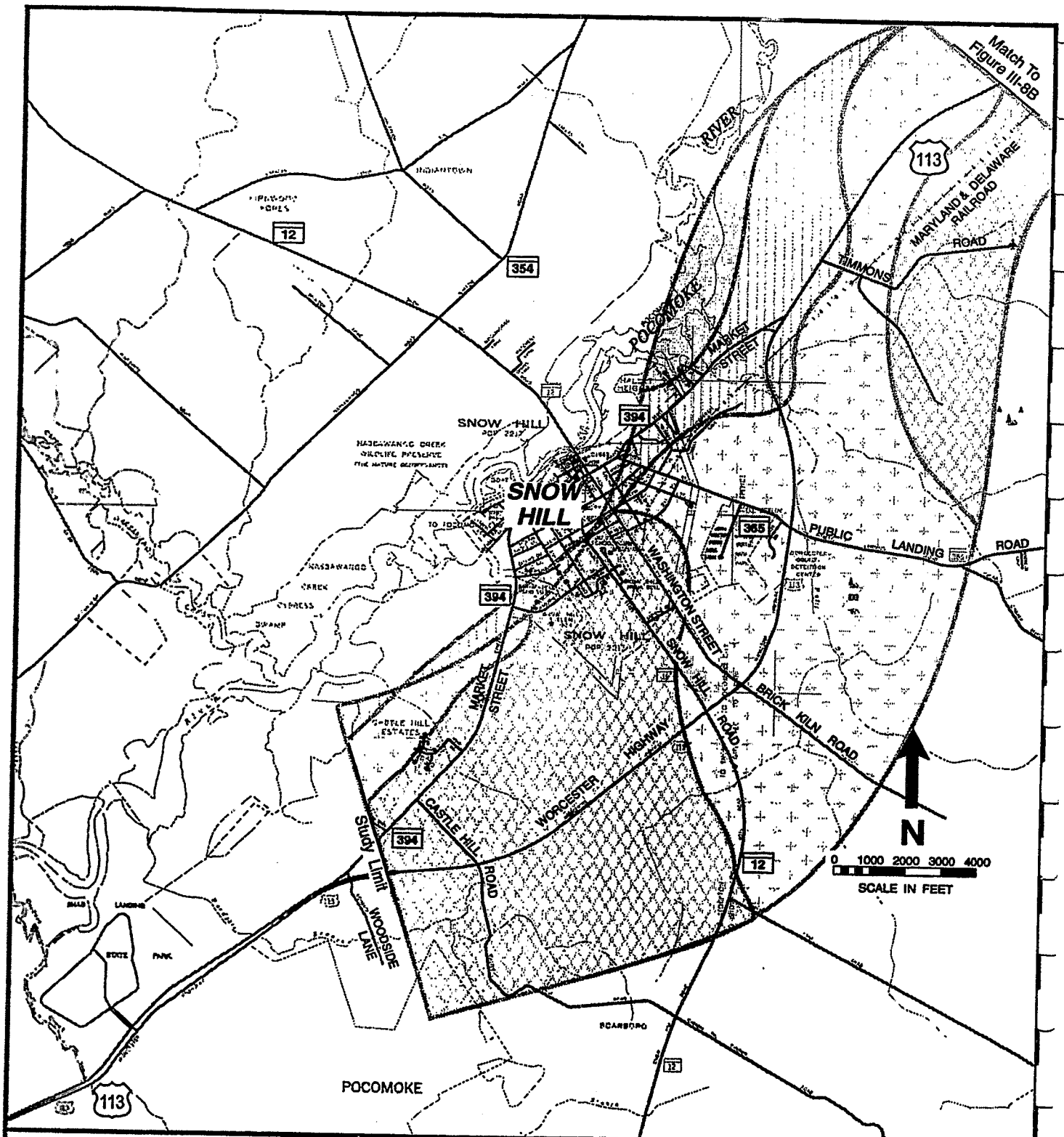
Based upon the Soil Conservation Service (SCS) Soil Survey for Worcester County, Maryland, 1973, the soils encountered along the project alignment consist primarily of sandy loams and silt loams underlain by loamy sands or sands. These soils are classified into soil series according to similar soil profiles as determined by the Soil Survey. The soil series encountered along the majority of the project alignment are the Othello, Fallsington, Woodstown, Sassafras, Mattapex, Matapeake and Pocomoke series. Other soils series encountered are the Fort Mott, Lakeland, Klej, Portsmouth and Plummer series (SCS, 1973).

A brief description of the common soil series encountered within the study areas are contained in Table III-12. The soil series have been grouped into soil associations based on similar soil forming processes and geographic setting. These associations are shown on Figures III-8A through 8D.

Table III-12: Description of Common Soil Series in the Study Area

Soil Series	Description
Othello Series	Nearly level, poorly drained silt loam
Fallsington Series	Nearly level, poorly drained sandy loam to loam
Woodstown Series	Gently sloping, moderately well drained sandy loam to loam
Sassafras Series	Level to steep, well drained sandy loam to loam
Mattapex Series	Gently sloping, moderately well drained sandy loam to loam
Matapeake Series	Level to steep, well drained sandy loam
Pocomoke Series	Nearly level, poorly drained sandy loam to loam

The characteristics of each of the soil series have been evaluated for the suitability of the soils for engineering projects. The properties of soils important for design and construction include permeability, compactibility, drainage and shrink-swell potential. Other considerations are topography, natural drainage, depth to ground water and hazard of flooding (SCS, 1973).



Legend

- Fallsington-Woodstown-Sassafras Association
- Mattapex-Matapeake-Portsmouth Association
- Othello-Fallsington-Portsmouth Association
- Pokomoke-Rutledge-Plummer Association
- Muck Association
- Lakeland-Klej-Plummer Association

KEY MAP

A B C D

US 113 PLANNING STUDY

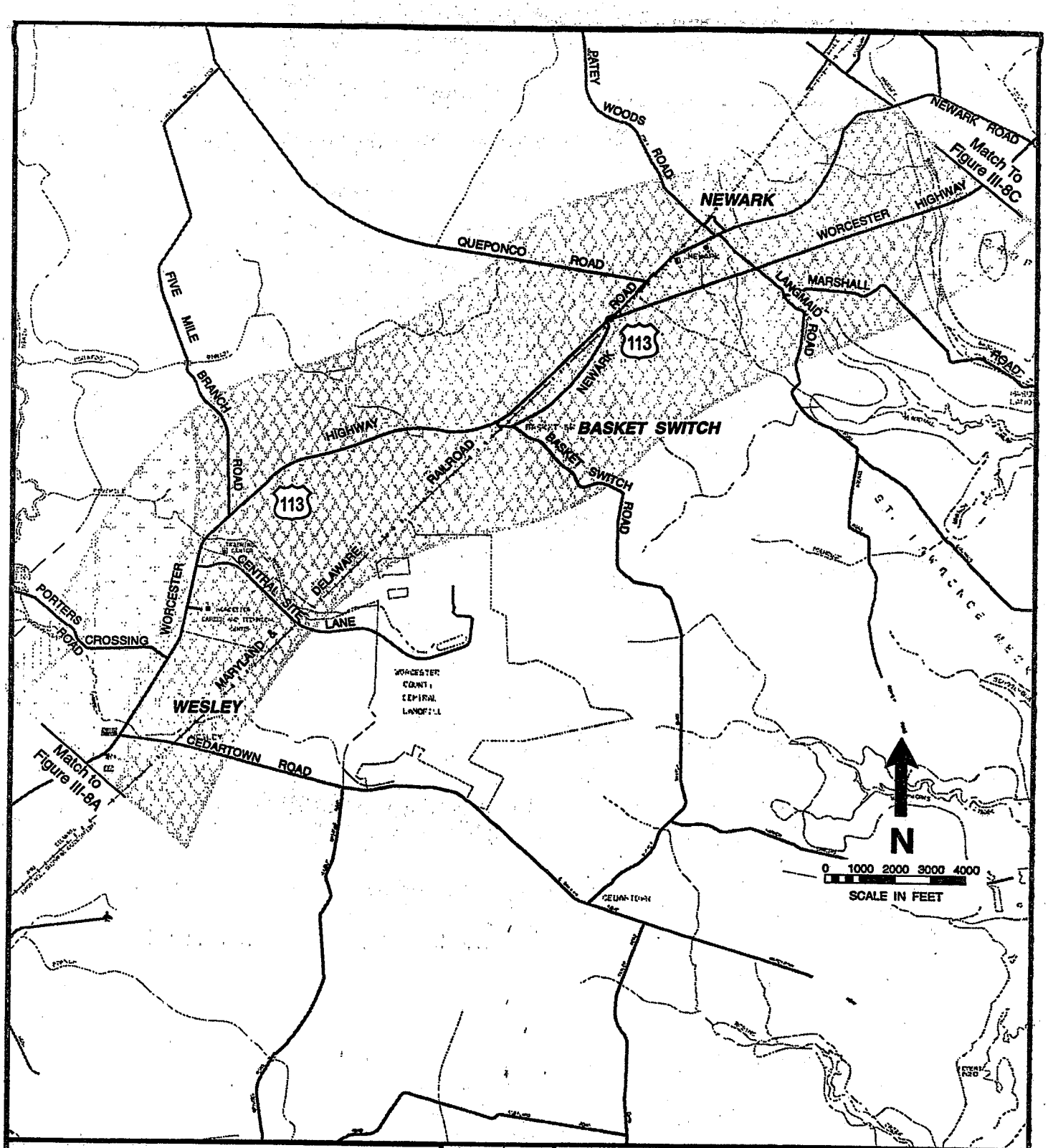
Soil Associations

SOUTHERN STUDY AREA

Maryland State Highway Administration

February 1998

Figure III-8A



Legend

- Fallsington-Woodstown-Sassafras Association
- Mattapex-Matapeake-Portsmouth Association
- Othello-Fallsington-Portsmouth Association
- Pokomoke-Rutledge-Plummer Association
- Muck Association
- Lakeland-Klej-Plummer Association

KEY MAP

A B C D

US 113 PLANNING STUDY

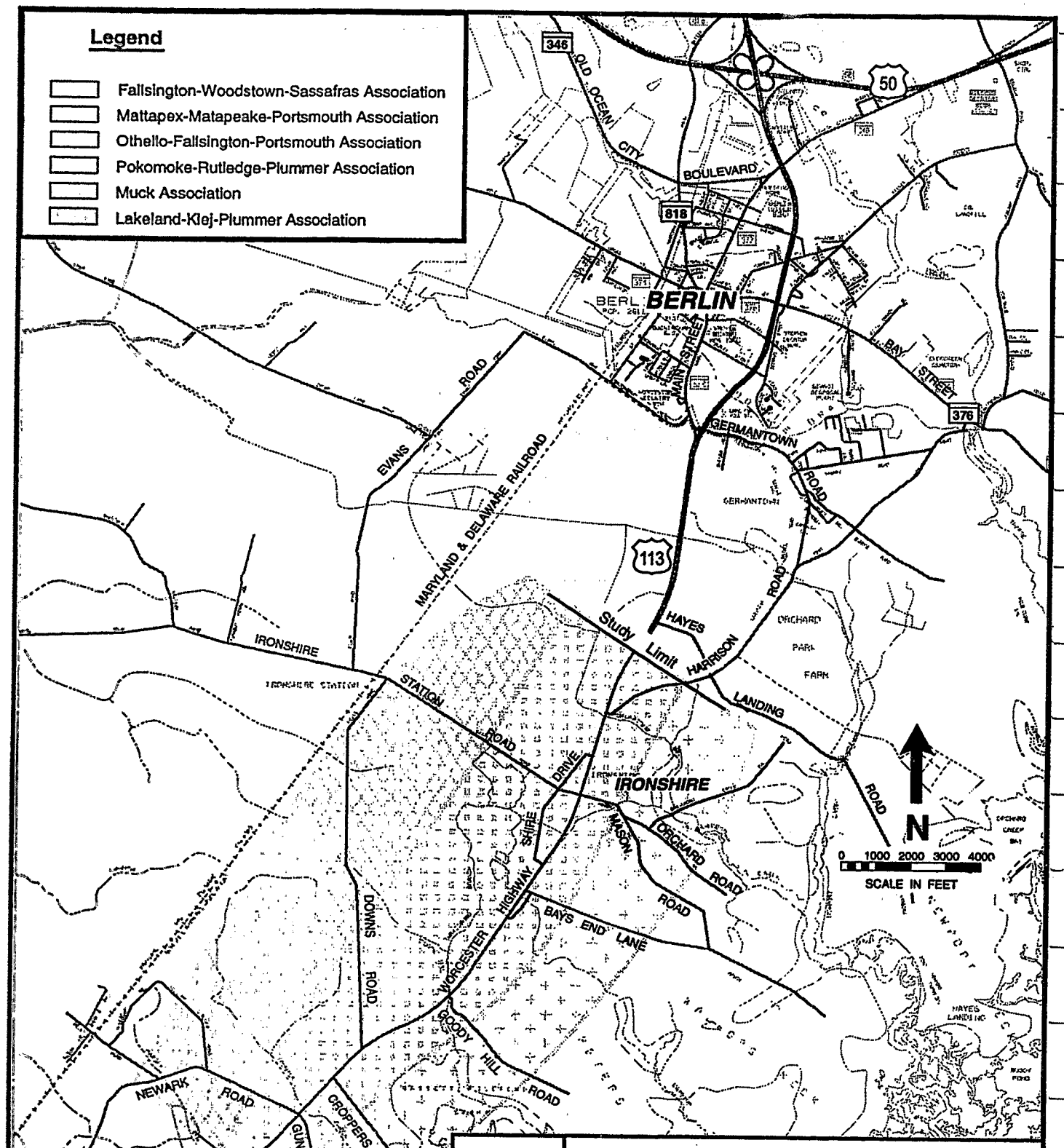
Soil Associations

SOUTHERN STUDY AREA

Maryland State Highway Administration

February 1998

Figure III-8B



US 113 PLANNING STUDY

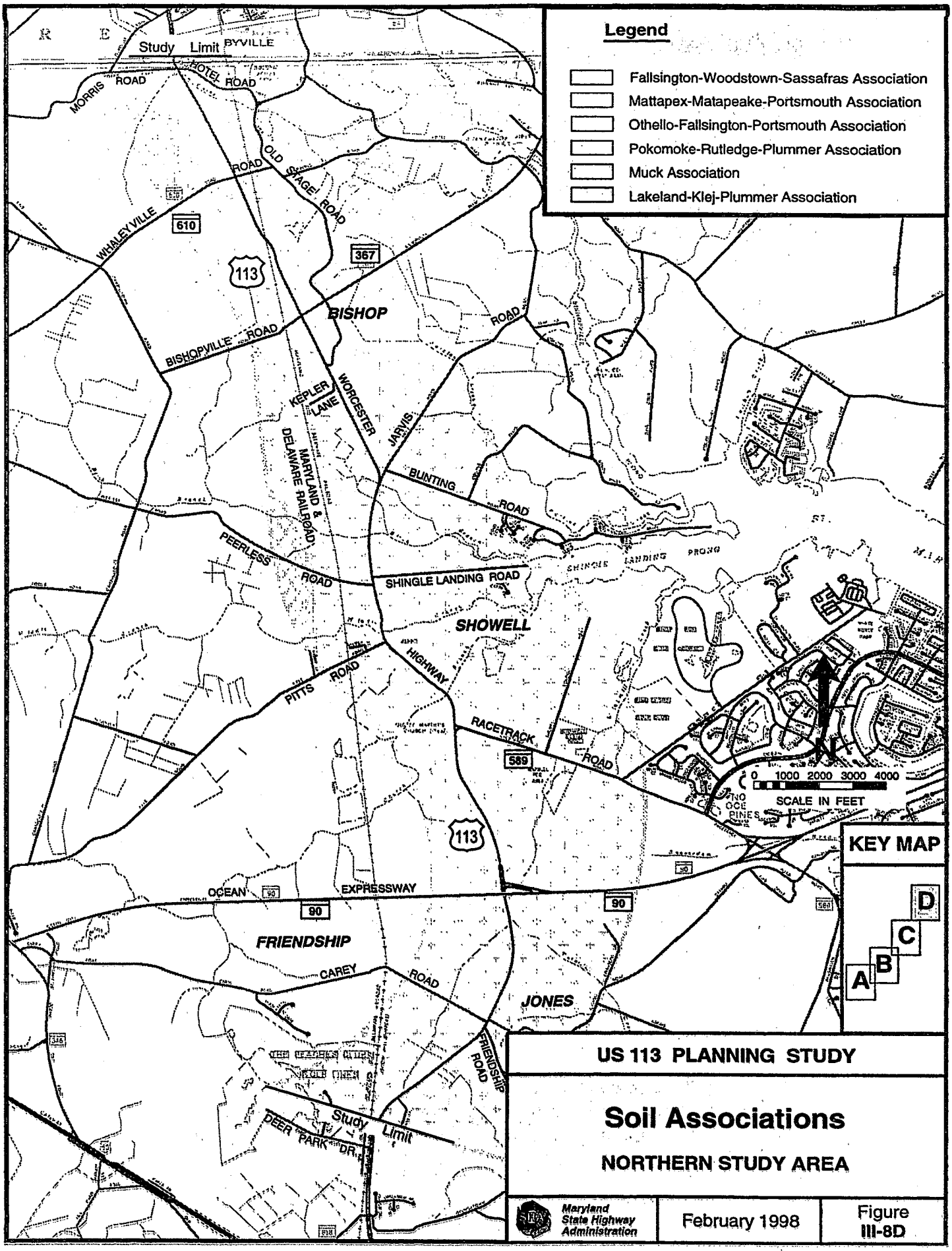
Soil Associations

SOUTHERN STUDY AREA

Maryland State Highway Administration

February 1998

Figure III-8C



US 113 PLANNING STUDY

Soil Associations

NORTHERN STUDY AREA

Maryland State Highway Administration

February 1998

Figure III-8D

The estimated permeability of the soils encountered along the project ranges from low to high. The Othello, Fallsington and Mattapex series contain soils with permeabilities as low as 0.2 inches per hour. Soils encountered in all of the series within the study area are estimated to have permeabilities as high as 6.3 inches per hour. The soils range from poorly drained to well drained and have little potential for shrink-swell. Most of the soils, however, are severely affected by frost action. Soils in each of the soil series are affected by a seasonable high water level with the water table near ground surface (SCS, 1973).

Representative soils have been tested by the SCS to determine maximum soil density. Maximum dry densities of the soils in the soil series encountered within the study area vary from 90 to 125 pounds per cubic foot with optimum moisture contents ranging from 7 to 18 percent (SCS, 1973). The compaction standard to which the test results conform was not stated by the Survey. Soil density testing for soils within the study area should be performed at locations of proposed roadways, pipelines, and embankments to verify published information.

Soils encountered along the project alignment have been evaluated for pipeline, roadway, and embankment constructability. The Othello soils provide poor stability for pipeline, roadway, and embankment construction. These soils are highly erodible and are susceptible to severe frost action. The ground water table is encountered at or near ground surface (SCS, 1973).

The Mattapex and Pocomoke soils provide fair stability for construction. Ground water is high and the soils are susceptible to severe frost action. The Mattapex soils are highly erodible while the Pocomoke soils are moderately erodible (SCS, 1973).

The Fallsington and Matapeake soils provide fair to good stability for construction. The Fallsington soils contain a high water table where the Matapeake soils encounter water at more than five feet in depth. Soils in each of these series are susceptible to severe frost action and are moderately erodible (SCS, 1973).

The Sassafras and Woodstown soils provide good stability for pipeline, roadway, and embankment construction. The Woodstown soils have a high water table and are susceptible to severe frost action. The Sassafras soils encounter water at more than five feet in depth and are subject to moderate frost action. Soils in each of these series are moderately erodible (SCS, 1973).

D. Farmlands

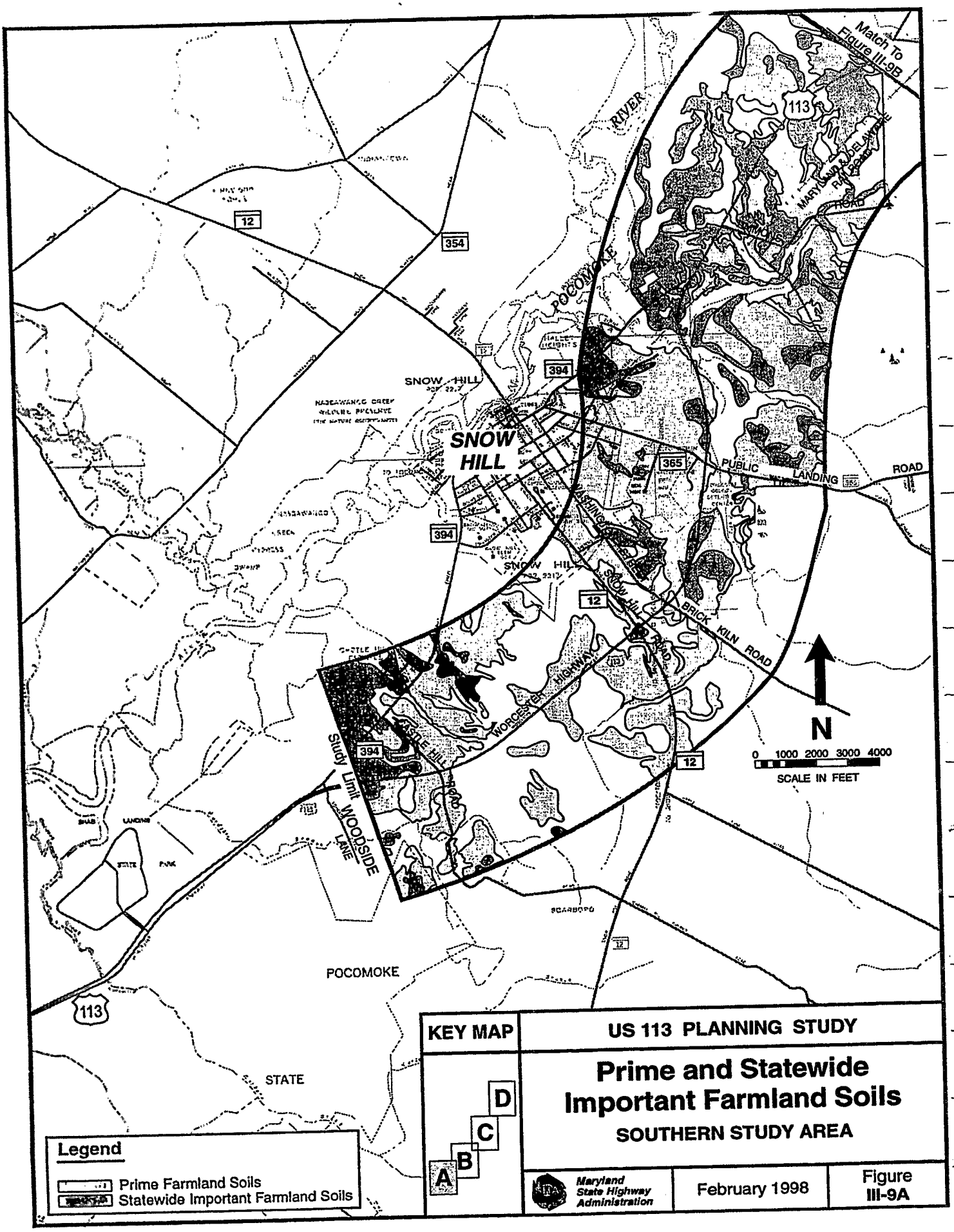
1. Introduction

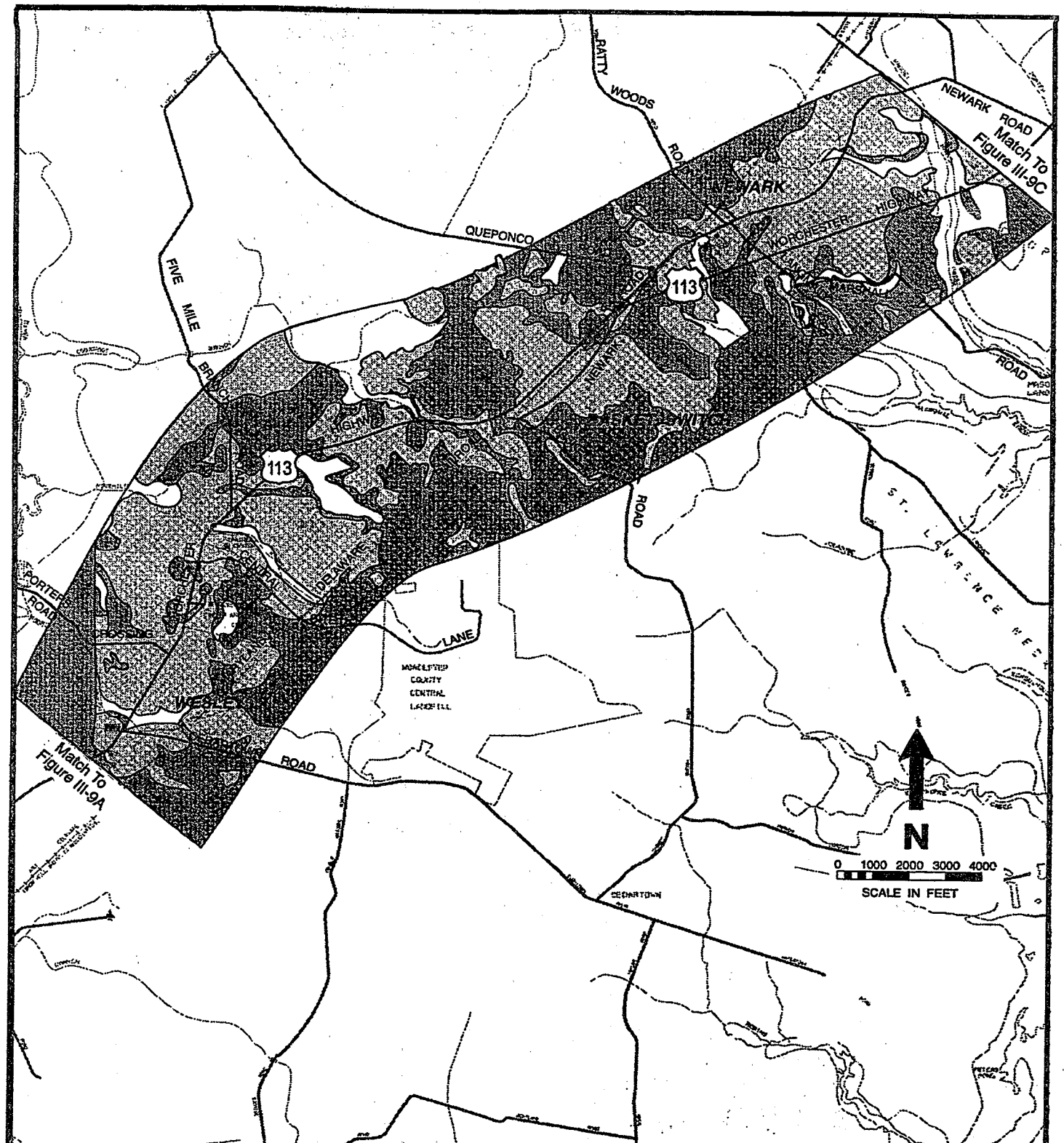
Agriculture is the dominant land use adjacent to US 113 in the study area. In Worcester County, farms are located throughout the project corridor with cultivated fields and chicken houses as the dominant agricultural features. Poultry processing and feed mill operations are located in Bishop, Showell, Berlin and Snow Hill. Figures III-3A through 3D show the

agricultural land use within the study area. The crops that are mostly grown in the study area are corn, soybeans, barley and wheat according to the Worcester County USDA Natural Resources Conservation Service (NRCS).

2. Farmland Soils

The NRCS, formerly the Soil Conservation Service (SCS) located in Snow Hill was contacted to obtain information regarding prime farmland soils and farmland soils of statewide importance. Listings of these soils were received, reviewed, and coordinated with maps in the Soil Survey of Worcester County, dated May, 1973. The prime farmland soils and soils of statewide importance are shown in Tables III-13 and III-14, respectively, as well as in Appendix B. Figures III-9A through 9D show the distribution of the prime and statewide important farmland soils in the southern and northern study areas.

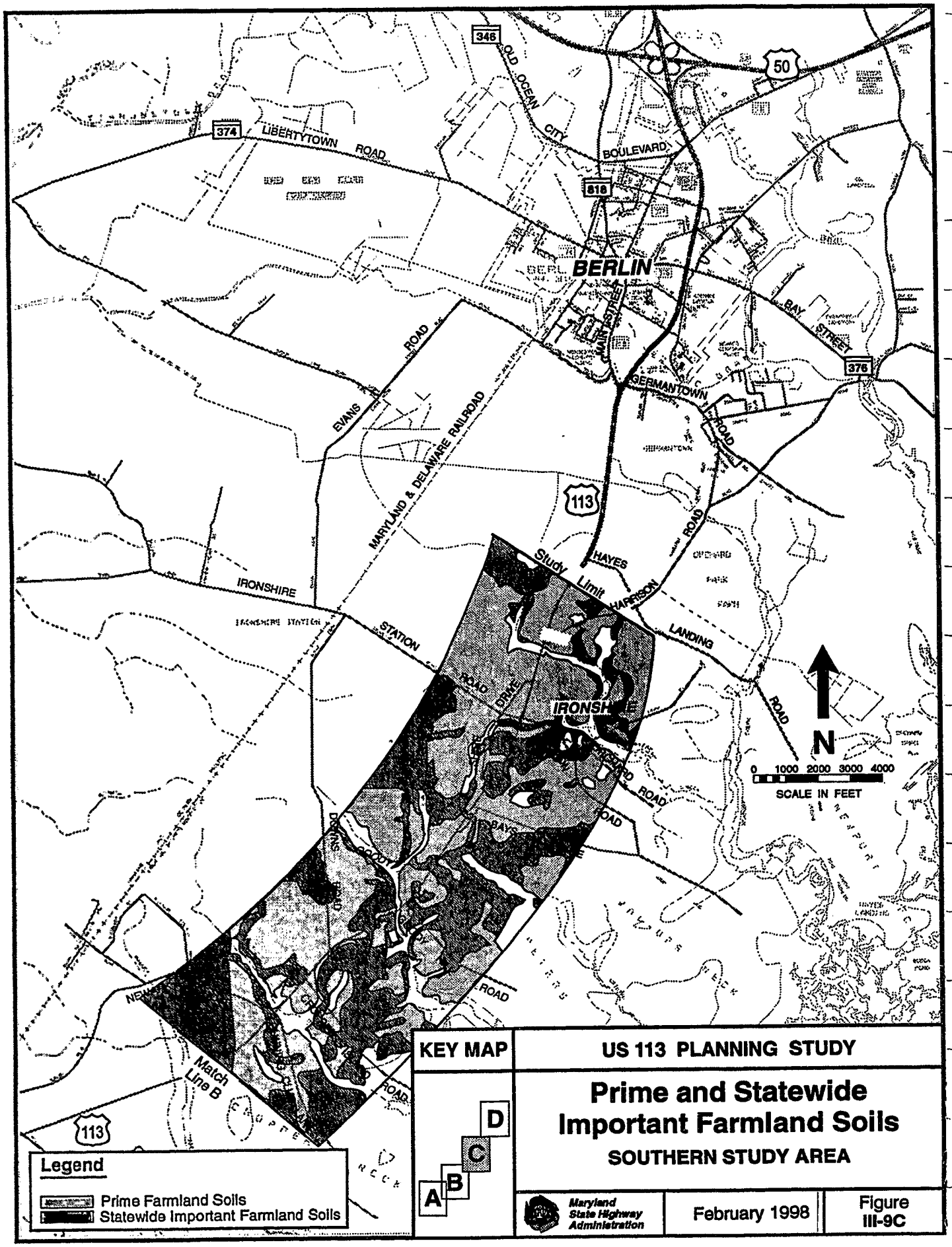

Match To Figure III-9B
POCOMOKE RIVER
113
12
354
394
SNOW HILL
365
PUBLIC LANDING ROAD
BRICK KILN ROAD
WORCESTER HIGHWAY
CASTLE HILL ROAD
Study Limit
WOODSIDE LANE
STATE PARK
SCARBORO
POCOMOKE
STATE
N
0 1000 2000 3000 4000
SCALE IN FEET
Legend
Prime Farmland Soils
Statewide Important Farmland Soils
KEY MAP
A
B
C
D
US 113 PLANNING STUDY
Prime and Statewide Important Farmland Soils
SOUTHERN STUDY AREA
Maryland State Highway Administration
February 1998
Figure III-9A

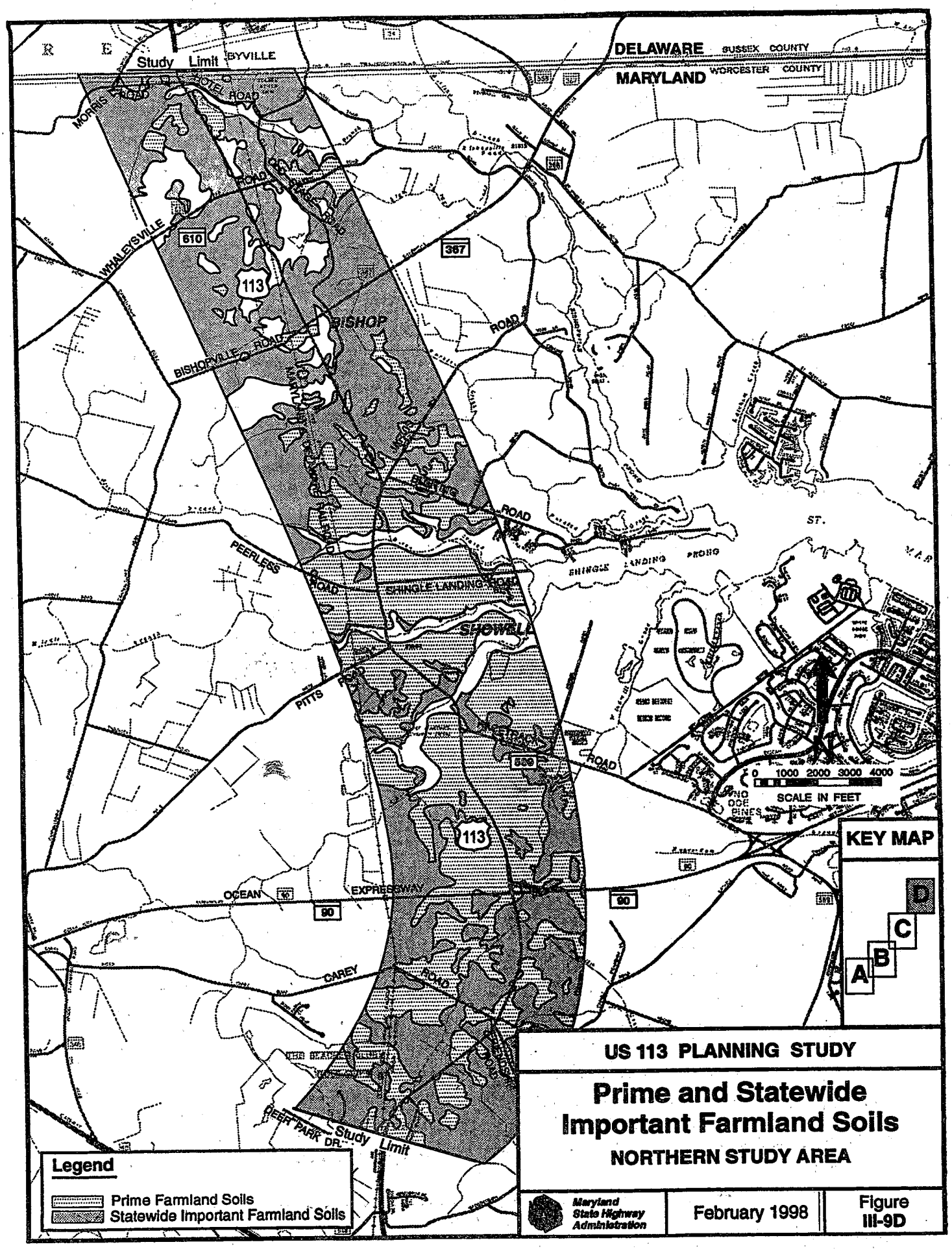


Legend

- Prime Farmland Soils
- Statewide Important Farmland Soils

KEY MAP	US 113 PLANNING STUDY	
A B C D	**Prime and Statewide Important Farmland Soils** SOUTHERN STUDY AREA	
	Maryland State Highway Administration	February 1998	Figure III-9B


346
OLD OCEAN CITY BOULEVARD
50
374
LIBERTYTOWN ROAD
818
BERLIN
MAIN STREET
RAY STREET
376
GERMANTOWN ROAD
EVANS ROAD
MARYLAND & DELAWARE RAILROAD
113
HAYES ROAD
Study Limit
HARRISON LANDING ROAD
IRONSHIRE
STATION ROAD
DRIVE
IRONSHIRE
ROAD
N
0 1000 2000 3000 4000
SCALE IN FEET
DOUGLAS
ROAD
Match Line B
113
Legend
Prime Farmland Soils
Statewide Important Farmland Soils
KEY MAP
A
B
C
D
US 113 PLANNING STUDY
Prime and Statewide Important Farmland Soils
SOUTHERN STUDY AREA
Maryland State Highway Administration
February 1998
Figure III-9C



US 113 PLANNING STUDY

Prime and Statewide Important Farmland Soils

NORTHERN STUDY AREA

Maryland State Highway Administration | February 1998 | Figure III-9D

Table III-13: Prime Farmland Soils

Soil Survey Symbol	Soil Name
MdA	Matapeake fine sandy loam, 0 to 2 percent slopes
MdB	Matapeake fine sandy loam, 2 to 5 percent slopes
MeA	Matapeake silt loam, 0 to 2 percent slopes
MeB	Matapeake silt loam, 2 to 5 percent slopes
MoA	Mattapex fine sandy loam, 0 to 2 percent slopes
MoB	Mattapex fine sandy loam, 2 to 5 percent slopes
MpA	Mattapex loam, 0 to 2 percent slopes
MpB	Mattapex loam, 2 to 5 percent slopes
MtA	Mattapex silt loam, 0 to 2 percent slopes
MtB	Mattapex silt loam, 2 to 5 percent slopes
SmA	Sassafras loam, 0 to 2 percent slopes
SmB2	Sassafras loam, 2 to 5 percent slopes moderately eroded
SaA	Sassafras sandy loam, 0 to 2 percent slopes
SaB2	Sassafras, sandy loam, 2 to 5 percent slopes moderately eroded
WoA	Woodstown loam, 0 to 2 percent slopes
WoB	Woodstown loam, 2 to 5 percent slopes
WdA	Woodstown sandy loam, 0 to 2 percent slopes
WdB	Woodstown sandy loam, 2 to 5 percent slopes

Table III-14: Soils of Statewide Importance

Soil Survey Symbol	
Fg	Fallsington loam
Fa	Fallsington sandy loam
FmA	Fort Mott loamy sand, 0 to 2 percent slopes
FmB	Fort Mott loamy sand, 2 to 5 percent slopes
KsA	Klej loamy sand, 0 to 2 percent slopes
KsB	Klej loamy sand, 2 to 5 percent slopes
LmB	Lakeland loamy sand, clayey substratum, 0 to 5 percent slopes
LlB	Lakeland sand, clayey substratum, 0 to 5 percent slopes
LoB	Lakeland-Fort Mott loamy sands, 0 to 5 percent slopes
MdC	Matapeake fine sandy loam, 5 to 10 percent slopes
MeC	Matapeake silt loam, 5 to 10 percent slopes
Ot	Othello silt loam
Pm	Pocomoke loam drained
Pk	Pocomoke sandy loam, drained
Pr	Portsmouth sandy loam
Pt	Portsmouth silt loam
SaC2	Sassafras sandy loam, 5 to 10 percent slopes, moderately eroded
St	St. Johns loamy sandy
Su	St. Johns mucky loamy sand

The Farmland Protection Policy Act (FPPA), as amended in 1984 and 1994, includes new criteria defining the situations to which the FPPA applies and to which a Form AD-1006 is required. Under this legislation, Federal programs are administered in compatibility with state and local government, and private programs and policies to protect farmland. Under this legislation, farmland is defined by the NRCS in Worcester County as Prime Farmland Soils and Soils of Statewide Importance (NRCS, 1996). The criteria for these designations are related to soil characteristics such as texture, erodibility, depth to water table, slope, and available moisture.

The prime farmland soils in the northern and southern study areas have been categorized by the SCS as being in Capability Class I. Class I soils have few limitations that restrict their use, as they are well drained, occurring on nearly level uplands. Soils of statewide importance in the study areas include soils in Capability Classes II, III and V. The Class II and III soils have moderate to severe limitations, such as erosion and variable hydrology, that reduce the choice of plants and require moderate or special conservation practices. The Class V soils have hydrology limitations impractical to remove that prohibit uses other than pasture, range, woodland or wildlife habitats.

The most prevalent soils within the southern study area are of the Othello-Fallsington-Portsmouth association with minor areas of the Fallsington-Woodstown-Sassafras and Mattapex-Matapeake-Othello associations. Soils in these associations vary, occurring on level to steeply sloping areas and are well-drained to poorly and very poorly drained and have subsoil layers dominantly of sandy clay loam or silty clay loam (SCS, 1973). Approximately 60 percent of these soils are actively being farmed at this time, while the remaining 40 percent occur as forested areas.

The most prevalent soils within the northern study area are of the Fallsington-Woodstown-Sassafras association. Soils in this association are generally poorly drained to well-drained occurring respectively on level terrain to steeper slopes. These soils have a dominant subsoil consisting of sandy clay loam (SCS, 1973). Approximately 56 percent of these soils are actively being farmed.

3. Farm Operation

Assessment of Farm Operations and Impacts

Following circulation of the **DEIS/Section 4(f) Evaluation** and in response to questions from several Federal resource agencies, a detailed study of farm owners and operators for the 1997 growing season was compiled using data from the Consolidated Farm Service Bureau in Snow Hill, MD. This information, while providing an accurate assessment of current parcel usage, is not applicable to future years due to the fact that farm parcel ownership and usage change due to crop changes, soil conservation measures, and economic factors. Also contributing to the variability of farm parcel usage is the fact that many farm operators do not own the land they use. While the study indicated 114 parcels (for this study, parcels

which cross US 113 were defined as two separate parcels to indicate the need of the operator to cross the highway), only 18 of the 114 parcels were farmed by the owner during 1997. The Natural Resources Conservation Service in Snow Hill states that many farm operators lease or own parcels that are not adjacent to one another and therefore farm vehicles often travel on the existing roadways.

A total of 43 farm operators were identified as operating on 114 parcels in the study area, 22 of the 43 operators cultivate only one parcel of land while the remaining 92 parcels are cultivated by 21 operators. Table III-15 shows the distribution of parcels among the farm operators. The average parcel size in Worcester County is 160 acres, but some farm operators cultivate nearly 3,000 acres located piecemeal throughout the region.

Table III-15: Farm Parcels per Operator Along US 113

No. of Parcels	1	2	3	4	5	6	7	8	9
No. of Operators	22	7	3	2	3	1	1	3	1

The access needs of farm operators vary according to the time of year and crop. Peak times of the year for farm vehicle travel on US 113 are planting time and harvesting time. During these times, farm vehicles are common on the roadway, as are the trucks that pick up and haul the produce to market. The mixture of these slow moving farm vehicles with other higher speed vehicles including tractor trailer trucks along US 113 creates an additional need for four travel lanes (a passing lane in each direction).

A count of farm access points compiled from aerial photography and field observations indicates that there are 70 to 90 farm access points along existing US 113 southern study area. In the northern study area, 40 to 55 farm access points were along Alternative 3N; 25 to 35 for Alternative 4N; and 25 to 40 for Combination Alternative 3N/4N.

To evaluate the impact of farm access needs on US 113, the distribution of parcels among the farmers was determined. Table III-16 shows all 43 farm operators, how many parcels they each operate, the location of the parcels referenced to the closest cross street, and the estimated travel length.

The amount of road travel required for each farm operator varies greatly. The maximum length of road travel predicted by this study is 8 miles, with the average among those traveling being 3¼ miles. These farm traffic operations reflect only those farm activities adjacent to the US 113 roadway, they do not reflect the farm traffic operations of farmers who travel US 113 to reach parcels outside of the corridor. For this reason, farm vehicle usage of US 113 discussed is a conservative estimate of actual farm traffic.

Table III-16: Distribution of Farm Operators Along US 113

Operator Number	Number of Parcels	Estimated Travel Length (miles)	Distribution
1	2		Newark Rd. (South)
2	1		Public Landing Rd.
3	3	6.0	Hayes Landing Rd to Peerless Rd.
4	1		Castle Hill Rd.
5	2	0.8	Peerless Rd. to Kepler Lane
6	1		Cedartown Rd.
7	5	7.6	Castle Hill Rd. to Five Mile Branch Rd.
8	6	6.8	Timmons Rd. to Gunning Club Lane
9	3	0.3	Goody Hill Rd. to Shire Rd.
10	2	0.8	Kepler Lane
11	2	0.5	Public Landing Rd.
12	1		Whaleyville Rd.
13	2	0.5	Porters Crossing Rd. to Five Mile Branch Rd.
14	1		Carey Rd.
15	1		Castle Hill Rd.
16	1		Five Mile Branch Rd.
17	1		Carey Rd.
18	9	8.0	Goody Hill Rd. to Peerless Rd.
19	5	3.3	Peerless Rd. to Morris Rd.
20	1		Racetrack Rd.
21	2	0.2	Carey Rd.
22	1		MD 90
23	1		Carey Rd.
24	8	5.0	Five Mile Branch Rd. to Gunning Club Rd.
25	3	0.7	Market St. to Timmons Rd.
26	1		Carey Rd.
27	1		Carey Rd.
28	5	6.8	Hayes Landing Rd. to Kepler Rd.
29	7	3.0	Cedartown Rd. to Newark Rd. (South)
30	8	3.5	Newark Rd. (South) to Goodyhill Rd.
31	2	2.4	Public Landing Rd. to Cedartown Rd.
32	1		Snow Hill Rd.
33	1		Public Landing Rd.
34	1		Cedartown Rd.
35	8	6.0	Hayes Landing Rd. to Peerless Rd.
36	1		Carey Rd.
37	1		Public Landing Rd.
38	4	2.2	Carey Rd. to Racetrack Rd.
39	1		Goodyhill Rd.
40	1		Carey Rd.
41	4	3.9	Snow Hill Rd. to Cedartown Rd.
42	1		Kepler Lane
43	1		Porters Rd.

The largest farm equipment typical in the study area includes combines and farm tractors with tillers, planters, and sprayers attached. Combines are typically 20 to 25 feet in width and farm tractor with implements attached are typically 18 to 20 feet in width. These widths can be reduced by several feet by removal of parts for travel, however, this time consuming and cumbersome procedure is rarely used by an operator intending to travel only a few miles along existing US 113.

The maximum speed of a typical piece of farm equipment is 25 mph. Slow speeds combined with the width of these vehicles interferes with general traffic operations. When possible, farm operators pull to the side of the road to allow traffic to pass. Because many drivers attempt to pass these farm vehicles, this movement must take place in the lane of opposite direction traffic along the two-lane portions of US 113.

E. Ground Water Resources

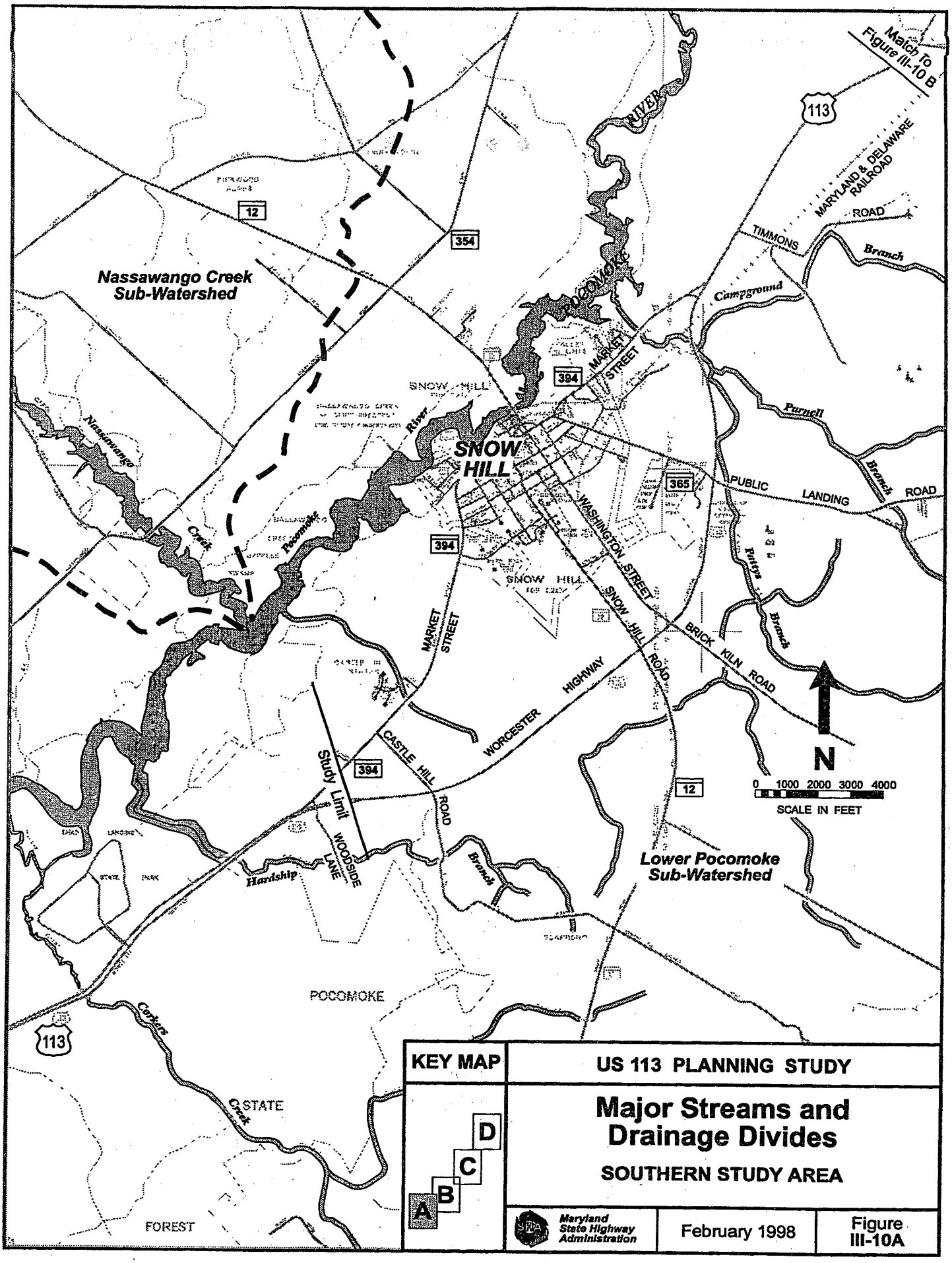
The project alignment lies within the Coastal Plain Physiographic Province where abundant water is available from water-bearing beds in the uppermost 500 feet of sedimentary deposits. Ground water occurs in 14 aquifers ranging from shallow to more than 7,700 feet below ground surface. Water in shallow wells is obtained from sediment of the Pleistocene and Pliocene Ages while water for principal areas is obtained from the Pocomoke and Manokin aquifers contained in the Yorktown-Cohansey (?) Formation (Maryland Department of Geology, Mining, and Water Resources, 1955).

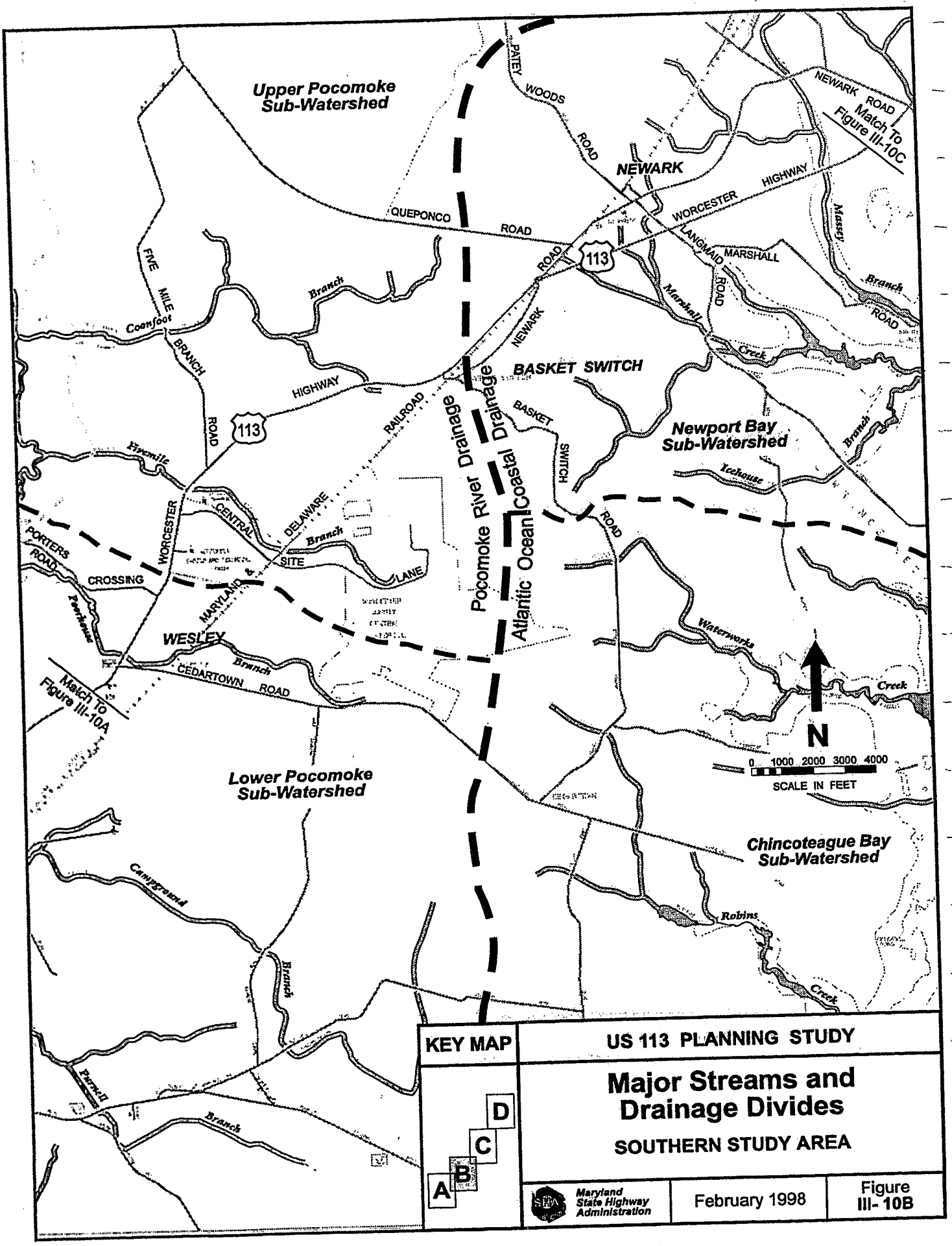
The majority of ground water comes from precipitation that filters through the soil or water that seeps in from streams. The low relief of the Coastal Plain and the permeability of the soils aid the retention and infiltration of water to recharge aquifers. Aquifers within this region are generally saturated by recharge from precipitation. It is estimated that 360 million gallons per day of water is available from water-bearing beds within the uppermost 500 feet of sedimentary deposits (Maryland Department of Geology, Mining and Water Resources, 1955). An abundant ground water supply is available for development within the project area.

Worcester County depends on ground water for its water supply. Residences and businesses in the northern and the southern study areas operate on well systems for their water supply and septic tanks for their waste management. Because of high recharge rates in the area and large water holding capacity of the unconsolidated sediments, wells that yield moderate to large quantities of water can be constructed almost anywhere in the region (Heath, 1984).

F. Surface Water Resources

Surface waters within the study area are comprised of ponds, streams, rivers and wetlands and are considered Waters of the U.S. and Waters of the State, including jurisdictional wetlands. Wetlands are discussed in detail in Section III-H. The study area lies within portions of the Pocomoke River and Atlantic Coastal drainages. Figures III-10A through 10D show the location of these surface water features and the drainage divide.


Match to Figure III-10 B
113
MARYLAND & DELAWARE RAILROAD
ROAD
TIMMONS
Branch
Campground
POCOMOKE
RIVER
12
354
Nassawango Creek Sub-Watershed
394
MARKET STREET
SNOW HILL
Purnell
Branch
Nassawango
Creek
Pocomoke
River
SNOW HILL
365
PUBLIC LANDING ROAD
WASHINGTON STREET
394
SNOW HILL
Pettys
Branch
MARKET STREET
SNOW HILL ROAD
BRICK KILN ROAD
HIGHWAY
WORCESTER
CASTLE HILL ROAD
Study Limit
394
12
N
0 1000 2000 3000 4000
SCALE IN FEET
WOODSIDE LANE
Hardship
Branch
Lower Pocomoke Sub-Watershed
POCOMOKE
Corkers
Creek
113
STATE
FOREST
KEY MAP
A
B
C
D
US 113 PLANNING STUDY
Major Streams and Drainage Divides
SOUTHERN STUDY AREA
Maryland State Highway Administration
February 1998
Figure III-10A



US 113 PLANNING STUDY

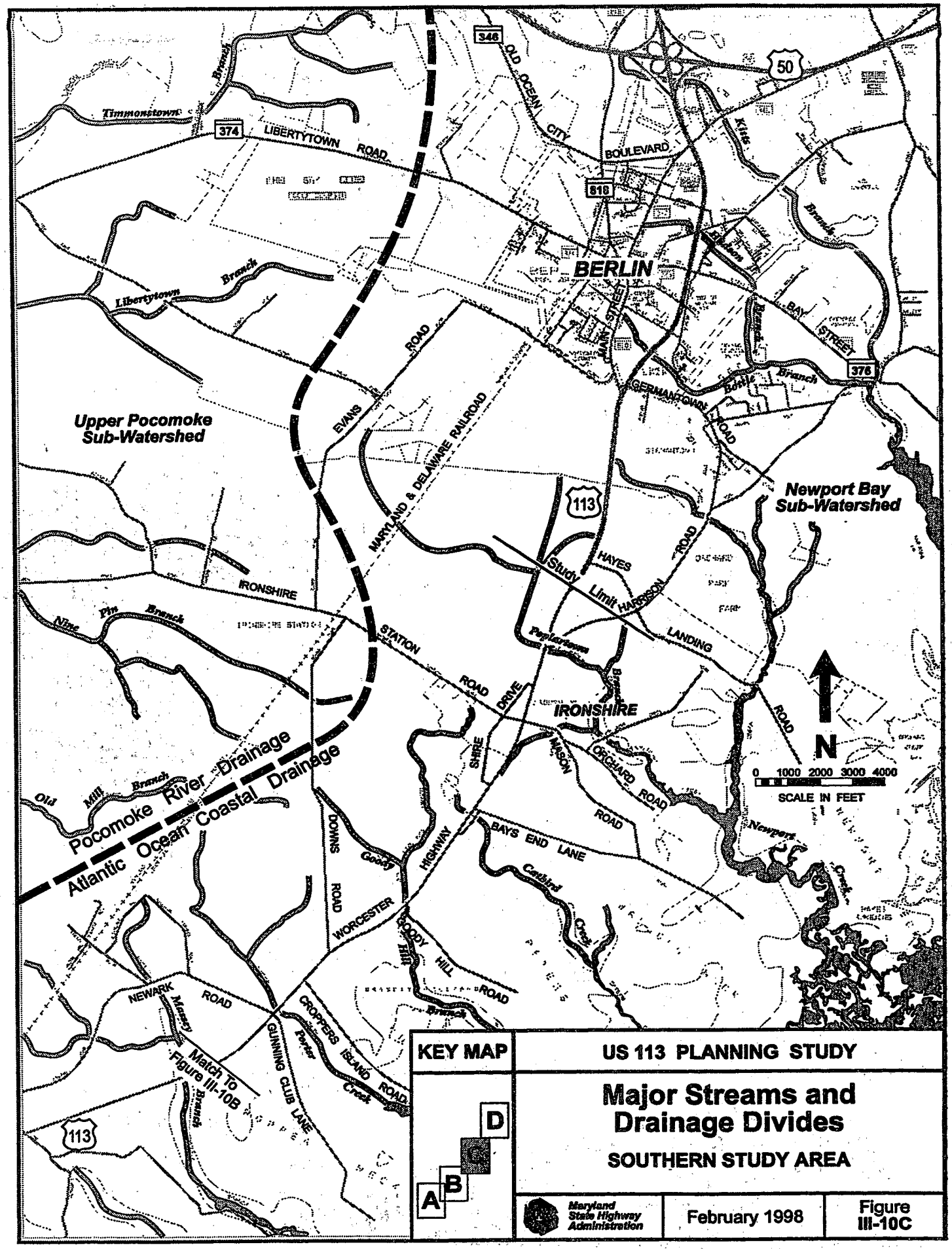
Major Streams and Drainage Divides

SOUTHERN STUDY AREA

Maryland State Highway Administration

February 1998

Figure III-10B



US 113 PLANNING STUDY

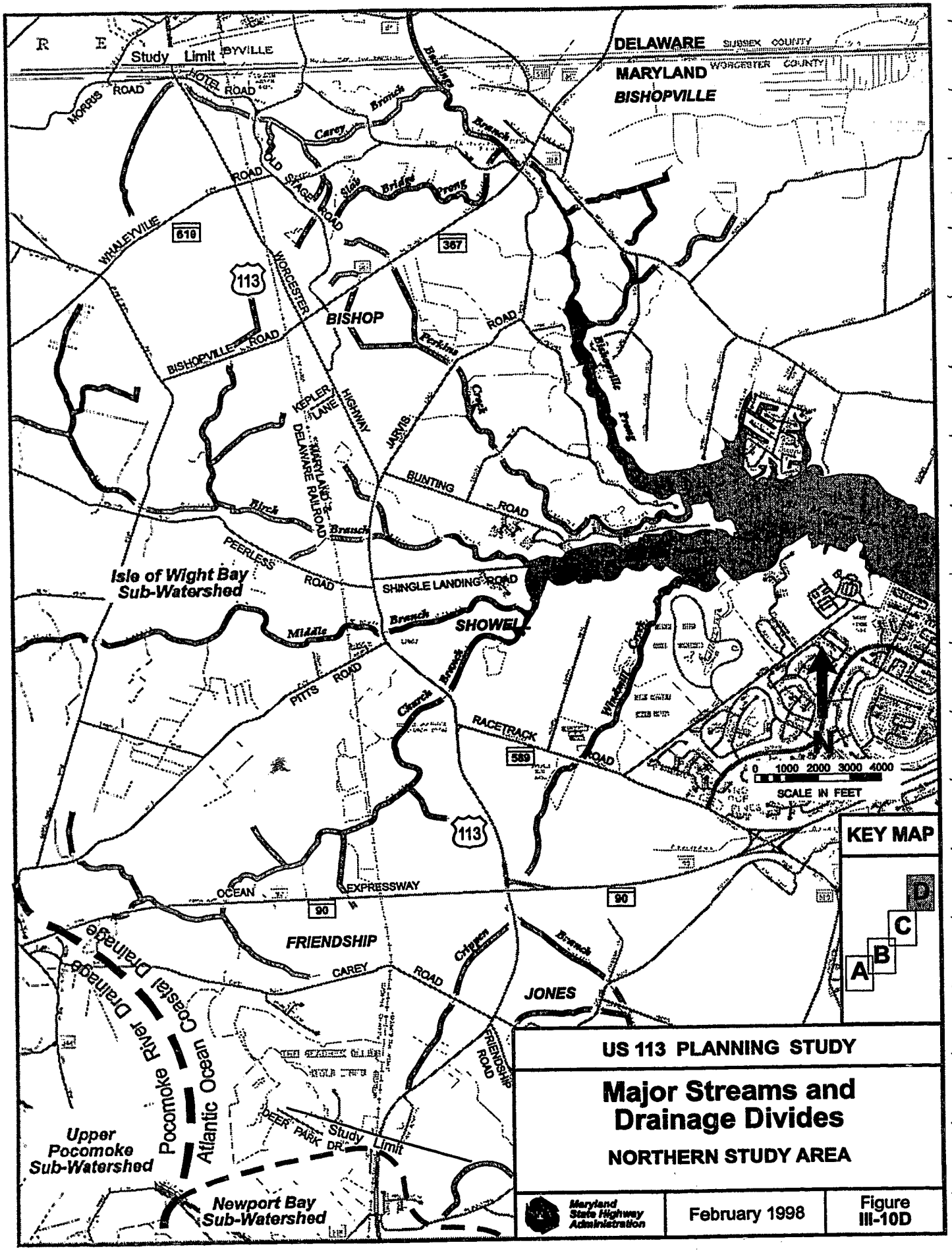
Major Streams and Drainage Divides

SOUTHERN STUDY AREA

Maryland State Highway Administration

February 1998

Figure III-10C



US 113 PLANNING STUDY

Major Streams and Drainage Divides

NORTHERN STUDY AREA

Maryland State Highway Administration | February 1998 | Figure III-10D

1. Streams and Rivers

All the streams and rivers within the study areas are classified by the Maryland Department of the Environment (MDE) as Use I, which indicates that the designated uses include Water Contact Recreation and Protection of Aquatic Life. Streams within the Pocomoke River drainage of the southern study area include: Purnell Branch and its tributaries Pattys Branch and Campground Branch, Poorhouse Branch, Fivemile Branch, and a small tributary of Coonfoot Branch. Streams within the Atlantic Ocean Coastal drainage of the southern study area include: Marshall Creek and two small tributaries, Massey Branch, Porter Creek, Goody Hill Branch, the headwaters of Catbird Creek, and Poplartown Branch and a tributary. In the northern study area, Crippen Branch, Church Branch, Middle Branch, Birch Branch and Carey Branch of the Atlantic Ocean Coastal drainage are encountered. The functions provided by these streams and rivers include production export and nutrient removal/ transformation.

The streams throughout both study areas vary in width from approximately 5 feet up to approximately 70 feet and in depth from approximately 8 inches to greater than 6 feet. Review of respective United States Geologic Survey (USGS) maps indicates that most tributaries are probably generated by ground water discharge and surface water run-off from surrounding upland areas. The majority of the streams and river channels are unvegetated. Besides ponds, these tributaries also provide aquatic habitat and drinking water for both mammal and bird species. The sizeable freshwater tributaries also provide excellent spawning environments for fish species indigenous to the Pocomoke River, the Atlantic Coast and the inner bays. A discussion of the aquatic and wetland habitat features within the study areas is included in Section III-I.

Recent fish kills and human health problems in the Pocomoke River have been linked to a microorganism called *Pfiesteria piscicida*. First discovered at the North Carolina School of Veterinary Medicine in 1988 and identified and named in 1991, *Pfiesteria piscicida* is a dinoflagellate which occurs naturally in waters along the eastern coast of the United States (North Carolina State University, 1997). *Pfeisteria* has been found in estuaries from the Mid Atlantic to the Gulf Coast. It becomes toxic to the environment during the warmer months of the year when human influences such as excessive nutrients are introduced to poorly flushed estuine ecosystems. (Further information on this organism can be found on web sites http://www.creamofthecrop.tierranet.com/grass_man/cellfromhell.htm and http://www2.ncsu.edu/unity/lockers/project/aquatic_botany/pfiest/html).

Research into the causes which trigger toxicity in *Pfiesteria* is still in the early stages of development. Furthermore, nitrogen and phosphorus loading have been linked to increases in toxic effects. It is currently thought that these nutrients increase algal populations, which in turn feed the non-toxic form of *Pfiesteria*. When the algal population diminishes, the large *Pfiesteria* population turns to fish as the main food source (Gong, 1997). These fish excrete the unidentified ephemeral substance which triggers toxicity in the *Pfiesteria* (North Carolina State University, 1997).

Concern about the effects of this microorganism are two-fold. First, large fish kills could have a grave effect on the fishing industry, and the supply of food created by this resource. The human health effects linked to airborne and waterborne *Pfiesteria* toxins. Symptoms include narcosis, sores, reddening of eyes, headaches, blurred vision, nausea/vomiting, breathing difficulties, kidney and liver dysfunction, acute short-term memory loss, and severe cognitive impairment (North Carolina State University, 1997). Symptoms usually dissipate once exposure to the toxins ceases, but can recur during exercise, indicating that the toxin may be stored in body fat (Niehoff, 1997).

Researchers are currently studying affected individuals, monitoring water samples, and recording the various forms and stages of the *Pfiesteria* to learn more about the mechanisms which cause toxicity and what can be done to alleviate the problems associated with this toxicity. Finally, warnings are being issued to the public to avoid eating fish that appear sick, and to avoid swimming in waters during or immediately after a fish kill in the hopes of protecting the public until more information can be gathered about these organisms and their toxic effects.

The Pocomoke River is currently being studied by several State of Maryland and Federal agencies due to the ongoing concerns regarding *Pfiesteria* outbreaks. Several recommendations have been developed by the Hughes Blue Ribbon Commission of *Pfiesteria*. (Citizens Pfiesteria Action Commission, 1997).

Figures III-10A through 10D show the Pocomoke River and Atlantic Coastal Drainage Divide and major streams.

2. Lakes and Ponds

Approximately 14 acres of ponds were observed within 400 feet of the project study areas on both the east and west sides of US 113.

These elements occur as inundated borrow pits, stormwater management facilities and possibly as spring-fed ponds, varying in depth from approximately 3 feet to greater than 6 feet. Many of these ponds are bordered with areas of vegetation tolerant of frequent soil saturation or continued inundation. (NOTE: There are no natural ponds or lakes in Maryland).

These water resources serve as habitats for plant and animal species which require such conditions and as a water source for animals which may frequent the adjacent forested and old field habitats.

3. Wild and Scenic Rivers

The Maryland DNR's Wild and Scenic Rivers program was developed to protect the scenic, recreational, and aquatic habitat values of the state's wild and scenic rivers. Rivers under this program are protected from development which would diminish the character of the resource. The Pocomoke River was Maryland's first state designated wild and scenic river (DNR, 1996). The river is located to the west of US 113 roughly parallel to the roadway alignment. The Pocomoke River was studied as part of the federal Nationwide Rivers Inventory and it was determined that portions of the river may be eligible for national designation. This designation was not granted however, and no current federal studies are under way (Haubert, 1997).

The Pocomoke River originates in southern Delaware in the Great Cypress Swamp and empties into the Pocomoke Sound of the Chesapeake Bay. The total length of the river is 73 miles, 55 miles of which are in Maryland. Near Snow Hill, the river is approximately 400 feet wide and ranges in depth form 7 to 25 feet, averaging about 15 feet deep (Worcester County Tourism, undated).

The river has a rich and varied history. It was an important source of food and transportation for the Algonquin tribes in the area in pre-colonial times. Throughout the late 1700's and 1800's shipbuilding, brick manufacturing, iron smelting (from local bog ore deposits) and the shipping of tobacco and lumber flourished. A number of historic sites are located in the vicinity (Worcester County Tourism, undated).

The Pocomoke River is also home to a wide variety of plant and animal life. More than 240 species of animals have been seen in the forests and wetlands bordering the river. Some ornithologists describe the area as one of the Atlantic Coast's best environments for bird life. Because of the brackish tidal waters, the Pocomoke holds both saltwater and freshwater fish species. At least 72 families of plants have been identified in the wetlands of the Pocomoke River including some of the northern most stands of bald cypress. (Sipple, 1994)

Recreational activities on or near the Pocomoke River include picnicking, hiking, bicycling, camping, bird watching, hunting, canoeing, river cruising, and fishing. Facilities are available at the nearby Pocomoke River State Forest and Park. A number of annual events including festivals, fairs, and parades are also held in the area (Worcester County Tourism, undated).

G. Floodplain

1. Existing Floodplain Studies

The 100-year floodplain limits have been identified and delineated based on mapping provided by the Federal Emergency Management Agency (FEMA). Within the study area, 100-year floodplains are associated with numerous tributaries draining into the Pocomoke

River, Newport Bay, and Isle of Wight Bay. The tributaries and their associated floodplains are shown on Figures III-11A through 11D and on the alternatives mapping in Appendix A.

Within the southern study area, 100-year floodplains are associated with Purnell Branch and its tributaries Pattys Branch and Campground Branch, Poorhouse Branch, Five Mile Branch, Coonfoot Branch, Massey Branch, Goody Hill Branch, and Poplartown Branch and its tributaries. In the northern study area, Crippen Branch, Church Branch, Middle Branch, Birch Branch and Carey Branch each have associated 100-year floodplains.

2. Existing Floodplain Conditions

The 100-year floodplains associated with Purnell, Pattys and Campground Branches are generally wooded with extensive wetlands. No improved properties or structures are located in the limits of the floodplains within the southern study area. The 100-year floodplain of Poorhouse Branch within the southern study area includes farm fields, some wetlands and an improved property with three buildings. The 100-year floodplain of Five Mile Branch within the southern study area includes farm fields and wetlands but no improved properties. An improved property with three chicken houses is located within the 100-year floodplain of Coonfoot Branch in the southern study area. The 100-year floodplain associated with Massy Branch in the southern study area is generally forested with extensive wetlands.

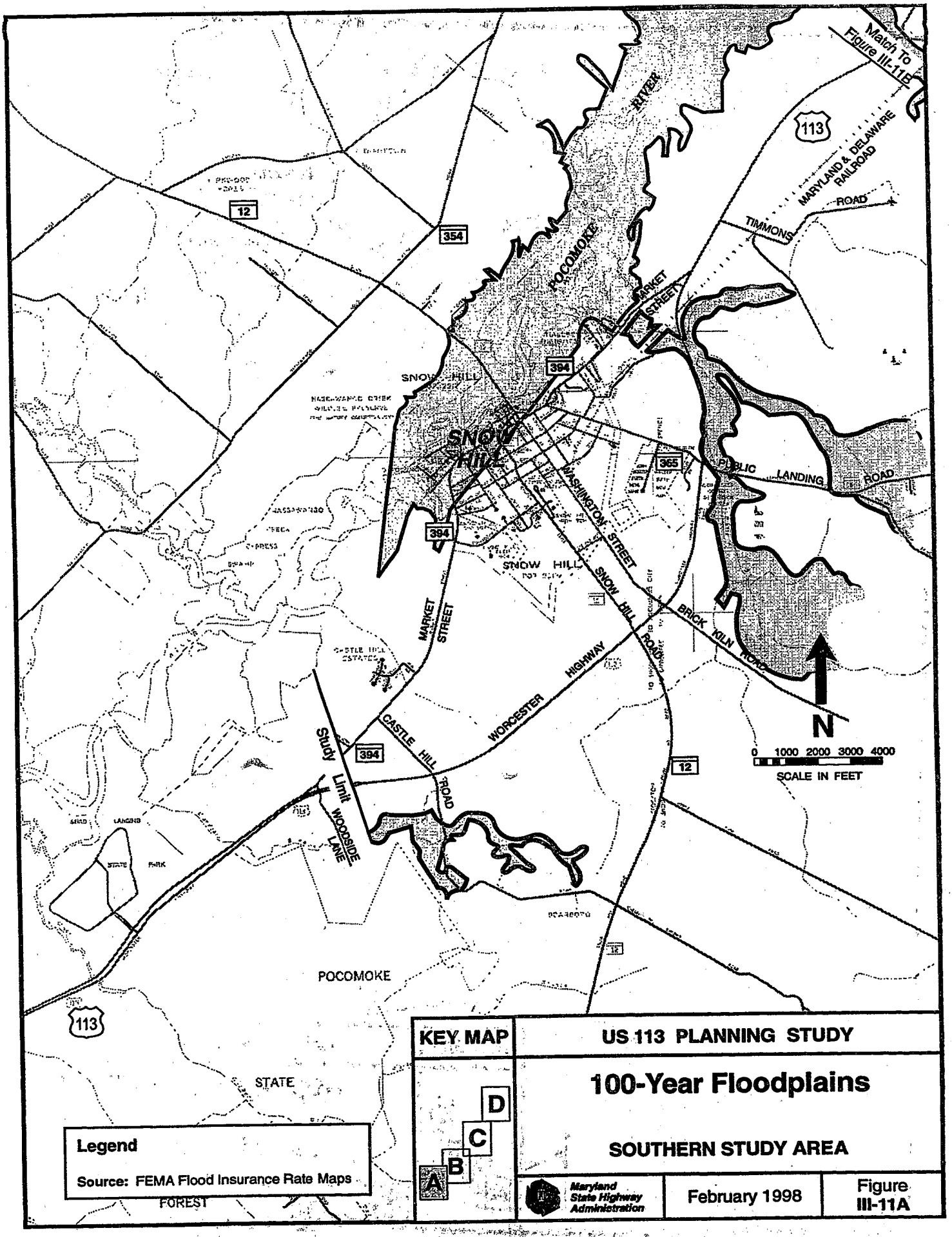
At Goody Hill Branch, the 100-year floodplain within the southern study area is generally forested with extensive wetlands, however, an improved property with two chicken houses is also present. The 100-year floodplain of Poplartown Branch and its tributaries within the southern study area is generally forested and contains wetlands but no improved properties.

The 100-year floodplain of Crippen Branch in the northern study area includes farm fields as well as several improved properties including six structures. The 100-year floodplains associated with Church, Middle, Birch and Carey Branches are generally forested and contain extensive wetlands but no improved properties.

H. Wetlands

1. Methodology

Wetlands were identified in accordance with the Corps of Engineers Wetland Delineation Manual, (Environmental Laboratory, Technical Report Y-87-1 (ACOE, 1987), and supplemental guidance papers issued by the Corps of Engineers. This method requires positive identification of three wetland parameters under normal circumstances: hydrophytic vegetation, hydric soils, and wetland hydrology.



US 113 PLANNING STUDY

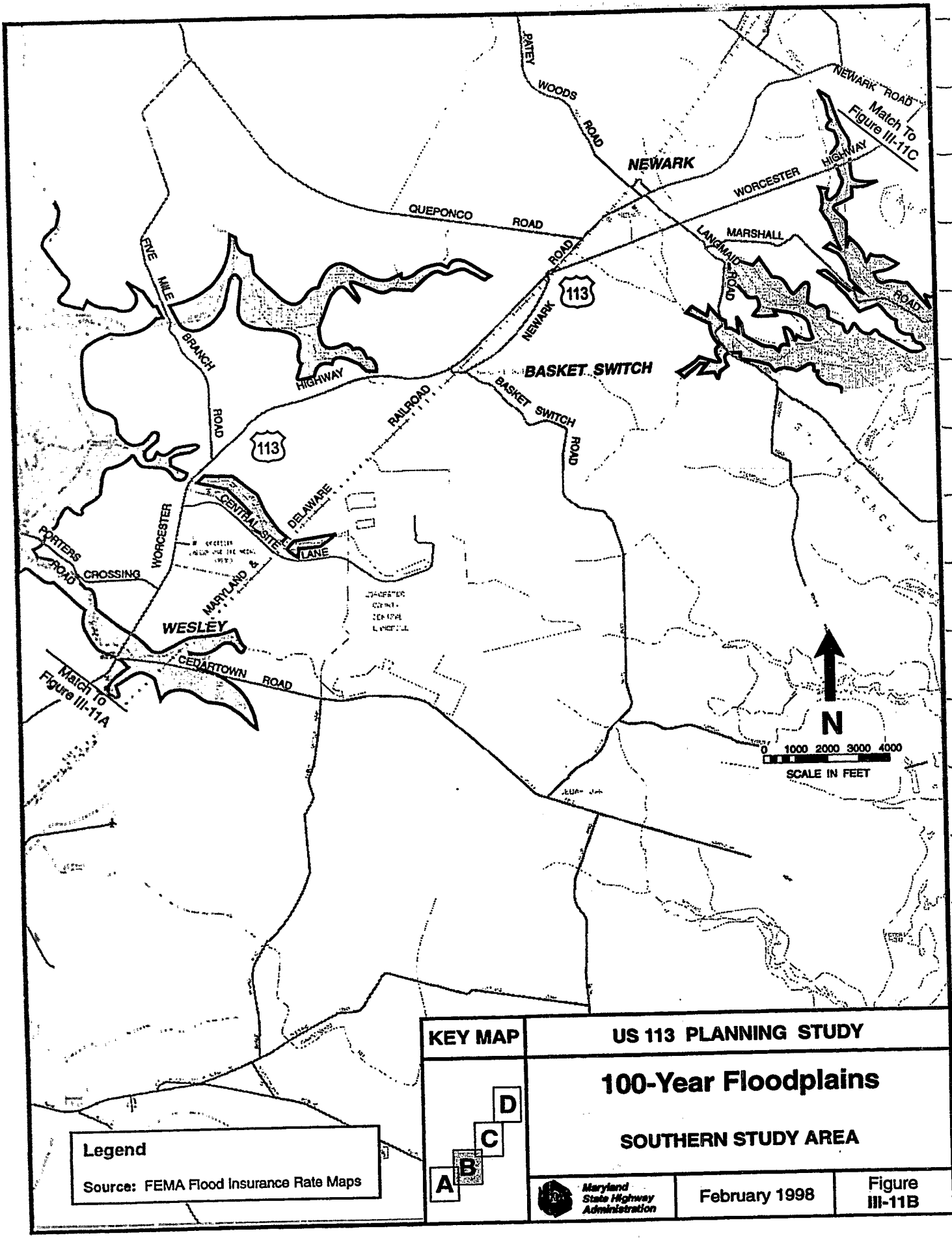
100-Year Floodplains

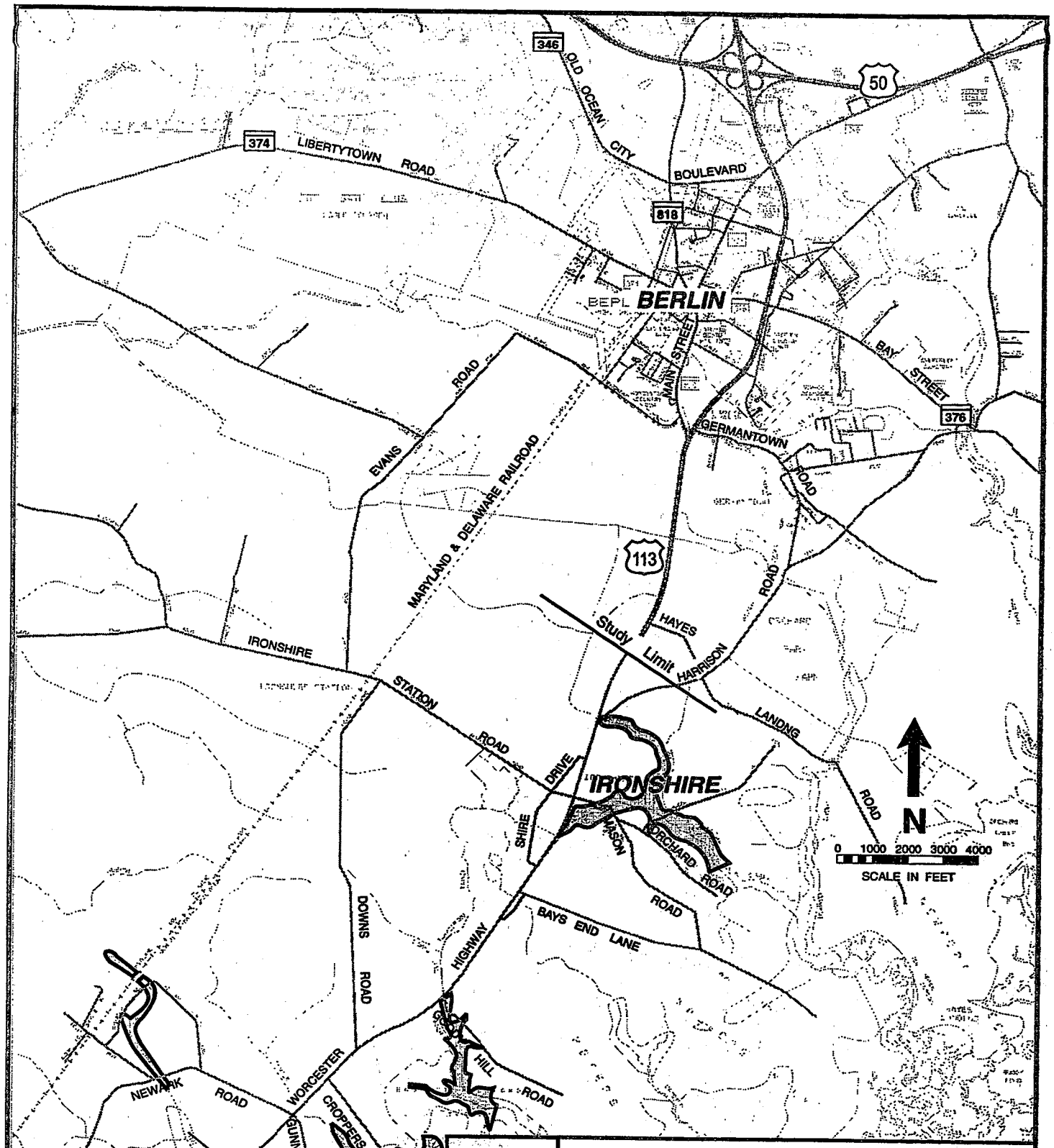
SOUTHERN STUDY AREA

Maryland State Highway Administration

February 1998

Figure III-11A


PATTY WOODS ROAD
NEWARK ROAD
Match To Figure III-11C
NEWARK
WORCESTER HIGHWAY
QUEPONCO ROAD
MARSHALL ROAD
LANDMAID ROAD
FIVE MILE BRANCH ROAD
NEWARK ROAD
113
HIGHWAY
BASKET SWITCH
RAILROAD
BASKET SWITCH ROAD
113
CENTRAL SITE
DELAWARE LANE
PORTERS ROAD
CROSSING
WORCESTER
MARYLAND &
WESLEY
CEDARTOWN ROAD
Match To Figure III-11A
N
0 1000 2000 3000 4000
SCALE IN FEET
Legend
Source: FEMA Flood Insurance Rate Maps
KEY MAP
A
B
C
D
US 113 PLANNING STUDY
100-Year Floodplains
SOUTHERN STUDY AREA
Maryland State Highway Administration
February 1998
Figure III-11B



Legend

Source: FEMA Flood Insurance Rate Maps

KEY MAP

A B C D

US 113 PLANNING STUDY

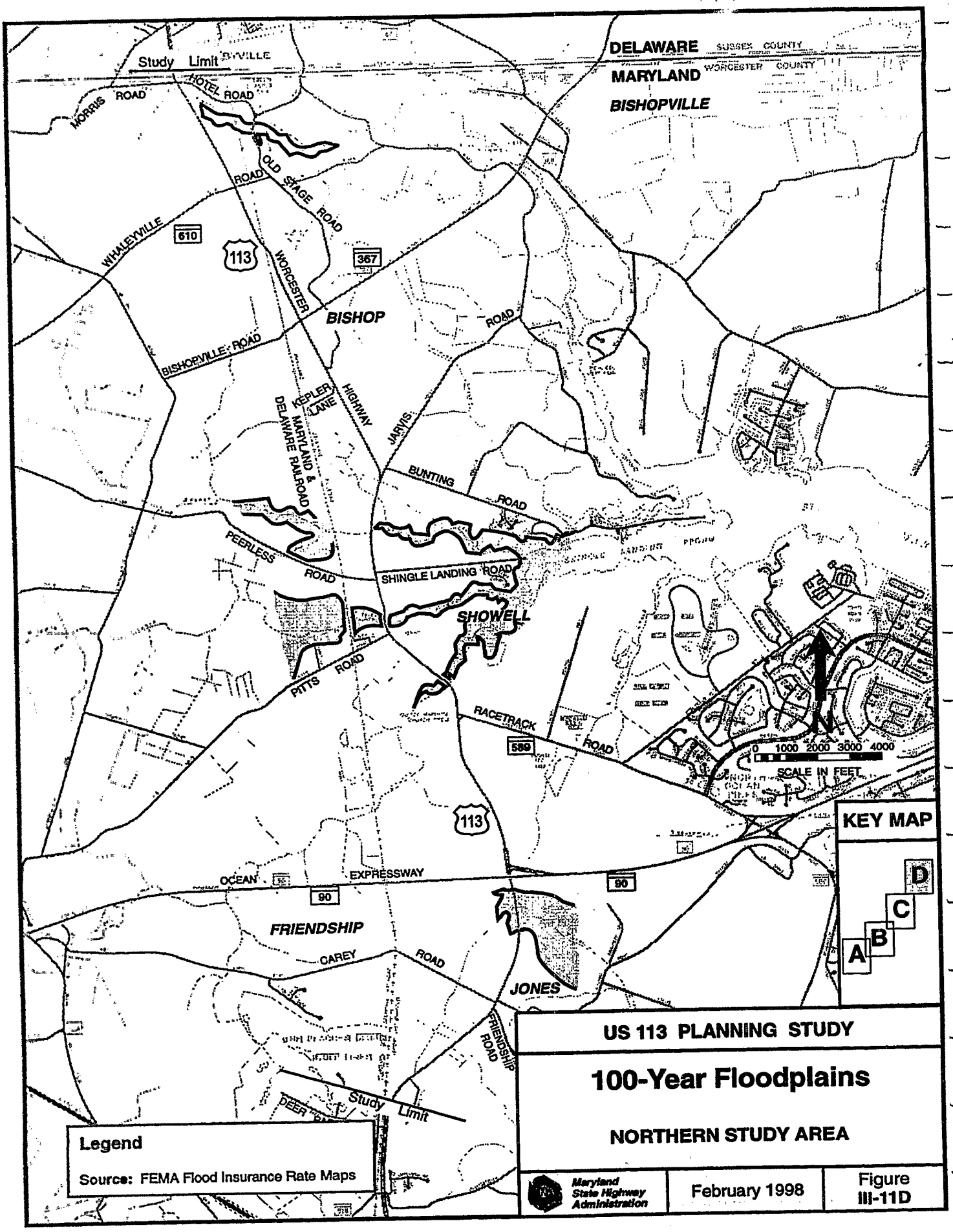
100-Year Floodplains

SOUTHERN STUDY AREA

Maryland State Highway Administration

February 1998

Figure III-11C



Legend

Source: FEMA Flood Insurance Rate Maps

US 113 PLANNING STUDY

100-Year Floodplains

NORTHERN STUDY AREA

Maryland State Highway Administration

February 1998

Figure III-11D

Wetlands in the study area were classified according to the Cowardin System, as described in A Classification of Wetlands and Deepwater Habitats of the United States (Cowardin, et.al., 1979). The wetland indicator status of the observed vegetation was determined using the National List of Plant Species That Occur in Wetlands: Maryland (U.S. Fish and Wildlife Service, 1988).

Prior to the field investigation, possible wetland areas were located using preliminary wetland mapping completed during previous planning studies for the project; National Wetland Inventory (NWI) maps prepared by the US Fish and Wildlife Service; Maryland Nontidal Wetland Guidance Maps; Soil Survey maps for Worcester County; and, topographic maps (at a scale of 1" = 200'). Potential wetlands were identified in areas with hydric soils, along drainage ways, and in topographic depressions.

The field investigation for the project was conducted in July and September, 1996 to identify and delineate the boundaries of wetlands in the study area. The limit of wetlands was flagged in the field with pink survey ribbon labeled as "SHA Wetland" for verification by the U.S. Army Corps of Engineers and survey by SHA. Field work for the Jurisdictional Determination by the U.S. Army Corps of Engineers was completed in March, 1997.

The approximate location of farmed wetlands in the study area have been identified through consultation with NRCS staff in Snow Hill, MD, review of aerial photography on file at the NRCS office, and preliminary field reconnaissance. Farmed wetlands were not flagged or surveyed for this Final EIS, but will be surveyed during the spring of 1998 when wetland hydrology would be apparent.

2. Identification and Delineation

Observations of vegetation, soils, and hydrology were made in wetland and upland locations to characterize the study area and to verify wetland boundaries. The field data from 65 of these observation points are documented on the data sheets provided in the Natural Environment Technical Report.

Approximately forty-two (42) wetland areas have been delineated in the project area. The location of each of these wetlands is identified on Figures III-12A through 12D and on the alternatives mapping in Appendix A. Wetlands located west of the Pocomoke River/Atlantic Ocean Coastal Drainage divide (Wetlands 1 through 10) are part of the Pocomoke River Drainage system. Those wetlands located east of the drainage divide (Wetlands 11 through 40) are part of the Atlantic Ocean Coastal drainage system. The location of the drainage divide is shown on Figures III-10A through 10D. A description of each delineated wetland is provided below. A discussion of the aquatic and wetland habitat features within the study areas is included in Section III-I. Information for each of the wetlands is provided on Table III-17. The majority of the wetlands are forested and are associated with the floodplains of numerous streams that flow through the project area. Other wetlands are associated with broad, upland flats and depressions that have poor surface drainage. Most of the depressional

and upland flat wetlands are located in the northern study area and have been altered by previous logging and farming activities (Schockley, 1997).

Wetland 1 is associated with a narrow drainage swale that has recently been logged. Drainage from the wetland flows into a culvert which carries runoff from surrounding agricultural land under US 113. The wetland is on either side of US 113, approximately 350-feet north of Castle Hill Road. The ditched portion of the wetland may have originally been part of a natural tributary to Hardship Branch. The area is classified as a palustrine emergent wetland with a seasonal saturated water regime (PEM1E). The principal wetland function associated with the wetland is wildlife habitat.

The wetland was inundated to a depth of 8-inches at the time of the field visit, and sediment deposits and water stained leaves were observed. Soils within the wetland are mapped as Fallsington sandy loam which is listed as a hydric soil in Maryland. Soil samples showed signs of past disturbance from road construction and ditching. The matrix of the samples was bright (2.5Y5/3), however, mottles were present (10YR5/6) and a sulfidic odor was noted. Dominant vegetation in the wetland includes *Eleocharis sp.* (spikerush), *Cinna arundinacea* (wood reed), *Carex lurida* (lurid sedge), *Alisma plantago-aquatica* (water plantain), and *Juncus effusus* (soft rush).

Wetland 2 is located on both sides of US 113, approximately 1,300-feet south of Snow Hill Road and is associated with a broad drainage swale. The northeast corner of the wetland is farmed, however, the majority of the area is classified as a palustrine forested wetland with a saturated water regime (PFO1B). The soils within the wetland were saturated at a depth of 4-inches below the ground surface at the time of the field visit. Water marks, sediment deposits, drainage patterns and water stained leaves were also observed. The principal wetland functions associated with W-2 are groundwater recharge/discharge, sediment/ toxicant retention, nutrient removal, and wildlife habitat.

The soils within the wetland are mapped as Othello silt loam which is listed as a hydric soil in Maryland. Soil samples were gleyed (2.5Y5/1) and mottled (10YR5/8). *Acer rubrum* (red maple) and *Liquidambar styraciflua* (sweet gum) are the dominant species in the canopy of the forested wetland. The shrub layer is dominated by *Clethra alnifolia* (coast pepperbush), *Vaccinium corymbosum* (highbush blueberry), *Viburnum dentatum* (arrowwood), and *Myrica cerifera* (bayberry). *Cinna arundinacea* (wood reed) is the dominant herbaceous species.

Wetland 3 is located in a narrow ditch on either side of US 113, approximately 400-feet south of Snow Hill Road. It appears that the area was originally a natural tributary to Patty's Branch which was ditched for agricultural purposes. The area is classified as a palustrine emergent wetland with a saturated water regime (PEM1B) on the east side of US 113, and a palustrine forested wetland with a seasonal water regime (PFO1C) on the west side of the highway. The principal function associated with the wetland is wildlife habitat.

At the time of the field visit, the wetland was inundated to a depth of 2-inches. Sediment deposits and drainage patterns were also noted. Soils within the wetland are mapped as Woodstown sandy loam which is generally found in uplands, however, the map type was not confirmed in the field. Soil samples were gleyed (10YR6/1) and mottled (7.5YR5/8) and were characteristic of a hydric soil. The forested portion of the wetland is dominated by *Acer rubrum* (red maple) and *Liquidambar styraciflua* (sweet gum). The emergent wetland is dominated by *Salix nigra* (black willow), *Juncus effusus* (soft rush), *Scirpus atrovirens* (green bulrush), and *Eleocharis sp.* (spikerush species).

Wetland 4 is located east of US 113 and adjacent to the south side of Brick Kiln Road. The wetland appears to have formed due to a long-term blockage in a drainage ditch which carries surface runoff from the roadways. The area is classified as palustrine forested wetland with a seasonal saturated water regime (PFO1E). At the time of the field visit, the wetland was inundated to a depth of 6-inches and water marks were observed.

Soils in the area are mapped as Sassafras which is a well-drained soil, however, the long-term impoundment of water in the area has altered drainage patterns enough that it is likely that hydric characteristics have developed or will develop over time. No soil samples were taken due to the degree of inundation within the wetland. Dominant vegetation in the wetland includes *Quercus phellos* (willow oak), *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweet gum), *Pinus taeda* (loblolly pine) and *Nyssa sylvatica* (black gum) in the canopy and *Clethra alnifolia* (coast pepperbush) in the shrub layer. The herbaceous layer was sparse, most likely due to long-term inundation.

Wetland 5 is located on the west side of US 113, approximately 1,650-feet north of Washington Street. The portion of the wetland adjacent to the roadway, within a powerline right-of-way, has been mowed. The area is classified as both a palustrine emergent and a palustrine scrub-shrub wetland with a saturated water regime (PEM/PSS1B). Scattered pockets within the wetland were inundated to a depth of 0 to 3-inches at the time of the field visit, however, the majority of the wetland was saturated at a depth of 6-inches below the ground surface. The principal functions and values associated with the wetland are groundwater recharge/discharge and wildlife habitat.

Soils within the wetland are mapped as Fallsington sandy loam which is listed as a hydric soil in Maryland. Soil samples were gleyed (2.5Y5/1). Dominant vegetation within the wetland includes *Ilex glabra* (inkberry) and *Acer rubrum* (red maple) in the shrub layer and *Dicanthelium acuminatum* (panic grass), *Scripus atrovirens* (green bulrush), *Rhexia mariana* (Maryland meadow beauty), *Carex sp.* (sedge species), and *Hypericum sp.* (St Johnswort species) in the herbaceous layer.

Wetland 5A is located on the west side of US 113, approximately 1,000-feet south of Public Landing Road. The wetland appears to have formed in an excavated area, possibly created as a borrow pit for the original construction of US 113. The wetland does not appear to have a direct hydrologic connection by way of surface waters. The area consists of palustrine

emergent wetlands along the edge of right-of-way, with palustrine scrub/shrub wetlands within the interior of the wetland. Principal functions and values associated with the wetland are groundwater recharge/discharge and wildlife habitat.

Soils within the wetland are mapped as Fallsington sandy loam which is listed as a hydric soil in Maryland. Dominant vegetation includes *Baccharis halimifolia* (groundsel tree), *Phagmites australis* (common reed), *Dichanthelium acuminatum* (panic grass), *Pinus taeda* (loblolly pine), *Juncus effusus* (soft rush), and *Smilax rotundifolia* (common greenbriar).

Wetland 6 is located directly adjacent to the west side of US 113, just north of Public Landing Road. The wetland has formed in the upper edge of the Patty's Branch floodplain which has been bisected by the roadway. Consequently, the wetland is confined on the west by the natural floodplain slope and on the east by the berm of US 113. The wetland flows northward in a ditch and is connected to the main floodplain of Patty's Branch (Wetland 7) through a culvert beneath the roadway. The area is classified primarily as a palustrine forested wetland with a ten-foot wide palustrine emergent wetland along the road ditch (PFO/PEM1B). Principal wetland functions and values associated with the wetland are groundwater recharge/discharge, floodplain alteration, sediment/toxicant retention, nutrient removal, production export, wildlife habitat, uniqueness/habitat, and visual quality/ aesthetics.

At the time of the field visit, the wetland was inundated to a depth of 2 to 6-inches. Other hydrologic indicators noted include water marks, sediment deposits, drainage patterns, and water stained leaves. Soils in the area are mapped as Fallsington sandy loam which is listed as a hydric soil. Soil samples were gleyed (10YR3/1). The dominant vegetation in the canopy of the forested wetland is *Acer rubrum* (red maple), while the understory and shrub layer is dominated by *Magnolia virginiana* (sweetbay) and *Viburnum dentatum* (arrowwood). The emergent portion of the wetland is dominated by *Typha latifolia* (common cattail), *Saururus cernuus* (lizards tail), *Carex crinita* (fringed sedge), *Angelica aropurpurea* (great angelica), *Onoclea sensibilis* (sensitive fern), *Pontederia cordata* (pickerel weed), and *Nuphar luteum* (spatterdock).

Wetland 7 has formed in the floodplain of Patty's Branch which parallels the east side of US 113 in the vicinity of Public Landing Road. The portion of the floodplain designated as Wetland 7 begins approximately 150-feet north of Public Landing Road and extends northward for a distance of approximately 1,400-feet. The area is classified primarily as a palustrine forested wetland with a ten-foot wide palustrine emergent wetland along the road ditch (PFO/PEM1B). Principal wetland functions and values associated with the wetland are groundwater recharge/discharge, floodplain alteration, sediment/toxicant retention, nutrient removal, production export, wildlife habitat, uniqueness/habitat, and visual quality/ aesthetics.

The wetland was inundated and water depths ranged from 0 to 4-inches. Other hydrologic indicators noted include water marks, drift lines, and sediment deposits. Soils in the floodplain are mapped as Fallsington sandy loam and Mixed Alluvium. Soil samples were black and mucky and had a sulfidic odor. Dominant vegetation in the forested portions of the wetland includes *Fraxinus pennsylvanica* (green ash), *Liquidambar styraciflua* (sweet gum), *Acer rubrum* (red maple) in the canopy, *Alnus serrulata* (alder) in the shrub layer, and *Saururus cernuus* (lizards tail) in the herbaceous layer. The emergent portions of the wetland are dominated by *Salix nigra* (black willow), *Boehmeria cylindrica* (false nettle), *Nuphar luteum* (spatterdock), *Cephalanthus occidentalis* (buttonbush), and *Sambucus canadensis* (elderberry).

Wetland 8 is located on either side of US 113 within the floodplain of Purnell Branch, approximately 400-feet south of where the Maryland and Delaware Railroad crosses the roadway. Purnell Branch is joined by Patty's Branch just to the east (upstream) of the US 113 crossing over the waterway. The wetland is classified as a palustrine forested wetland with a seasonal saturated water regime (PFO2/1E). The wetland is of particular note because it is dominated by bald cypress. Bald cypress swamps are relatively unusual in Maryland, although they are most common on the eastern shore. Principal wetland functions and values associated with the wetland are groundwater recharge/discharge, floodplain alteration, sediment/toxicant retention, nutrient removal, production export, wildlife habitat, uniqueness/habitat, and visual quality/aesthetics.

The wetland was inundated to a depth of 4-inches throughout the majority of the floodplain. Areas that were not inundated were saturated to within 1-inch of the ground surface with free water observed in an unlined bore hole at 2-inches below the surface. Other hydrologic indicators include water marks, drainage patterns and water stained leaves. Soils within the wetland are mapped as Fallsington sandy loam and Muck. Samples had a low chroma matrix (2.5Y6/2) and were mottled (7.5YR5/8). Dominant vegetation observed in the forest canopy includes *Taxodium distichum* (bald cypress), *Acer rubrum* (red maple) and *Liquidambar styraciflua* (sweet gum). The shrub layer is dominated by *Clethra alnifolia* (coast pepperbush), *Vaccinium corymbosum* (highbush blueberry), *Alnus serrulata* (alder), and *Ilex verticillata* (winterberry). The dominant herbaceous species are *Cinna arundinacea* (wood reed), *Osmunda regalis* (royal fern), and *Saururus cernnus* (lizards tail).

Wetland 9 is located on either side of US 113 in the floodplain of Poorhouse Branch. The stream crosses US 113 approximately 250-feet north of Cedartown Road. The area is classified as both a palustrine forested and a palustrine emergent wetland with a saturated water regime (PFO/PEM1B). The wetland was inundated and flowing, with water depths ranging from 6 to 12-inches. Water marks, sediment deposits and drainage patterns were also observed. Principal wetland functions and values associated with the wetland are sediment/ toxicant retention, nutrient removal, and wildlife habitat.

Soils within the wetland are mapped as Mixed Alluvium. No samples were taken due to the level of inundation. Dominant vegetation in the forested portions of the wetland includes *Acer rubrum* (red maple), and *Salix nigra* (black willow) in the canopy and *Alnus serrulata* (alder) in the shrub layer. The emergent wetland is dominated by *Cephalanthus occidentalis* (buttonbush), *Impatiens capensis* (jewelweed), *Veronia noveboracensis* (New York ironweed), and *Asclepias incarnata* (swamp milkweed).

Wetland 10 is located within the floodplain of Five Mile Branch which crosses US 113 approximately 850-feet south of Five Mile Branch Road. Five Mile Branch is ditched on the west side of the road. Wetland 10 is on the east side of the road where the natural floodplain still exists. The area is classified as a palustrine forested wetland with a seasonal saturated water regime (PFO1E). The wetland was inundated at the time of the field visit, with water depths ranging from 2 to 4-inches. Principal wetland functions and values associated with the wetland are sediment/toxicant retention, nutrient removal, and wildlife habitat.

Soils within the wetland are mapped as Mixed Alluvium and soil samples were low chroma (5Y3/2). The dominant woody vegetation within the wetland includes *Acer rubrum* (red maple), *Fraxinus pennsylvanica* (green ash), *Liquidambar styraciflua* (sweet gum) and *Nyssa sylvatica* (black gum) in the canopy, *Carpinus carolinana* (American hornbeam) in the understory and *Viburnum dentatum* (arrowwood) in the shrub layer. The herbaceous layer is dominated by *Saururus cernuus* (lizards tail) and *Onoclea sensibilis* (sensitive fern).

Wetland 11 is located along the banks and bottom of an unnamed perennial stream which crosses US 113 approximately 1,700-feet south of Langmaid Road. The streambank area is classified as a palustrine forested wetland with a seasonal saturated water regime (PFO1E). The wetland was inundated and water depths ranged from 1 to 4-inches at the time of the field visit. Principal wetland functions and values associated with the wetland are sediment/ toxicant retention, nutrient removal, and wildlife habitat.

Soils in the wetland are mapped as Fallsington sandy loam which is listed as a hydric soil. Soil samples were not taken due to the level of inundation. Dominant vegetative species noted include *Acer rubrum* (red maple) in the canopy, *Viburnum dentatum* (arrowwood) and *Lindera benzoin* (spicebush) in the shrub layer and *Boehmeria cylindrica* (false nettle), *Impatiens capensis* (jewelweed), and *Carex sp.* (sedge species) in the herbaceous layer.

Wetland 12 is a large system located on both sides of US 113, approximately 2,500-feet south of Newark Road. The south end of the wetland has formed in a broad swale draining to Massey Branch, while the north side is located along the main channel of Massey's Branch itself. The area is classified as a palustrine forested wetland with a seasonal saturated water regime (PFO1E). Principal wetland functions and values associated with the wetland are floodplain alteration, sediment/toxicant retention, nutrient removal, production export, wildlife habitat, uniqueness/habitat, and visual quality/aesthetics.

At the time of the field visit, the ground was saturated to the surface. Soils within the wetland are mapped as Portsmouth silt loam and Mixed Alluvium. Portsmouth is listed as a hydric soil in Maryland. Soil samples were gleyed (7.5YR2/0). Dominant canopy vegetation includes *Acer rubrum* (red maple) and *Liquidambar styraciflua* (sweet gum). The dominant understory and shrub species are *Lindera benzoin* (spice bush), *Viburnum dentatum* (arrowwood), *Magnolia virginiana* (sweetbay), *Ilex opaca* (American holly), and *Ilex verticillata* (winterberry). The herbaceous layer is dominated by *Woodwardia areolata* (netted chainfern), *Saururus cernuus* (lizards tail), *Onoclea sensibilis* (sensitive fern) and *Pilea pumila* (clearweed).

Wetland 13 is located within the floodplain of Porter Creek which crosses US 113 just north of Newark Road. The area is classified as a palustrine forested wetland with a saturated water regime (PFO1B). At the time of the field visit, the wetland was saturated to within 10-inches of the ground surface, with free water observed in an unlined bore hole at 12-inches below the surface. Principal wetland functions and values associated with the wetland are floodplain alteration, sediment/toxicant retention, nutrient removal, production export, wildlife habitat, uniqueness/habitat, and visual quality/aesthetics.

Soils within the wetland are mapped as Mixed Alluvium which often contains hydric soils. Soil samples were low chroma (2.5Y6/2) and mottled (7.5YR5/8). Dominant canopy vegetation in the wetland includes *Acer rubrum* (red maple), *Fraxinus pennsylvanica* (green ash), *Nyssa sylvatica* (black gum) and *Liquidambar styraciflua* (sweet gum). The dominant understory and shrub species are *Magnolia virginiana* (sweet bay), *Lindera benzoin* (spicebush) and *Clethra alnifolia* (coast pepperbush). The herbaceous layer is dominated by *Symplocarpus foetidus* (skunk cabbage), *Saururus cernuus* (lizards tail), *Impatiens capensis* (jewelweed), *Boehmeria cylindrica* (false nettle), and *Woodwardia areolata* (netted chainfern).

Wetland 14 is located on the east side of US 113, approximately 650-feet north of Croppers Island Road and directly across from Downes Road. The wetland has formed in a broad swale which drains to Goody Hill Branch. The area is classified as a palustrine forested wetland with a seasonal water regime (PFO1C). At the time of the field visit, the wetland was inundated to a depth of 2-inches, and drainage patterns were observed within the wetland.

Soils are mapped as Pocomoke silt loam which is listed as a hydric soil in Maryland. Soil samples were gleyed (10YR 2/1). Dominant vegetation in the wetland includes *Acer rubrum* (red maple) in the canopy, *Ilex opaca* (American holly) in the understory and *Thelypteris noveboracensis* (New York fern) and *Osmunda cinnamomea* (cinnamon fern) in the herbaceous layer.

Wetland 15 is a wetland of special state concern located on the west side of US 113, approximately 1,700-feet north of Downes Road. *Alnus maritima* (seaside alder) is located along the road ditch and is listed as a state rare species. The area is classified as a palustrine

forested wetland with a seasonal water regime (PFO1C). At the time of the field visit, the wetland was inundated to a depth of 3-inches and sediment deposits and drainage patterns were observed. Principal wetland functions and values associated with the wetland are groundwater recharge/discharge, sediment/toxicant retention, nutrient removal, wildlife habitat, and uniqueness/habitat.

Soils within the wetland are mapped as Fallsington sandy loam which is listed as a hydric soil in Maryland. Soil samples were gleyed (10YR4/1) and a high organic content was observed within the top 4-inches. Dominant vegetation within the canopy of the wetland includes *Acer rubrum* (red maple), and *Nyssa sylvatica* (black gum). The understory and shrub layers are dominated by *Magnolia virginiana* (sweetbay), *Lindera benzoin* (spicebush), *Viburnum dentatum* (arrowwood), and *Alnus maritima* (seaside alder). The dominant herbaceous species are *Woodwardia areolata* (netted chainfern) and *Boehmeria cylindrica* (false nettle).

Wetland 16 is located within the floodplain of Goody Hill Branch, which crosses US 113 approximately 2,600-feet north of Downes Road. The area is classified as a palustrine forested wetland with a seasonal water regime (PFO1C). The wetland was inundated at the time of the field visit with water depths ranging from 2 to 4-inches. Drainage patterns were also noted. Principal wetland functions and values associated with the wetland are groundwater recharge/discharge, floodplain alteration, sediment/toxicant retention, nutrient removal, and wildlife habitat.

Soils are mapped as Mixed Alluvium which often has not had sufficient time to develop hydric characteristics. Soil samples, however, were gleyed (10YR4/1). Dominant vegetation within the wetland includes *Acer rubrum* (red maple), *Fraxinus pennsylvanica* (green ash) and *Liquidambar styraciflua* (sweet gum) in the canopy, *Viburnum dentatum* (arrowwood) and *Smilax rotundifolia* (greenbrier) in the shrub layer and *Impatiens capensis* (jewelweed), *Boehmeria cylindrica* (false nettle) and *Saururus cernuus* (lizards tail) in the herbaceous layer.

Wetland 17 is located in a small depression on the west side of US 113, approximately 750-feet north of Goody Hill Road. The depression appears to have been created by past disturbances caused by the maintenance of a cable right-of-way. The area is classified as a palustrine forested wetland with a saturated water regime (PFO1B) and was inundated to a depth of 2 to 6-inches at the time of the field visit. Water marks were also observed.

Soils in the area are mapped as Fallsington silt loam which is listed as a hydric soil in Maryland. Soil samples were gleyed (10YR5/1). Dominant vegetation observed includes *Acer rubrum* (red maple) in the canopy, *Viburnum dentatum* (arrowwood) and *Myrica cerifera* (bayberry) in the shrub layer, and *Carex sp.* (sedge species) and *Didiplis diandra* (water purslane) in the herbaceous layer.

Wetland 18 is located on both sides of US 113, just south of Bays End Lane. The wetland is associated with an unnamed tributary to Catbird Creek and is classified as a palustrine forested wetland with a seasonal saturated water regime (PFO1E). The wetland was inundated up to a depth of 3-inches in some places. Areas that were not inundated were saturated to the surface and the trunks of the trees within the wetland were buttressed. Principal wetland functions and values associated with the wetland are groundwater recharge/ discharge, floodplain alteration, sediment/toxicant retention, nutrient removal, and wildlife habitat.

Soils within the wetland are mapped as Mixed Alluvium and soil samples were gleyed (7.5YR2/0) and mucky. Dominant vegetation in the wetland canopy includes *Acer rubrum* (red maple), *Nyssa sylvatica* (black gum), and *Liquidambar styraciflua* (sweet gum). The dominant understory and shrub species are *Ilex opaca* (American holly), *Magnolia virginiana* (sweetbay), *Viburnum dentatum* (arrowwood) and *Rhododendron viscosum* (swamp azalea). Sphagnum moss was the dominant species in the herbaceous layer.

Wetland 19 is located on the east side of US 113, approximately 450-feet north of Shire Drive. The area has been ditched and may now be effectively drained, however, due to the presence of soils and hydrophytic vegetation, the area was flagged as a wetland. The wetland is classified as a palustrine forested wetland with a saturated water regime (PFO1B). At the time of the field visit, there was 0 to 4-inches of water in the ditch, however, no other hydrologic indicators outside of the ditch were observed. Principal wetland functions and values associated with the wetland are groundwater recharge/discharge, floodplain alteration, sediment/toxicant retention, nutrient removal, and wildlife habitat.

Soils are mapped as Portsmouth silt loam which is listed as a hydric soil. Soil samples were black and had a high content of organic matter. The dominant vegetation in the canopy of the wetland is *Acer rubrum* (red maple) and *Liquidambar styraciflua* (sweet gum). The shrub layer is dominated by *Alnus serrulata* (brookside alder), while *Impatiens capensis* (jewelweed) and *Woodwardia areolata* (netted chainfern) are the dominant herbaceous species. *Parthenocissus quinquefolia* (Virginia Creeper) is also common.

Wetland 20 is on the east side of US 113, approximately 700-feet south of Ironshire Station Road, and is bisected by a gravel driveway. The wetland is located in a broad swale which drains to an unnamed tributary of Poplartown Branch. It is classified as a palustrine forested wetland with a saturated water regime (PFO1B). The ground surface within the wetland was saturated and free water was observed 8-inches below the ground surface in an unlined bore hole.

Principal wetland functions and values associated with the wetland are groundwater recharge/discharge, floodplain alteration, sediment/toxicant retention, nutrient removal, and wildlife habitat.

Soils are mapped as Fallsington sandy loam which is listed as a hydric soil. Soil samples were gleyed (10YR6/1). *Acer rubrum* (red maple) is the dominant vegetative specie in the wetland canopy while *Alnus serrulata* (brookside alder) is the dominant shrub specie. It is possible that *Alnus maritima* (seaside alder) was also present, although this was not confirmed. Dominant herbaceous species include *Cinna arundinacea* (woodreed) and *Boehmeria cylindrica* (false nettle). *Smilax rotundifolia* (greenbrier) was also common in the wetland. Principal wetland functions and values associated with the wetland are groundwater recharge/discharge, floodplain alteration, sediment/toxicant retention, nutrient removal, and wildlife habitat.

Wetland 21 is on the east side of US 113 and is confined within the Poplartown Branch floodplain. The area is approximately 200-feet south of Harrison Road and is classified as a palustrine forested wetland with a temporary water regime (PFO1A). The ground surface in the wetland was saturated at the time of the field visit, and free water was observed 3 to 4-inches below the ground surface in an unlined bore hole. Principal wetland functions and values associated with the wetland are groundwater recharge/discharge, floodplain alteration, sediment/toxicant retention, nutrient removal, and wildlife habitat.

Soils in the wetland are mapped as Mixed Alluvium, which is typically poorly drained and often includes hydric soils. Samples had a low chroma matrix (10YR6/2) and were mottled (10YR4/4). Dominant vegetation within the wetland includes *Acer rubrum* (red maple) and *Liquidambar styraciflua* (sweet gum) in the canopy, *Viburnum dentatum* (arrowwood), *Rosa multiflora* (multiflora rose) and *Smilax rotundifolia* (greenbrier) in the shrub layer, and *Saururus cernuus* (lizards tail) and *Arisaema triphyllum* (jack-in-the-pulpit) in the herbaceous layer.

Wetland 22 is also within the floodplain of Poplartown Branch, but is found on the west side of US 113 and is wetter than the area (Wetland 21) downstream of the roadway. It is classified as a palustrine forested wetland with saturated water regime (PFO1B). At the time of the field visit, the wetland was inundated to a depth of 2 to 3-inches and water stained leaves were observed. Principal wetland functions and values associated with the wetland are groundwater recharge/discharge, floodplain alteration, sediment/toxicant retention, nutrient removal, and wildlife habitat.

The soils within the floodplain wetland are mapped as Mixed Alluvium, which is typically poorly drained and often includes hydric soils. Soils were not sampled due to the level of inundation. Dominant vegetation in the wetland includes *Acer rubrum* (red maple) and *Populus deltoides* (cottonwood) in the canopy, and *Saururus cernuus* (lizards tail), *Cinna arundinacea* (woodreed) and *Boehmeria cylindrica* (false nettle) in the herbaceous layer. The wetland did not have a developed shrub layer.

Wetland 23 is located approximately 800-feet north of the split for the existing dualized portion of US 13, and is classified as a palustrine forested wetland with a seasonal water regime (PFO1C). The wetland includes four depressions that are located within a wooded

area bounded by the Maryland and Delaware Railroad and US 113. Surface water runoff is impeded by a constricted outlet beneath the railroad. At the time of the field visit, the wetland was saturated at 10-inches below the surface. Principal wetland functions and values associated with the wetland are groundwater recharge/discharge, nutrient removal, and wildlife habitat.

Soils within the wetland are mapped in the Soil Survey of Worcester County as Fallsington loam, which is listed as a hydric soil in Maryland. Soil samples were gleyed (2.5Y6/1) and mottled (7.5YR5/6). Dominant vegetation in the wetland includes *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweet gum) and *Nyssa sylvatica* (black gum) in the canopy, *Leucothoe racemosa* (fetterbush) and *Viburnum nudum* (possum-haw) in the shrub layer and *Wodwardia areolata* (netted-chain fern) in the herbaceous layer.

Wetland 24 is located on the east side of existing US 113, approximately 1,500-feet north of the southern boundary of the northern study area. The wetland is bounded by US 113 to the northwest and a residential driveway on the west. The area is classified as a palustrine forested wetland with a seasonal water regime (PFO1C) and is primarily formed by the gravel driveway which restricts positive drainage from the area. At the time of the field visit, the ground surface was inundated or saturated and water marks were observed. Principal wetland functions and values associated with the wetland are groundwater recharge/discharge, nutrient removal, and wildlife habitat.

Soils within the wetland are mapped as Woodstown sandy loam which is not listed as a hydric soil in Maryland, but may contain inclusions of the hydric Fallsington soil. Soil samples confirmed the presence of the nonhydric Woodstown soils; however, it appears that positive drainage has been impeded by construction of a residential driveway, and typical morphological indicators of prolong saturation have not yet developed. It is likely that the area is now inundated for a long duration during the growing season based on observed hydrology indicators. Vegetation within the wetland includes *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweet gum), *Quercus alba* (white oak) and *Clethra alnifolia* (coast pepperbush).

Wetland 25 forms in a broad headwater swale on the east side of existing US 113, just northwest of the residential driveway which impedes the drainage of W-24. The wetland forms in small depressions within the swale and is classified as a palustrine forested wetland with a seasonal water regime (PFO1C). Soils within the depressional areas were saturated at a depth of 8-inches. Principal wetland functions and values associated with the wetland are groundwater recharge/discharge, nutrient removal, and wildlife habitat.

Soils within the wetland are mapped as Fallsington sandy loam which is listed as a hydric soil in Maryland. Samples were gleyed (2.5Y6/1). Vegetation in the wetland is dominated by *Acer rubrum* (red maple), *Quercus phellos* (willow oak), *Vaccinium corymbosum* (high-bush blueberry), *Clethra alnifolia* (coast pepperbush), and *Woodwardia areolata* (netted chainfern).

Wetland 26 is located along Alternate 4N Modified, approximately 2,200-feet north of the southern boundary of the northern study area. The area is adjacent to the railroad line and is primarily a mix of palustrine forested and palustrine scrub-shrub wetland with a saturated water regime (PFO/PSS1B). A small portion of the wetland is also currently under cultivation and has been classified as a farmed wetland during the jurisdictional determination. Principal wetland functions and values associated with the wetland are groundwater recharge/discharge, nutrient removal, wildlife habitat, and visual quality/ aesthetics.

The wetland forms in a topographic low and was inundated to a depth of 4-inches in some areas. Portions of the wetland that were not inundated were saturated at 0 to 6-inches below the ground surface. Surface water runoff is impeded by a constricted outlet beneath the Maryland and Delaware Railroad. Soils in the wetland are mapped as Othello silt loam which is listed as a hydric soil in Maryland.

The canopy of the forested wetland is dominated by *Acer rubrum* (red maple) and *Liquidambar styraciflua* (sweet gum). The shrub layer in the forested and scrub-shrub wetland is dominated by *Myrica cerifera* (bayberry), *Baccharis halimifolia* (groundsel tree), and *Smilax rotundifolia* (common greenbrier), while the dominant herbaceous species is *Juncus effusus* (soft rush). In the agricultural field, the dominant vegetation includes *Juncus effusus* (soft rush), *Scirpus cyperinus* (wool grass), *Agrostis alba* (redtop), *Polygonum sp.* (smartweed species), and *Carex sp.* (sedge species).

Wetland 27 is located along Alternate 4N Modified north of Carey Road and just south of MD 90 (the Ocean Expressway). The wetland occurs on a broad flat with extensive depressional micro-relief and is classified as a palustrine forested wetland with a seasonally saturated water regime (PFO1E). The majority of the wetland was inundated to a depth of 2 to 4-inches at the time of the field visit. Areas that weren't inundated were saturated at 8-inches below the ground surface. Drainage patterns and water marks were also observed throughout the wetland. Principal wetland functions and values associated with the wetland are groundwater recharge/discharge, nutrient removal, and wildlife habitat. Included with Wetland 27 are three, small depressional wetlands that are associated with ditches inside the MD 90 interchange. These wetlands are labeled W-27A, B and C on the alternatives mapping in Appendix A.

Soils are mapped as Fallsington sandy loam and soil samples were gleyed (10YR5/1). The wetland is dominated by *Acer rubrum* (red maple), *Quercus phellos* (willow oak), *Quercus nigra* (water oak) in the canopy and *Viburnum dentatum* (arrowwood), *Ilex opaca* (American holly), *Carpinus caroliniana* (American hornbeam), and *Smilax rotundifolia* (common greenbrier) in the understory/shrub layer.

Wetland 28 is approximately 600-feet north of Racetrack Road and is associated with Church Branch and its floodplain. The stream and wetland cross both the US 113 upgrade alternate and Alternate 4N Modified. The wetland is found on both sides of Church Branch

and in most places is confined at the edge of the floodplain by steep slopes. The area is classified as a palustrine forested wetland with a seasonally saturated water regime (PFO1E). Principal wetland functions and values associated with the wetland are groundwater recharge/discharge, floodplain alteration, fish and shellfish habitat, sediment/toxicant retention, nutrient removal, production export, sediment/shoreline stabilization, wildlife habitat, and visual quality/aesthetics.

At the time of the field visit, the wetland was inundated to a depth of 1-inch in some areas. Portions of the wetland that were not inundated were saturated to the surface. Soils within the wetland are mapped as Mixed Alluvium, which is typically poorly drained and often includes hydric soils. However, soil samples taken within the wetland were mucky and gleyed (7.5YR2/0) and were characteristic of a histic epipedon.

The canopy of the forest within the wetland is dominated by *Acer rubrum* (red maple), *Fraxinus pennsylvanica* (green ash), and *Nyssa sylvatica* (black gum). The dominant understory and shrub species include *Ilex opaca* (Amercian holly), *Ilex verticillata* (winterberry), *Clethra alnifolia* (coast pepperbush), and *Viburnum dentatum* (arrowwood). The herbaceous layer is dominated by *Saururus cernuus* (lizard's tail), *Impatiens capensis* (jewelweed), and *Woodwardia areolata* (netted chainfern).

Wetland 29 is located northeast of the US 113 crossing of Church Branch, approximately 100' northwest of where Alternate 4N Modified emerges from the floodplain of Church Branch. The wetland has formed in an excavated depression that is most likely the result of past sand or gravel borrow operations. The area is classified as a palustrine forested wetland with a seasonally saturated water regime (PFO1E). Principal wetland functions and values associated with the wetland are groundwater recharge/discharge, and wildlife habitat.

Soils within the wetland are mapped as Fort Mott loamy sand which is a well-drained soil type. Excavation has removed the original soil profile, so the area no longer is characteristic of this upland soil association. At the time of the field visit, the wetland was inundated up to a depth of 6-inches, so soil samples were not feasible. Due to the level of flooding within the wetland, it is likely that if hydric soil characteristics are not yet present, that they will develop over time.

Dominant vegetation within the wetland includes *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweet gum), and *Pinus taeda* (loblolly pine) in the canopy and understory, *Clethra alnifolia* (coast pepperbush) in the shrub layer and *Phragmites australis* (common reed) in the herbaceous layer.

Wetland 30 is associated with Middle Branch which crosses existing US 113 approximately 300-feet north of Pitts Road and Alternate 4N approximately 1,700-feet south of Shingle Landing Road. The wetland is found on either side of the stream and is generally confined by steep slopes which border the Middle Branch floodplain. Principal wetland functions and values associated with the wetland are groundwater recharge/discharge, floodplain alteration,

fish and shellfish habitat, sediment/toxicant retention, nutrient removal, production export, sediment/shoreline stabilization, wildlife habitat, uniqueness/habitat, and visual quality/ aesthetics.

The wetland is classified as a palustrine forested wetland with a seasonal water regime (PFO1C). The soil within the wetland was saturated 4-inches below the ground surface and free water was observed in an unlined bore hole at 8-inches below the surface. The soils are mapped as Mixed Alluvium, which is typically poorly drained and often includes hydric soils. Soil samples confirmed the presence of poorly drained soils with a low chroma (10YR5/2) matrix.

Dominant species in the vegetative canopy include *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweet gum), and *Fraxinus pennsylvanica* (green ash). The understory/shrub layer is dominated by *Ilex opaca* (American holly), *Lindera benzoin* (spicebush) and *Clethra alnifolia* (coast pepperbush). The dominant herbaceous species include *Impatiens capensis* (jewelweed), *Boehmeria cylindrica* (false nettle), and *Saururus cernuus* (lizards tail).

Wetland 31 is located along Birch Branch which crosses US 113 approximately 1,300-feet north of Peerless Road. The wetland has formed within the floodplain of the stream and is confined by the steep slopes which border the edges of the floodplain. The wetland is classified as a palustrine forested wetland with a seasonal/seasonally saturated water regime (PFO1C/E). Principal wetland functions and values associated with the wetland are groundwater recharge/discharge, floodplain alteration, fish and shellfish habitat, sediment/toxicant retention, nutrient removal, production export, sediment/shoreline stabilization, wildlife habitat, uniqueness/habitat, and visual quality/aesthetics.

At the time of the field visit, soils within the wetland were saturated to the surface. Drainage patterns and water stained leaves were also observed. According to the SCS's mapping of the area, soils within the wetland are Mixed Alluvium. Samples taken in the field were mucky and gleyed (7.5YR2/0).

Dominant vegetation in the forest canopy includes *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweet gum), and *Fraxinus pennsylvanica* (green ash). *Ilex opaca* (American holly), *Lindera benzoin* (spicebush), *Ilex verticillata* (winterberry) and *Magnolia virginiana* (sweetbay) are the dominant shrub/understory species, while *Arisaema triphyllum* (jack-in-the-pulpit), *Woodwardia areolata* (netted chainfern), *Osmunda cinnamomea* (cinnamon fern) and *Saururus cernuus* (lizards tail) are dominant in the herbaceous layer.

Wetland 32 is located approximately 520-feet east of US 113, adjacent to the north side of the Birch Branch floodplain (W-31). The area has been excavated and was inundated to a depth of 6-inches in most places at the time of the field visit. The area is classified as both a palustrine forested and a scrub-shrub wetland with a seasonal water regime (PFO/PSS1C). Soils within the wetland are mapped as Fort Mott loamy sand, however, this soil type has

been excavated and no longer characterizes the site. Soil samples were not feasible at the time of the field visit due to inundation, however, it is assumed that if hydric soils are not already present, they will form over time due to the degree of saturation in the wetland.

Dominant vegetation noted in the field includes *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweet gum), and *Betula nigra* (river birch) in both the canopy and shrub layer of the wetland. *Myrica cerifera* (bayberry) was also present in the shrub layer. *Phragmites australis* (common reed), *Osmunda cinnamomea* (cinnamon fern) and *Woodwardia areolata* (netted chainfern) were the dominant herbaceous species.

Wetland 33 is located on the west side of US 113, 50-feet or more outside of the existing right-of-way and approximately 1,300-feet north of Kepler Lane. The area is classified as a palustrine forested wetland with a saturated water regime (PFO1B) and is characterized by scattered unvegetated depressions. The wetland is ditched along its southern edge. At the time of the field visit, water stained leaves were observed within the wetland and soils were saturated at a depth of 12-inches below the ground surface. Principal wetland functions and values associated with the wetland are groundwater recharge/discharge, nutrient removal, and wildlife habitat.

Soils in the area are mapped as Rutlege loamy sand which is listed as a hydric soil in Maryland. Soil samples were gleyed (2.5Y5/1) and mottled (2.5Y3/2). Dominant vegetation observed includes *Acer rubrum* (red maple) and *Liquidambar styraciflua* (sweet gum) in the canopy, *Magnolia virginiana* (sweetbay) in the understory and Sambucus canadensis (elderberry) in the shrub layer. The dominant herbaceous species are *Woodwardia areolata* (netted chainfern), *Osmunda cinnamomea* (cinnamon fern), and *Eulalai viminea* (microstegium).

Wetland 34 is located along existing US 113, approximately 100-feet south of Kepler Lane. The areas is classified as a palustrine forested wetland with a saturated water regime (PFO1B). The land surface has been significantly disturbed and is characterized by scattered unvegetated depressions. Soils were saturated at a depth of 12 to 16-inches below the ground surface and drainage patterns were observed throughout the wetland. Principal wetland functions and values associated with the wetland are groundwater recharge/discharge, nutrient removal, and wildlife habitat.

Soils in the wetland are mapped as Pocomoke loam which is listed as a hydric soil in Maryland. Samples were low chroma (2.5Y6/2) and streaking was observed from 14 to 32-inches. Dominant woody vegetation observed in the wetland includes *Acer rubrum* (red maple), *Nyssa sylvatica* (black gum) and *Liquidambar styraciflua* (sweet gum) in the canopy, *Magnolia virginiana* (sweetbay) in the understory, and *Clethra alnifolia* (coast pepperbush) in the shrub layer. The dominant herbaceous species are *Woodwardia areolata* (netted chainfern), and *Osmunda cinnamomea* (cinnamon fern).

Wetland 35 is located northeast of MD 113, approximately 100-feet south of Old Stage Road. The area is a small depressional wetland and would be classified as a palustrine forested wetland with a seasonal saturated water regime. At the time of the field visit, the wetland was inundated to a depth of 6-inches and water marks were observed.

Soils are mapped as Rutlege loamy sand which is listed as a hydric soil. When sampled, the soils were black sandy loam with a high percentage of sapric material. Dominant vegetation includes *Acer rubrum (*red maple) and *Liquidambar styraciflua* (sweet gum) in the canopy, *Vaccinium corymbosum* (highbush blueberry) and *Clethra alnifolia* (coast pepperbush) in the shrub layer. *Smilax rotundifolia* (greenbrier) was also observed throughout much of the wetland.

Wetland 36 is located adjacent to the east side of US 113, approximately 200-feet north of Old Stage Road. The area is classified as both a palustrine forested wetland with a seasonal saturated water regime (PFO1E) and a palustrine emergent wetland with a seasonal water regime (production exportM1B). The portion of the wetland that is emergent is adjacent to US 113 and has been cleared for power lines and billboards. Principal wetland functions and values associated with the wetland are groundwater recharge/discharge, nutrient removal, and wildlife habitat.

At the time of the field visit, the wetland was inundated to a depth of 4-inches and water marks were observed. Soils in the area are mapped as Pocomoke sandy loam. Soil samples were characterized by black muck from 0 to 2- inches. Dominant vegetation in the forested portion of the wetland includes *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweet gum), *Smilax rotundifolia* (greenbrier), *Clethra alnifolia* (pepperbush), and *Woodwardia areolata* (netted chainfern). The emergent wetland is dominated by *Scirpus cyperinus* (wool grass), *Juncus effusus* (soft rush), *Solidago rugosa* (rough-stemmed goldenrod), *Sambucus canadensis* (elderberry), and *Aster sp.* (aster).

Wetland 37 is a large system located on the west side of US 113. It begins approximately 2,500-feet north of Bishopville Road and extends parallel to US 113 for a distance of approximately 2,600-feet. The area is classified as a palustrine forested wetland with a saturated water regime (PFO1B) and has formed in a broad flat area with scattered unvegetated depressional areas. The land surface has been significantly disturbed by past logging activities within the wetland. Principal wetland functions and values associated with the wetland are groundwater recharge/discharge, nutrient removal, and wildlife habitat.

At the time of the field visit, the ground was saturated to the surface and free water was observed in an unlined bore hole at 10-inches below the surface. Water stained leaves were also observed. Soils in the wetland are mapped as Rutlege loamy sand which is listed as a hydric soil in Maryland. Soil samples were gleyed (2.5Y2.5/1). Dominant woody vegetation in the wetland includes *Acer rubrum* (red maple), *Quercus phellos* (willow oak) and *Liquidambar styraciflua* (sweet gum) in the canopy, *Magnolia virginiana* (sweetbay) in the understory, and *Vaccinium corymbosum* (highbush blueberry) in the shrub layer. The

dominant herbaceous species include *Woodwardia areolata* (netted chainfern) and *Carex sp.* (sedge species).

Wetland 38 is located on the east side of US 113, on the north side of the intersection of the highway and the Maryland and Delaware Railroad tracks. The wetland is bounded on three sides by either the highway or railroad and appears to be regularly mowed for billboard visibility. The area is classified as a palustrine emergent wetland with a saturated water regime (PEM1B). Soils in the wetland are mapped as Leon loamy sand which is a hydric soil, and were saturated at a depth of 12-inches. Soils samples were gleyed (2.5Y2.5/1). Dominant vegetation in the wetland includes *Osmunda regalis* (royal fern), *Didiplis diandra* (water purslane), *Carex lurida* (lurid sedge), *Juncus effusus* (soft rush), *Rhexia mariana* (Maryland meadow beauty), *Juncus canadensis* (Canada sedge) and *Rhynchospora glomerata* (clustered beakrush).

Wetland 39 is located west of US 113, approximately 200-feet north of where Alternate 4N Modified crosses MD 610 (Whaleyville Road). The area is classified as a palustrine forested wetland with a saturated/seasonal saturated water regime (PFO1B/E). The area has been significantly disturbed by past logging activities. At the time of the field visit, portions of the wetland were inundated to a depth of 2-inches. Areas that were not inundated were saturated 0 to 6-inches below the ground surface. Principal wetland functions and values associated with the wetland are groundwater recharge/discharge, nutrient removal, and wildlife habitat.

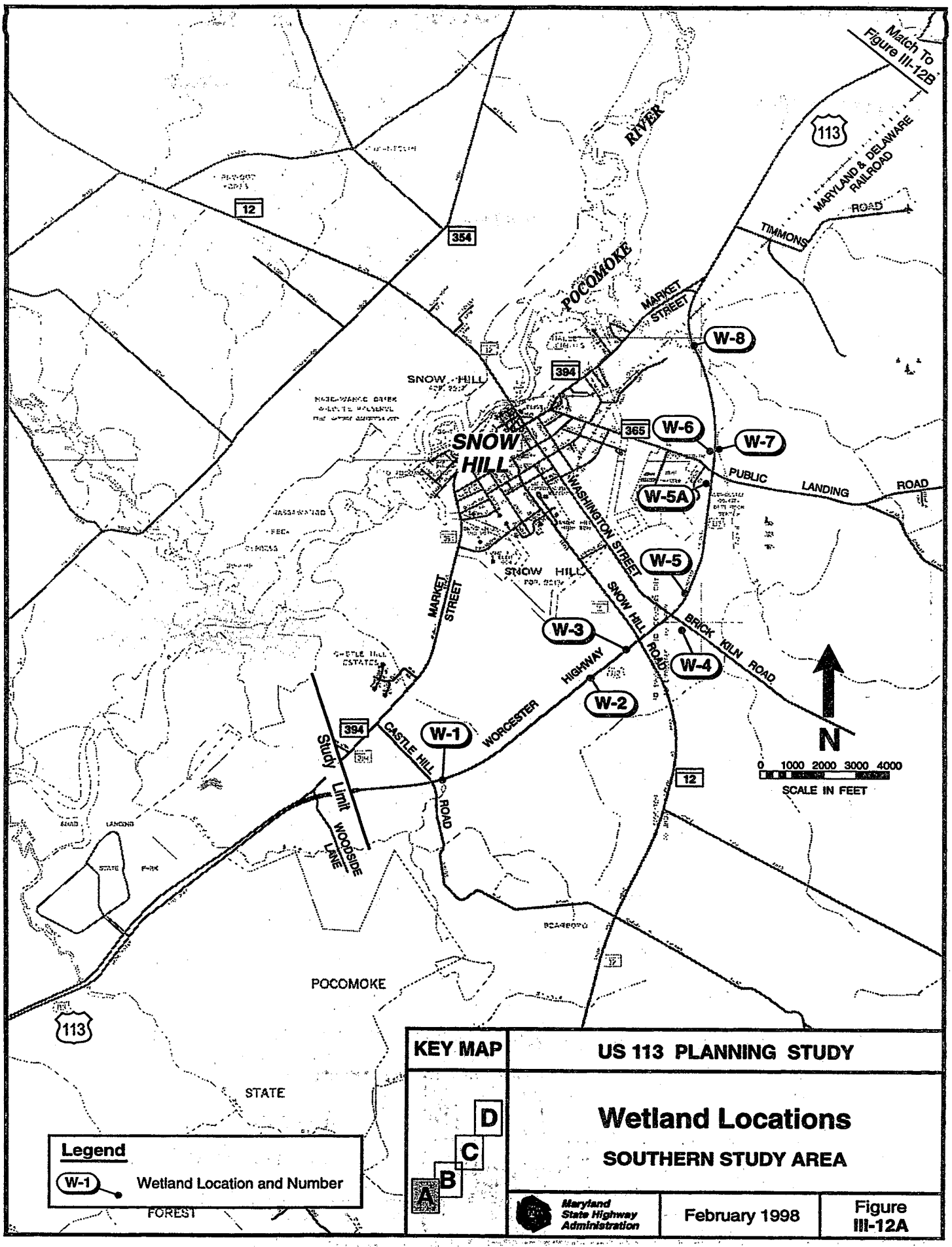
Soils are mapped as Pocomoke sandy loam which is a hydric soil. Soil samples were gleyed (2.5Y2.5/1) and a high organic content was observed in the surface layer of the sandy soils. The dominant vegetation in the canopy of the wetland is *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweet gum), *Quercus palustris* (pin oak), *Nyssa sylvatica* (black gum) and *Pinus taeda* (loblolly pine). The understory and shrub layer is dominated by *Symplocos tinctoria* (horse sugar), *Clethra alnifolia* (coast pepperbush) and *Vaccinium corymbosum* (highbush blueberry) while the dominant herbaceous species is *Woodwardia areolata* (netted chainfern).

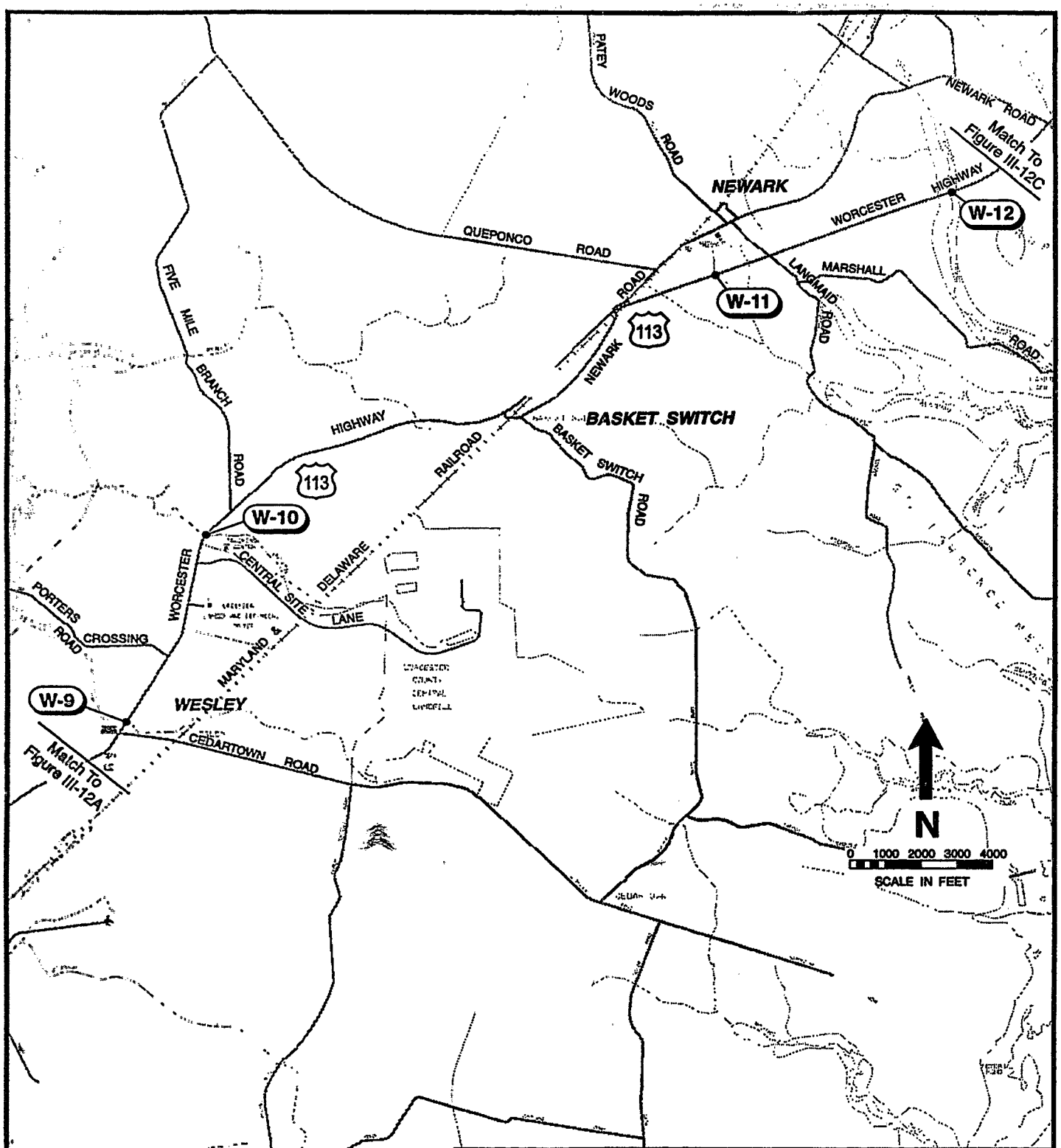
Wetland 40 is located within the floodplain of Carey Branch which crosses US 113 just south of Morris Road. The area is classified as a palustrine forested wetland with a seasonal saturated water regime (PFO1E) and was inundated to a depth of 2-inches at the time of the field visit. Numerous other hydrologic indicators, such as water marks, drift lines, sediment deposits and drainage patterns, were also noted. Principal wetland functions and values associated with the wetland are groundwater recharge/discharge, floodplain alteration, fish and shellfish habitat, sediment/toxicant retention, nutrient removal, production export, sediment/shoreline stabilization, wildlife habitat, and visual quality/aesthetics.

Soils within the wetland are mapped as Mixed Alluvium, which is typically poorly drained and often includes hydric soils. Soil samples were black and mucky to a depth of 20-inches. The dominant canopy species in the wetland are *Acer rubrum* (red maple) and *Liquidambar*

styraciflua (sweet gum). The shrub layer is sparse, however, the dominant species in the herbaceous layer include *Saururus canadensis* (lizards tail), *Boehmeria cylindrica* (false nettle), and *Impatiens capensis* (jewelweed).

A large portion of the study area is mapped in the Soil Survey as having hydric soils; however, an extensive series of drainage ditches has effectively lowered the water table in many areas. The most problematic of these areas are associated with abandoned fields that have returned to woodland. Most of the ditches in the study area support hydrophytic vegetation. On-site inspection by the Corps of Engineers has determined which ditches are jurisdictional. The ditches have been identified and labeled on the mapping for the Preferred Alternatives presented in Appendix A of this FEIS. Ditches have been included as jurisdictional wetlands where they are located immediately adjacent to wetland areas.

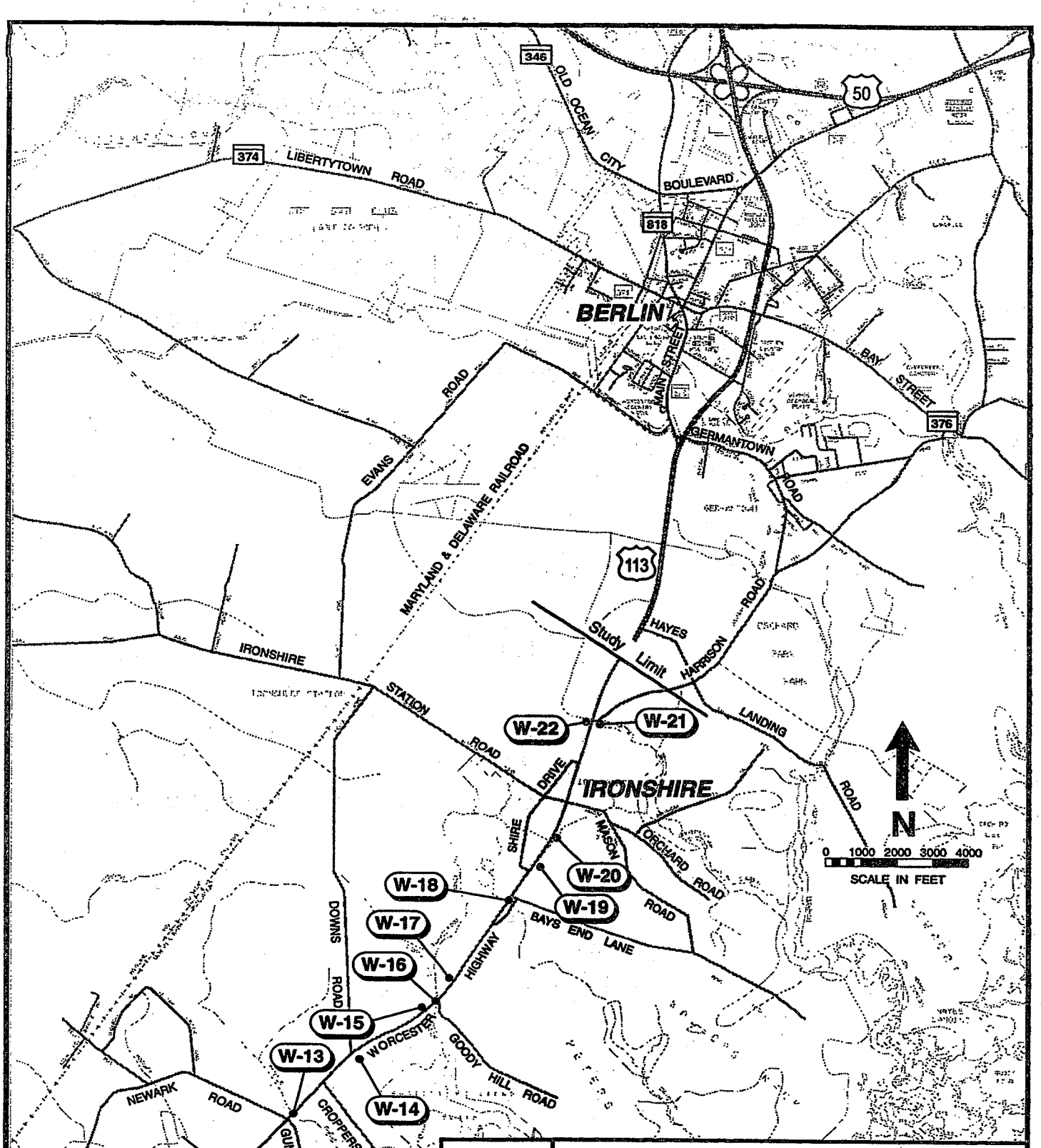

Match To Figure III-12B
113
MARYLAND & DELAWARE RAILROAD
TIMMONS ROAD
RIVER
POCOMOKE
MARKET STREET
W-8
12
354
394
SNOW HILL
365
W-6
W-7
PUBLIC LANDING ROAD
W-5A
WASHINGTON STREET
W-5
SNOW HILL ROAD
BRICK KILN ROAD
W-4
W-3
W-2
HIGHWAY
WORCESTER
W-1
CASTLE HILL ROAD
Study Limit
WOODSIDE LANE
N
0 1000 2000 3000 4000
SCALE IN FEET
POCOMOKE
STATE
FOREST
Legend
W-1 Wetland Location and Number
KEY MAP
A
B
C
D
US 113 PLANNING STUDY
Wetland Locations
SOUTHERN STUDY AREA
Maryland State Highway Administration
February 1998
Figure III-12A

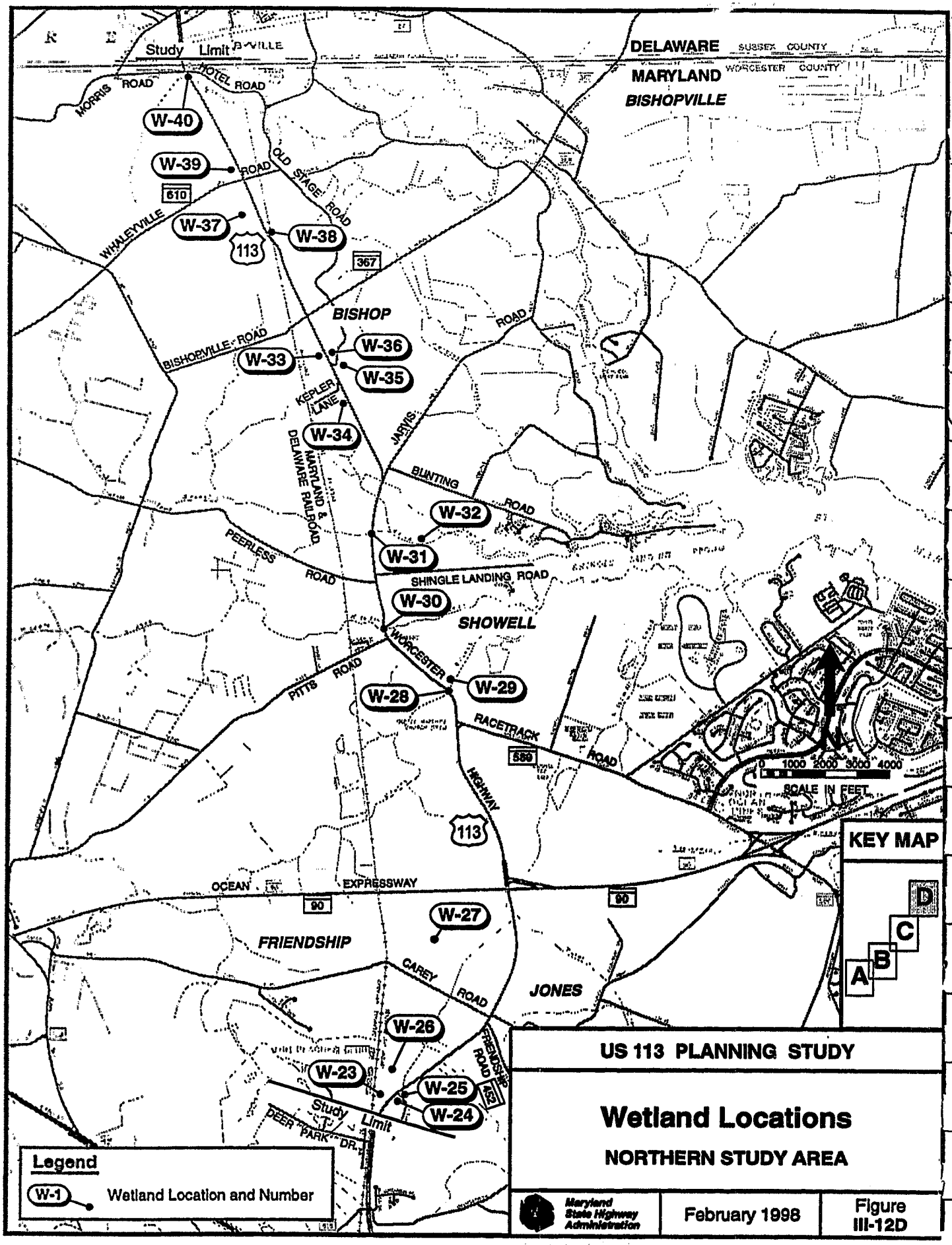


Legend

W-1 Wetland Location and Number

KEY MAP	US 113 PLANNING STUDY	
A B C D	**Wetland Locations** **SOUTHERN STUDY AREA**	
	Maryland State Highway Administration	February 1998	Figure III-12B


346
OLD OCEAN CITY BOULEVARD
50
374
LIBERTYTOWN ROAD
818
BERLIN
MAIN STREET
BAY STREET
376
GERMANTOWN ROAD
EVANS ROAD
MARYLAND & DELAWARE RAILROAD
113
HAYES ROAD
Study Limit
HARRISON LANDING ROAD
IRONSHIRE STATION ROAD
W-22
W-21
IRONSHIRE DRIVE
MASON ROAD
ORCHARD ROAD
N
0 1000 2000 3000 4000
SCALE IN FEET
W-20
W-19
W-18
W-17
W-16
W-15
W-13
W-14
DOWNS ROAD
BAYS END LANE
WORCESTER HIGHWAY
GOODY HILL ROAD
NEWARK ROAD
CROPPERS ISLAND ROAD
GUNNING CLUB LANE
Match To Figure III-12B
113
Legend
W-1 Wetland Location and Number
KEY MAP
A
B
C
D
US 113 PLANNING STUDY
Wetland Locations
SOUTHERN STUDY AREA
Maryland State Highway Administration
February 1998
Figure III-12C



US 113 PLANNING STUDY

Wetland Locations

NORTHERN STUDY AREA

Maryland State Highway Administration | February 1998 | Figure III-12D

Table III-17: Wetland Summary

Wetland Number	Approx[1] Size (Ac)	Cowardin System	Dominant Vegetation		Hydrologic Indicators	Soils	Principal Function	Other Observations
W-1	100	PEM1E	Spike Rush Wood Reedgrass Lurid Sedge Water Plantain Soft Rush	Eleocharis sp. Cinna Arundinacea Carex lurida Alisima plantago-aquatica Juncus effusus	Inundated Water Marks Sediment Deposits	Fallsington 0- 6" - sandy loam 10YR 5/2 6-18" - loamy sand 2.5Y 5/3 w/ 10YR 5/6	Grouped with W-3	Located at inlet and outlet of culvert under 113; ditched and disturbed by road; may have been natural tributary to Hardship Branch
W-2	>500	PFO1B	Red Maple Coast Pepperbush Wood Reedgrass Highbush Blueberry Arrow-wood Bayberry Sweetgum	Acer rubrum Clethra alnifolia Cinna Arundinacea Vaccinium corymbosum Viburnum dentatum Myrica cerifera Liquidambar styraciflua	Water Marks Sediment Deposits Saturated	Othello 4 to 12" - silt loam 2.5Y 5/1 with 10YR 5/8 redox	GR/D S/TR NR WH	Associated with broad drainage swale; northeast corner is farmed wetland
W-3	200	PEM1B (east) PFO1C (west)	Black Willow Soft Rush Green Bulrush Spike Rush Red Maple Sweetgum	Salix nigra Juncus effusus Scirpus atrovirens Eleocharis sp. Acer rubrum Liquidambar styraciflua	Inundated Saturated Sediment Deposits	Woodstown (hydric inclusion) 0-10" - sandy loam 10YR 6/1 with 7.5 YR 5/8 redox	WH	Appears to be a natural tributary to Patty's Branch that was ditched
W-4	2.0	PFO1E	Willow Oak Red Maple Coast Pepperbush Sweetgum Loblolly Blackgum	Quercus phellos Acer rubrum Clethra alnifolia Liquidambar styraciflua Pinus taeda Nyssa sylvatica	Inundated Saturated Water Marks	Sassafras Flooded - not described	[3]	Blocked ditch has impounded water; appears to have been flooded for several years based on water marks
W-5	11.0	PEM/SS1B	Panic Grass acuminatum Green Bulrush Ink-berry Red Maple MD Meadow Beauty Sedge St. Johnswort	Dichanthelium Scirpus atrovirens Ilex glabra Acer rubrum Rhexia mariana Carex spp. Hypericum sp.	Saturated Inundated Pockets	Fallsington 8-18" - sandy loam 2.5Y 5/1	Grouped with W-5A	Cleared r/w for powerline maintenance
W-5A	2.0	PEM/PFO	Loblolly Groundsel Tree Soft Rush Common Reed Common Greenbrier Panic Grass acuminatum Goldenrod	Pinus taeda Baccharis halimifolia Juncus effusus Phragmites australis Smilax rotundifolia Dichanthelium Solidago spp	Saturated	Fallsington	GR/D WH	Area appears to have been excavated, possibly for original highway construction.
W-6	>500	PFO/EM1B	Common Cattail Lizard's Tail Fringed Sedge Great Angelica Red Maple Sensitive Fern Sweetbay Arrow-wood Pickeralweed Spatterdock	Typha latifolia Saururus cernuus Carex crinita Angelica aropurpurea Acer rubrum Onoclea sensibilis Magnolia virginiana Viburnum dentatum Pontederia cordata Nuphar luteum	Inundated Saturated Water Marks Sediment Deposits Drainage Patterns	Fallsington 0-16" - sandy loam 10YR 3-4/1	Grouped with W-8	Upper floodplain limit of Patty's Branch; drainage pattern bisected by road

see page following table for footnotes

Wetland Number	Approx[1] Size (Ac)	Cowardin System	Dominant Vegetation		Hydrologic Indicators	Soils	Principal Function	Other Observations
W-7	>500	PFO1E PEM1E	Green ash Sweetgum Red Maple Lizard's Tail Brook-side Alder Black Willow False Nettle Spatterdock Buttonbush Elderberry	Fraxinus pennsylvanica Liquidambar styraciflua Acer rubrum Saururus cernuus Alnus serrulata Salix nigra Boehmeria cylindrica Nuphar luteum Cephalanthus occidentalis Sambucus canadensis	Inundated Saturated Drift lines Sediment Deposits Water Marks	Fallsington 0-18" - Black muck and sandy loam	Grouped with W-8	Patty's Branch and adjacent floodplain
W-8	>500	PFO2/1E	Bald Cypress Red Maple Sweetgum Coast Pepperbush Highbush Blueberry Wood Reedgrass Royal Fern Lizard's Tail Brook-side Alder Winterberry	Taxodium distichum Acer rubrum Liquidambar styraciflua Clethra alnifolia Vaccinium corymbosum Cinna Arundinacea Osmunda regalis Saururus cernuus Alnus serrulata Ilex verticillata	Inundated Saturated Water Marks	Fallsington 10-16" - sandy loam 5Y 6/1 with 10YR 4/6 redox	GR/D FA S/TR NR PE WH UH VQ/A	Cypress swamp in floodplain of Purnell and Campground Branch
W-9	200	PEM/FO1B	Red Maple Black Willow Brook-side Alder Buttonbush Jewelweed New York Ironweed Swamp Milkweed	Acer rubrum Salix nigra Alnus serrulata Cephalanthus occidentalis Impatiens capensis Veronia noveboracensis Asclepias incarnata	Inundated Water Marks Sediment Deposits Drainage Patterns	Mixed Alluvium Not described due to flooding	NR WH S/TR	Floodplain of Poorhouse Branch
W-10	>500	PFO1E	Red Maple Green ash Lizard's Tail Arrow-wood Blackgum Sensitive Fern American Hornbeam Sweetgum	Acer rubrum Fraxinus pennsylvanica Saururus cernuus Viburnum dentatum Nyssa sylvatica Onoclea sensibilis Carpinus caroliniana Liquidambar styraciflua	Inundated Water Marks	Mixed Alluvium 0-18" - silt loam 5Y 3/2	Grouped with W-9	Floodplain of Five Mile Branch
W-11	100	PFO1E	Red Maple Arrow-wood Spicebush False Nettle Jewelweed Sedge	Acer rubrum Viburnum dentatum Lindera benzoin Boehmeria cylindrica Impatiens capensis Carex sp	Inundated Saturated Sediment Deposits Drainage Patterns	Fallsington Not described due to flooding	Grouped with W-9	Bank and bottom of unnamed perennial stream
W-12	>500	PFO1E	Red Maple Sweetgum Spicebush Arrow-wood Sweetbay American Holly Netted Chainfern Lizard's Tail Sensitive Fern Winterberry Cinnamon Fern Clearweed	Acer rubrum Liquidambar styraciflua Lindera benzoin Viburnum dentatum Magnolia virginiana Ilex opaca Woodwardia areolata Saururus cernuus Onoclea sensibilis Ilex verticillata Osmunda cinnamomea Pilea pumila	Saturated	Portsmouth and Mixed Alluvium 4-12" - loam 7.5YR 2/0	Grouped with W-13	Broad headwater swale to Massey Branch; bisected by road

see page following table for footnotes

Wetland Number	Approx[1] Size (Ac)	Cowardin System	Dominant Vegetation		Hydrologic Indicators	Soils	Principal Function	Other Observations
W-13	100	PFO1B	Red Maple Green ash Blackgum Sweetbay Magnolia Spicebush Sweetgum Skunk Cabbage Lizard's Tail Jewelweed False Nettle Coast Pepperbush Netted Chainfern	Acer rubrum Fraxinus pennsylvanica Nyssa sylvatica Magnolia virginiana Lindera benzoin Liquidambar styraciflua Symplocarpus foetidus Saururus cernuus Impatiens capensis Boehmeria cylindrica Clethra alnifolia Woodwardia areolata	Saturated	Mixed Alluvium 4-10" - loamy sand 2.5Y 6/2 with 7.5YR 5/8 redox; 10-16" silty clay 10YR 4/1	FA S/TR NR PE WH VQ/A	Floodplain of Porter Creek
W-14	100	PFO1C	Red Maple Netted Chainfern New York Fern False Nettle American Holly Cinnamon Fern	Acer rubrum Woodwardia areolata Thelypteris noveboracensis Boehmeria cylindrica Ilex opaca Osmunda cinnamomea	Inundated Saturated Drainage Patterns	Fallsington/Pocomoke 0-18" Sandy loam 10YR 2/1	(3)	Headwater swale to Goody Hill Branch
W-15	5	PFO1C	Red Maple Sweetbay Spicebush Blackgum Seaside alder Arrow-wood Netted Chainfern False Nettle	Acer rubrum Magnolia virginiana Lindera benzoin Nyssa sylvatica Alnus maritima Viburnum dentatum Woodwardia areolata Boehmeria cylindrica	Inundated Saturated Sediment Deposits Drainage Patterns	Fallsington 4-18" Sandy loam 10YR 4/1	GR/D S/TR NR WH RES U/H	Wetland of special state concern; seaside alder, state status rare.
W-16	200	PFO1C	Red Maple Green ash Sweetgum Arrow-wood Jewelweed False nettle Common Greenbrier Lizard's Tail	Acer rubrum Fraxinus pennsylvanica Liquidambar styraciflua Viburnum dentatum Impatiens capensis Boehmeria cylindrica Smilax rotundifolia Saururus cernuus	Inundated Saturated Drainage Patterns	Mixed Alluvium 0-18" silt loam 10YR 4/1	GR/D FA S/TR NR WH	Floodplain of Basset Creek
W-17	0.8	PFO1B	Red Maple Arrow-wood Sedge Water Purslane Bayberry	Acer rubrum Viburnum dentatum Carex sp. Didiplis diandra Myrica cerifera	Inundated Saturated Water Marks	Fallsington 4-12 sandy loam 10YR 5/1 12-18 sandy loam 10YR 7/1	(3)	Cable r/w has created depressions; wetter hydrology than normal
W-18	100	PFO1E	Red Maple Blackgum Sweetgum Sweetbay Arrow-wood Netted Chainfern American Holly Swamp Azalea Sphagnum	Acer rubrum Nyssa sylvatica Liquidambar styraciflua Magnolia virginiana Viburnum dentatum Woodwardia areolata Ilex opaca Rhododendron viscosum	Inundated Saturated Buttressed Trunks	Mixed Alluvium 0-14" Muck	GR/D FA S/TR NR WH	
W-19	1.0	PFO1B	Brook-side Alder Red Maple Jewelweed Netted Chainfern Sweetgum Virginia Creeper quinquefolia	Alnus serrulata Acer rubrum Impatiens capensis Woodwardia areolata Liquidambar styraciflua Parthenocissus		Portsmouth 0-16" silt loam with high organic content	Grouped with W-18	Area has been drained by ditch; questionable hydrology

see page following table for footnotes

Wetland Number	Approx[1] Size (Ac)	Cowardin System	Dominant Vegetation		Hydrologic Indicators	Soils	Principal Function[2]	Other Observations
W-20	50	PFO1B	Red Maple Common Greenbrier Wood Reedgrass False Nettle Jewelweed Brook-side Alder	Acer rubrum Smilax rotundifolia Cinna Arundinacea Boehmeria cylindrica Impatiens capensis Alnus serrulata	Inundated Saturated	Fallsington 0 -10" sandy loam; 10YR 4/1 10-18" heavy sandy loam; 10YR 6/1	Grouped with W-18	Possible seaside alder
W-21	200	PFO1A	Arrow-wood Sweetgum Red Maple Lizard's Tail Multiflora Rose Jack-in-the-Pulpit Common Greenbrier	Viburnum dentatum Liquidambar styraciflua Acer rubrum Saururus cernuus Rosa multiflora Arisaema triphyllum Smilax rotundifolia	Saturated	Mixed Alluvium 4-8" silt loam 10YR 5/4 with 7.5 YR 5/4 redox; 8-18" silt loam 10YR 6/2 with 10YR 4/4 redox	Grouped with W-18	Floodplain of Poplartown Branch (east side of 113)
W-22	200	PFO1C	Red Maple Cottonwood Lizard's Tail Wood Reedgrass False Nettle	Acer rubrum Populus deltoides Saururus cernuus Cinna Arundinacea Boehmeria cylindrica	Inundated Saturated	Mixed Alluvium Not examined due to flooding	Grouped with W-18	Floodplain of Poplartown Branch (west side of 113)
W-23	3.0	PFO1C	Red Maple Sweetgum Blackgum Fetter-bush Possum-haw Netted Chainfern	Acer rubrum Liquidambar styraciflua Nyssa sylvatica Leucothoe racemosa Viburnum nudum Woodwardia areolata	Saturated Water Marks	Falllsington 3 -0" Fibric 0 -4" loam, 10YR 3/2 4-16"sandy clay loam	GR/D NR WH	Constricted outlet adjacent to railroad tracks
W-24	1.0	PFO1C	Red Maple Sweetgum White Oak Coast Pepperbush	Acer rubrum Liquidambar styraciflua Quercus alba Clethra alnifolia	Inundated Saturated Water Marks	Woodstown 0-5" loam 2.5Y 3/2; 5-10" sandy loam, 2.5Y 5/3 10-24" 2.5Y 5/4	Grouped with W-23	Gravel driveway restricts positive drainage; soils have not yet developed hydric indicators
W-25	100	PFO1C	Red Maple Willow oak Highbush Blueberry Coast Pepperbush Netted Chainfern	Acer rubrum Quercus phellos Vaccinium corymbosum Clethra alnifolia Woodwardia areolata	Saturated	Fallsington 0-8" loam, 2.5Y 3/1 8-14" sandy loam, 2.5Y 6/1	Grouped with W-23	Depressional micro-relief in broad headwater swale
W-26	3.0	PFO/SS1B	Red Maple Sweetgum Wood Reedgrass Bayberry Groundsel Tree Common Greenbrier Soft Rush Wool-grass Redtop smartweed Sedge	Acer rubrum Liquidambar styraciflua Cinna arundinacea Myrica cerifera Baccharis halimifolia Smilax rotundifolia Juncus effusus rush Scirpus cyperinus Agrostis alba Polygonum sp. Carex sp. Carex sp.	Inundated Saturated Water Marks Sediment Deposits	Othello/Fallsington 0-6" loam 10YR 3/2 6-18" heavy sandy loam, 10YR 6/1 with 10YR 5/6 redox	GR/D NR WH VQ/A	Adjacent to railroad tracks; eastern and western edge is farmed wetland
W-27	200	PFO1E	Red Maple Willow Oak Arrow-wood Water oak American Holly American Hornbeam Common Greenbrier	Acer rubrum Quercus phellos Viburnum dentatum Quercus nigra Ilex opaca Carpinus caroliniana Smilax rotundifolia	Inundated Saturated Water Marks Drainage Patterns	Fallsington 0-8" loam, 10YR 3/1 8-16" loam, 10YR 5/1	Grouped with W-37	Extensive depressional micro-relief

see page following table for footnotes

Wetland Number	Approx. Size (Ac)	Cowardin System	Dominant Vegetation		Hydrologic Indicators	Soils	Principal Function	Other Observations
W-28	200	PFO1E	Red Maple Green ash Blackgum Winterberry American Holly Coast Pepperbush Lizard's Tail Jewelweed Netted Chainfern Arrow-wood	Acer rubrum Fraxinus pennsylvanica Nyssa sylvatica Ilex verticillata Ilex opaca Clethra alnifolia Saururus cernuus Impatiens capensis Woodwardia areolata Viburnum dentatum	Inundated Saturated Drainage Patterns	Mixed Alluvium 0-24" Muck	GR/D FA FSH S/TR NR PE WH SSS VQ/A	Floodplain of Church Branch
W-29	1.8	PFO1E	Red Maple Highbush Blueberry Sweetgum Loblolly Coast Pepperbush Common Reed	Acer rubrum Vaccinium corymbosum Liquidambar styraciflua Pinus taeda Clethra alnifolia Phragmites australis	Inundated Saturated	Fort Mott Not described due to flooding	GR/D WH	Isolated depression from previous sand and gravel excavation
W-30	>500	PFO1C	Red Maple Sweetgum Green ash American Holly Spicebush Coast Pepperbush Jewelweed False Nettle Netted Chainfern Lizard's Tail	Acer rubrum Liquidambar styraciflua Fraxinus pennsylvanica Ilex opaca Lindera benzoin Clethra alnifolia Impatiens capensis Boehmeria cylindrica Woodwardia areolata Saururus cernuus	Saturated Drift Lines Sediment Deposits Drainage Patterns	Mixed Alluvium 5-18" silt loam 10YR 5/2	Grouped with W-28	Floodplain of Middle Branch
W-31	>500	PFO1C/E	Red Maple Blackgum American Holly Green ash Spicebush Sweetbay Jack-in-the-Pulpit Netted Chainfern Cinnamon Fern Lizard's Tail Winterberry	Acer rubrum Nyssa sylvatica Ilex opaca Fraxinus pennsylvanica Lindera benzoin Magnolia virginiana Arisaema triphyllum Woodwardia areolata Osmunda cinnamomea Saururus cernuus Ilex verticillata	Saturated Drainage Patterns	Mixed Alluvium 0-24" Muck	Grouped with W-28	Floodplain of unnamed tributary to Middle Branch
W-32	>500	PFO/SS1C	Red Maple Common Reed Sweetgum River birch Cinnamon Fern Netted Chainfern Bayberry	Acer rubrum Phragmites australis Liquidambar styraciflua Betula nigra Osmunda cinnamomea Woodwardia areolata Myrica cerifera	Inundated Saturated Water Marks Drift Lines	Fort Mott Not described due to flooding	(3)	Excavated depression adjacent to floodplain of unnamed tributary to Middle Branch; appears to be old sand and gravel pit
W-33	100	PFO1B	Red Maple Sweetgum Sweetbay Elderberry Netted Chainfern Cinnamon Fern Microstegium	Acer rubrum Liquidambar styraciflua Magnolia virginiana Sambucus canadensis Woodwardia areolata Osmunda cinnamomea Eulalai viminea	Saturated	Rutledge 0-12" loam 2.5Y 2.5/1 12-24"sandy clay loam, 2.5Y 5/1	GR/D NR WH	Scattered unvegetated depressions; ditched along southern edge

see page following table for footnotes

Wetland Number	Approx. Size (Ac)	Cowardin System	Dominant Vegetation		Hydrologic Indicators	Soils	Principal Function	Other Observations
W-34	100	PFO1B	Red Maple Sweetgum Sweetbay Coast Pepperbush Netted Chainfern Cinnamon Fern Common Greenbrier Blackgum	Acer rubrum Liquidambar styraciflua Magnolia virginiana Clethra alnifolia Woodwardia areolata Osmunda cinnamomea Smilax rotundifolia Nyssa sylvatica	Saturated Drainage Patterns	Pocomoke 0-10" loam, 2.5Y 2.5/1 10-14" sandy loam, 2.5Y 6/2 14-24" sandy clay loam, 2.5Y 6/3	Grouped with W-33	Land surface significantly disturbed by past logging; scattered unvegetated depressional areas
W-35	1.0	PFO1E	Red Maple Sweetgum Netted Chainfern Coast Pepperbush Highbush Blueberry greenbrier	Acer rubrum Liquidambar styraciflua Woodwardia areolata Clethra alnifolia Vaccinium corymbosum Smilax rotundifolia	Inundated Saturated Water Marks	Rutledge 0-18" Black silt loam with sapric material	(3)	Depressional wetland
W-36	5.0	PFO1E PEM1C	Red Maple Sweetgum Coast Pepperbush Netted Chainfern Common Greenbrier Wool-grass Soft Rush rough stem goldenrod Elderberry Aster	Acer rubrum Liquidambar styraciflua Clethra alnifolia Woodwardia areolata Smilax rotundifolia Scirpus cyperinus Juncus effusus rush Solidago rugosa Sambucus canadensis Aster sp.	Inundated Saturated Water Marks	Rutledge 0-20" Black muck and sandy loam	Grouped with W-33	Western portion of wetland along Rt. 113 has been cleared for power lines and billboards
W-37	200	PFO1B	Red Maple Sweetgum Highbush Blueberry Sweetbay Netted Chainfern Sedge Willow Oak	Acer rubrum Liquidambar styraciflua Vaccinium corymbosum Magnolia virginiana Woodwardia areolata Carex, sp. Quercus phellos	Saturated	Leon, Pocomoke, and Rutledge 0-24" loam to sandy loam, 2.5Y 2.5/1	GR/D NR WH	Scattered unvegetated depressional areas; land surface significantly disturbed by past logging
W-38	0.7	PEM1B	Royal Fern Water Purslane Lurid Sedge Soft Rush MD Meadow Beauty Canada Goldenrod Clustered Beakrush	Osmunda regalis Didiplis diandra Carex lurida Juncus effusus rush Rhexia mariana Juncus canadensis Rhynchospora glomerata	Saturated	Leon 0-12" sandy loam 2.5Y 2.5/1; 12-24" sandy clay loam, 2.5Y 5/2 with 2.5Y 3/1 redox	(3)	Mowed for billboard visibility; located between railroad tracks and Rt.113
W-39	200	PFO1B/E	Red Maple Sweetgum Loblolly Pin Oak Coast Pepperbush Highbush Blueberry Netted Chainfern Blackgum Horse Sugar	Acer rubrum Liquidambar styraciflua Pinus taeda Quercus palustris Clethra alnifolia Vaccinium corymbosum Woodwardia areolata Nyssa sylvatica Symplocos tinctoria	Inundated Saturated Water Marks	Pocomoke 0-24" loam to sandy loam, 2.5Y 2.5/1	Grouped with W-37	Significant disturbance by previous logging
W-40	>500	PFO1E	Red Maple Sweetgum Lizard's Tail False Nettle Jewelweed	Acer rubrum Liquidambar styraciflua Saururus cernuus Boehmeria cylindrica Impatiens capensis	Inundated Saturated Water Marks Drift Lines Sediment Deposits Drainage Patterns	Mixed Alluvium 0-20" Black muck and sandy loam	Grouped with W-28	Floodplain of Carey Branch

see page following table for footnotes

Footnotes To Table III-17: Wetland Summary:

1. Approximate size of the total wetland outside the study area has been estimated from available Soil Survey and National Wetland Inventory information.

2. See Section H.3 for functional assessment methodology.
   GR/D - Groundwater Recharge/Discharge
   F/A - Floodflow Alteration
   FSH - Fish and Shellfish Habitat
   S/TR - Sediment/Toxicant Retention
   NR - Nutrient Removal
   PE - Production Export
   SSS - Sediment/Shoreline Stabilization
   WH - Wildlife Habitat
   RES - Rare/Endangered Species Habitat
   U/H - Uniqueness/Heritage
   VQ/A - Visual Quality/Aesthetics

3. Wetland functions and values were not determined for wetlands that are less than one acre, or outside the study area for the alternatives under consideration.

3. Wetland Functions

Wetland functions and values were evaluated using The Highway Methodology Workbook Supplement - Wetland Functions and Values: A Descriptive Approach (ACOE, 1995). The methodology incorporates both wetland science and best professional judgment to determine what functions and values are present in the wetland, followed by a determination of principal functions and values provided by the wetland. Principal functions and values are defined as an important physical component of a wetland ecosystem (function only), and/or are considered of special value to society from a local, regional, or national perspective. The following functions and values are assessed by the "Descriptive Approach" methodology:

Groundwater Recharge/Discharge - This function considers the potential for a wetland to serve as a groundwater recharge and/or discharge area. It refers to the fundamental interaction between wetlands and aquifers, regardless of size or importance of either.

Floodflow Alteration - This function considers the effectiveness of the wetland in reducing flood damage by water retention for prolonged periods following precipitation events and the gradual release of floodwaters. It adds to the stability of the wetland ecological system or its buffering characteristics, and provides social or economic value relative to erosion and/or flood prone areas.

Fish and Shellfish Habitat - This function considers the effectiveness of seasonal or permanent watercourses associated with the wetland in question for fish and shellfish habitat.

Sediment/Toxicant/Pathogen Retention - This function reduces or prevents degradation of water quality. It relates to the effectiveness of the wetland as a trap for sediments, toxicants, and pathogens in runoff water from surrounding uplands, or upstream eroding areas.

Nutrient Removal/Retention/Transformation - This function considers the effectiveness of the wetland as trap for nutrients in runoff water from surrounding uplands or contiguous wetlands, and the ability of the wetland to process these nutrients into other forms or trophic levels. One aspect of this function is to prevent ill effects of nutrients entering aquifers or surface waters such as ponds, lakes, streams, rivers, or estuaries.

Production Export - This function evaluates the effectiveness of the wetland to produce food or usable products for man or other living things.

Sediment/Shoreline Stabilization - This function considers the effectiveness of a wetland to stabilize stream banks and shorelines against erosion.

Wildlife Habitat - This function considers the effectiveness of the wetland to provide habitat for various types and populations of animals typically associated with wetlands and the wetland edge.

Recreation - This value considers the suitability of the wetland and associated watercourses to provide recreational opportunities such as hiking, canoeing, boating, fishing, hunting, and other active or passive recreational activities.

Educational/Scientific Value - This value considers the suitability of the wetland as a site for an "outdoor classroom" or as a location for scientific study or research.

Uniqueness/Heritage - This value considers the effectiveness of the wetland or its associated water bodies to provide certain special values. These may include archeological sites, critical habitat for endangered species, its overall health and appearance, its role in the ecological system of the area, or its relative importance as a typical wetland class for this geographic location.

Visual Quality/Aesthetics - This value considers the visual and aesthetic quality or usefulness of the wetland.

Endangered Species Habitat - This value considers the suitability of the wetland to support threatened or endangered species.

An interagency study team was established to evaluate the functions and values of fifteen representative wetlands in the project area. The study team included staff members of the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, the Maryland State Highway Administration, and the environmental consultant. The wetlands selected for assessment were determined to be representative of typical wetlands in the project area based on size, landscape position, location within the watershed, and surrounding land-use. Although all wetlands provide varying degrees of functions and values, the interagency team agreed to complete functional assessments only for wetlands larger than one acre, and wetlands that are located within the study area of the proposed alignments. Principal wetland functions and values provided by the wetlands are summarized in Table III-18. Detailed information, including data sheets, are provided in the Natural Resources Technical Report.

Table III-18: Wetland Functions and Values [1]

Wetland Number[2]	Wetland Type	Watershed	Groundwater Recharge/ Discharge	Floodflow Alteration	Fish and Shellfish Habitat	Sediment/ Toxicant Retention	Nutrient Removal	Production Export	Sediment/ Shoreline Stabilize.	Wildlife Habitat	Unique./ Heritage	Visual Quality/ Aesthetics
2	PFO1B	Patty's Branch	X	●		X	X	●		X		●
3	PEM/FO	Patty's Branch	●			●				X		
5A	PEM/SS	Patty's Branch	X				●	●		X		
8	PFO2/1E	Purnell Branch	X	X	●	X	X	X	●	X	X	X
9	PFO1B	Poorhouse Branch	●	●		X	X	●	●	X		●
13	PFO1B	Porter Creek	●	X	●	X	X	X	●	X	●	X
15[3]	PFO1C	Bassett Creek	X	●		X	X	●		X	X	
16	PFO1B	Bassett Creek	X	X		X	X	●	●	X	●	●
18	PFO1E	Catbird Creek	X	X		X	X	●	●	X		●
23	PFO1C	Church Branch	X	●			X	●		X		●
26	PFO/SS	Church Branch	X			●	X	●		X		X
28	PFO1E	Church Branch	X	X	X	X	X	X	X	X		X
29	PFO1E	Church Branch	X	●	●	●	●	●		X		
33	PFO1B	Birch Branch	X				X	●		X		●
37	PFO1B	Carey Branch	X				X			X		●

Notes:

X - Denotes principal wetland function and value using the USACOE Descriptive Approach.

● - Denotes that wetland function and value are present to some degree.

(1) - Recreation value and Educational/Scientific value were evaluated by the study team and were not found to be a principal function/value for any wetland.

(2) - Other wetlands in the study area have been grouped with the listed reference wetlands for the purpose of the FEIS. The following wetlands are grouped based on similar site characteristic: (1 and 3), (5 and 5A), (6, 7, and 8), (9, 10, and 11), (12 and 13), (18, 19, 20, 21, and 22), (23, 24, and 25), (27,37, and 39), (28, 30, 31, and 40), (33, 34, and 36). Functions and values were not assessed for wetlands that are less than one acre or outside the study area.

(3) - Wetland of special state concern; provides habitat for seaside alder (state status rare).

I. Vegetation and Wildlife

1. Vegetation

Vegetation within the study area primarily consists of plant species associated with forested areas, wetlands, farmlands, and meadows, and landscaped and turfed areas associated with developed commercial, recreational, institutional and residential land uses.

The forested vegetation habitats vary from bottomland floodplain areas dominated by species tolerant of semi-saturated and prolonged saturated and inundated conditions, to gently sloping and level uplands consisting of species tolerant of drier soil environments.

The forest density in general is variable with some areas having a fairly dense overstory, subcanopy, shrub and herbaceous cover while in other areas the subcanopy trees, shrubs and herbaceous species are sparse or lacking. Some forest areas were logged at sometime in the past and it is within these areas that dense stands of early growth loblolly pine, deciduous tree saplings and various grass and flowering ground cover species occur.

The upland forests are dominated primarily by red maple (*Acer rubrum*), white oak (*Quercus alba*), southern red oak (*Q. falcata),* tulip tree (*Liriodendron tulipifera*), loblolly pine (*Pinus taeda*), American holly (*Ilex opaca*), sweet pepper-bush (*Clethra alnifolia*), arrow-wood (*Viburnum dentatum*), Japanese honeysuckle (*Lonicera japonica*), common poison-ivy (*Toxicodendron radicans*) and Virginia creeper (*Parthenocissus quinquefolia*).

Three specimen trees were identified and the size and quality documented: a southern red oak with 34.5 inch Diameter at Breast Height (DBH), the trunk is in good condition and top crown is generally well shaped with minimal dead wood; two tulip trees, one 41.2 inch DBH and one 43 inch DBH, have trunks in good condition with fairly well-shaped crowns and minimal dead wood. These trees are located approximately 150 feet northeast of Poplartown Branch and approximately 60 feet west of US 113.

The bottomland forests are dominated primarily by several species also found in the upland forests which include red maple, loblolly pine, arrow-wood, sweet pepper-bush, Japanese honeysuckle as well as sweetgum (*Liquidambar styraciflua)* and blackgum (*Nyssa sylvatica*).

Wetlands which occur within or adjacent to streams and within floodplains or other areas where a prolonged high water table sustains plant species able to adapt and reproduce in soils which may be saturated or inundated for long periods of time. Such species include: silky dogwood (*Cornus amomum*), bald cypress (*Taxodium distichum*), seaside alder (*Alnus maritma*), narrow-leaved cattail (*Typha angustifolia*), spotted touch-me-not (*Impatiens capensis*), buttonbush (*Cephalanthus occidentalis*), Sedges (*Carex sp.)* and skunk-cabbage (*Symplocarpus foetidus).*

A few fallow fields are interspersed between the farmed areas, landscaped areas and forests and are dominated by various grasses as well as flowering ground cover and shrubby species. Plant species occurring in the fallow field areas include: meadow fescue (*Festuca pratensis*), Canada thistle (*Cirsium arvense*), sour dock (*Rumex crispus*), fragrant goldenrod (*Euthania tenuifolia*), common pokeweed (*Phytolacca americana*) and daisy fleabane (*Erigeron strigosus*).

Vegetation on the farmed areas consists primarily of crops such as soybean (*Glycine max*), corn (*Zea mays*) and wheat (*Triticum aestivum*).

The developed areas contain a wide variety of native, naturalized and ornamental trees, shrubs and herbaceous plants. Included are lawns and other turfed areas, hedge rows, foundation plantings and flower beds.

2. Wildlife and Wildlife Habitat

Based on vegetation, three major habitat types within the study area have been identified: terrestrial or upland, wetland, and aquatic. Some of the wildlife species found in the study area such as whitetailed deer (*Odozoileus virginianus*), racoon (*Procyon loter*), and mourning dove (*Zenaida maccrouna*), use a variety of the habitats found in the study area. Other species such as black rat snake (*Elaphe obsoleta obsoleta*), meadow vole (*Microtus pennsylvanicus*), and Cooper's hawk (*Accipiter cooperii*), however, have more specialized habitat requirements and depend on specific habitats.

The southern and northern study areas generally parallel the existing alignment of US 113 and include many existing treelines and fringe portions of major and minor forested areas. Many of these forested tracts are interrupted by croplands, commercial and residential properties and meadows. Several of the forested areas are extensive enough, however, that they could potentially be used for safe havens and breeding by forest interior dwelling species. Some of these species would be year-round residents of the study area while others would migrate to the area during the spring and summer to breed. These species, that require large tracts of undisturbed forestland, have undergone substantial declines in parts of Maryland due to the loss, fragmentation, and isolation of forest habitat needed to sustain their populations (Maryland Department of Natural Resources, 1986). The criteria suggest that riparian forests, of 300 feet wide or wider, and upland forests of at least 100 acres, are likely to be habitats for interior dwelling birds (Maryland Department of Natural Resources, 1986).

a. Terrestrial Habitat

In the developed areas, wildlife species able to adapt and coexist with humans are commonly found. Certain forest dwelling mammal species will also occasionally venture onto developed and cropland areas in search of food. Bird species expected to commonly use the developed, cropland and meadow areas, as well as the forested areas, include: downy woodpecker (*Picoides pubessens*), American robin (*Turdus migratorius*), gray catbird (*Dumetella*

carolinensis), northern mocking bird (*Mimus polyglottos*), common grackle (*Quiscalus quiscula*), and American crow (*Corvus brachyrhynchos*). Mammal and reptile species include: red fox (*Vulpes vulpes*), woodchuck (*Marmota monox*), gray squirrel (*Sciurus carolinensis*), eastern chipmunk (*Tamias striatus*), Virginia opossum (*Didelphis virginiana*), and eastern gartersnake (*Thamnophis sirtalis*). A complete listing of amphibian, reptile, mammal and bird species found in Worcester County may be found in Appendix E of this document.

b. Aquatic and Wetland Habitat

The wetland habitats within and adjacent to both the north and south study areas are varied consisting of forested, scrub-shrub and emergent wetlands as well as riverine stream systems. The stream systems were identified and are described in Section III-F and the wetland systems are discussed in Section III-H. The streams crossed within the study area are primarily very slow moving with sand and mud bottoms, and the channels are mostly non-vegetated, other than plants occurring on the adjacent slopes which consist of emergent and scrub-shrub species. Palustrine deciduous forests often occur on the adjacent floodplains.

Bird species which are dependent on these habitats include: belted kingfisher (*Ceryle alcyon*), great blue heron (*Ardea herodias*), mallard (*Anas platyrhynchos*), wood duck (*Aix sponsa*), and red-winged black bird (*Agelaius phoeniceus*). Mammal, reptile and amphibian species also utilizing these habitats include: muskrat (*Ondatra zibethius*), nutria (*Myocaster coypus*), bullfrog (*Rana catesbeiana*), common musk turtle (*Sternotherus odoratus*) and northern water snake (*Nerodia sipedon*). Many of the upland species such as American robin, northern mockingbird, gray catbird, red fox, white-tailed deer, racoon, Virginia opossum and black rat snake also utilize the wetland and aquatic habitats.

A complete listing of amphibian, reptile, mammal and bird species found in Worcester County may be found in Appendix E of this document.

Streams and ponds within and adjacent to the study area are considered to be aquatic habitats within which shallow depths permit the dense growth of certain submerged vascular plant species, which are either attached to the substrate or float freely in the water above the bottom or on the surface.

The Pocomoke River is widely known for the quality of its sport fishery. The tributary streams within the project's southern study area are generally small and offer limited sport fishing potential, they do however, provide important spawning grounds which support the Pocomoke River fishery.

The stream systems which occur within both the Pocomoke River area and the Coastal Drainage areas provide food sources and spawning environments for migratory fish species such as white perch (*Morone americana*), yellow perch (*Perca flavescens*), blueback herring (*Alosa aestivalis*) and alewife (*Alosa pseudoharengus*) as well as resident species including:

large-mouth bass (*Micropterus salmoides*), chain pickerel (*Esox niger*), blue-spotted sunfish (*Ennea conthus gloriosus*), and pumpkinseed (*Lepomis gibbosus*). A complete listing of fish species found in Worcester County's freshwaters may be found in Appendix E of this document.

3. Rare, Threatened and Endangered Species

Coordination with the U.S. Fish and Wildlife Service (Wolflin, 1995) has revealed that there are no known Federally listed endangered or threatened species under their jurisdiction within the study area. Coordination with the Maryland DNR Wildlife and Heritage Division, however, (Dintaman, Jr., 1995, Davidson, 1996) indicates that there are several State rare, threatened and endangered plant species and a finfish species subject to potential impact within the study area.

The DNR Wildlife and Heritage Division has recorded 20 State rare, threatened and endangered plant species occurring within one mile of the southern section of the US 113 roadway study area. Within the immediate study area, four of these plant species are known to occur. The four species include: seaside alder (*Alnus maritima*), swamp beggar-ticks (*Bidens discoidea*) and variable yelloweyed-grass (*Xyris difformis*), state status, rare and low water-milfoil (*Myriophyllum humile*) which is state endangered. On July 17, 1996 a field survey was conducted in the effort to verify the existence and location of the four species. Only the seaside alder was found and identified near the roadway.

The DNR also lists a finfish species, the blackbanded sunfish (*Enneaconthus chaetadon*), which may occur in Cary Branch located north of Berlin (Dintaman Jr., 1995) . The sunfish population is thought to be limited or declining in the State such that it may be threatened in the future and therefore is in need of conservation. No surveys were undertaken to verify the occurrence of the sunfish in Cary Branch or any other stream in the study area.

J. Air Quality

The US 113 project is located in Worcester County, which is not listed as a nonattainment area for carbon monoxide and ozone. Therefore, with the exception of construction procedures requirements, the conformity requirements of 40 CFR 93 do not apply to this project. The project is also in an area where the State Implementation Plan (SIP) does not contain any transportation control measures. Therefore, the conformity procedures in the Federal Register on November 24, 1993 do not apply to this project.

The air quality analysis serves as support documentation for the project and has been prepared in accordance with the U.S. Environmental Protection Agency (U.S. EPA), Federal Highway Administration (FHWA), and Maryland SHA guidelines. A CO attainment area is defined in Section 186 of the Clean Air Act Amendments of 1990 (CAA '90) as a region that has a design value of less that 9.1 ppm. Carbon monoxide (CO) impacts were analyzed as the accepted indicator of vehicle-generated air pollution.

1. Methodology

The EPA's CAL3QHC dispersion model was used to predict CO concentrations for air quality sensitive receptors for the year of completion (2000) and the design year (2020). These detailed analyses predict air quality impacts from CO vehicular emissions for both the No Build and Dualization Alternatives 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).

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 attributed to the facility under consideration. The background levels were derived from the application of rollback methodology to on-site monitoring conducted by the Maryland Department of the Environment, Air Management Administration at their Essex Site during the period of 1994.

2. Description of Air Sensitive Receptors

Sixty-five air receptor locations were selected to represent air quality sensitive locations within the study area. These locations, representing residences, places of worship, and historic properties, were selected to represent the worst case conditions for air quality impacts associated with the proposed project. The locations of the air quality sensitive sites presented on Figures III-13A through 13D, were verified by a site visit in November, 1996.

3. Background CO Levels

Background CO, in parts per million (PPM) were determined to be 2.6 ppm for a 1-hour period and 0.9 ppm for an 8-hour period. These CO concentrations are lower than the S/NAAQS 1-hour CO concentration of 35 ppm and the 8-hour CO concentration of 9 ppm, at any air quality receptor location, in either analysis year.

K. Noise Quality

1. Design Noise Level/Activity Relationships

The design noise levels indicated in Table III-19 have been used to determine highway traffic noise impacts associated with different land uses or activities in existence at the time of project development. In addition, the design noise levels have been used to determine where further consideration of noise mitigation will be required during the final design of the project. The applicable activity category for developed land uses adjacent to US 113 is category "B" for which the L_{eq} (Exterior) design noise level is 67 dBA.

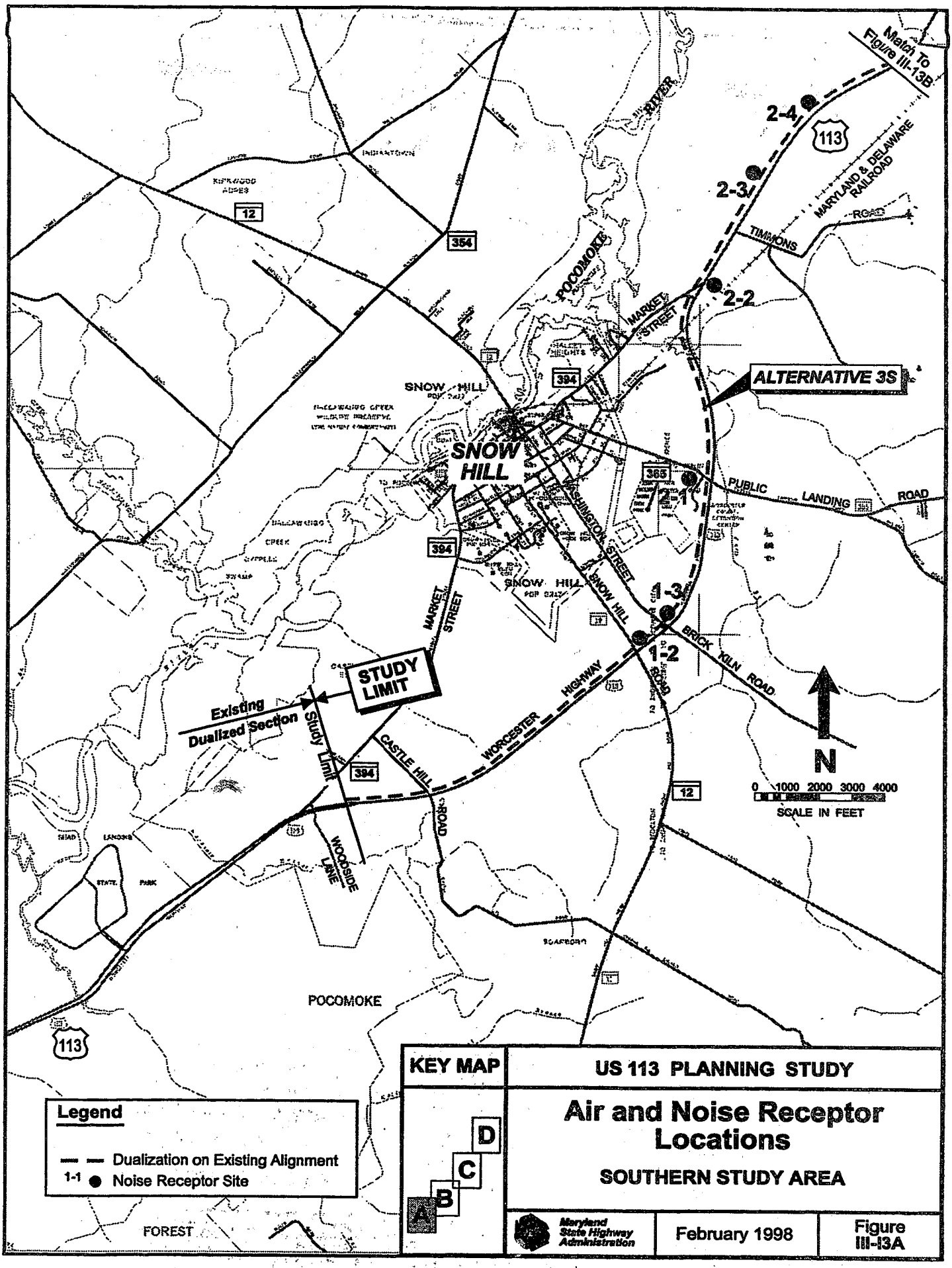
2. Existing Noise Environment

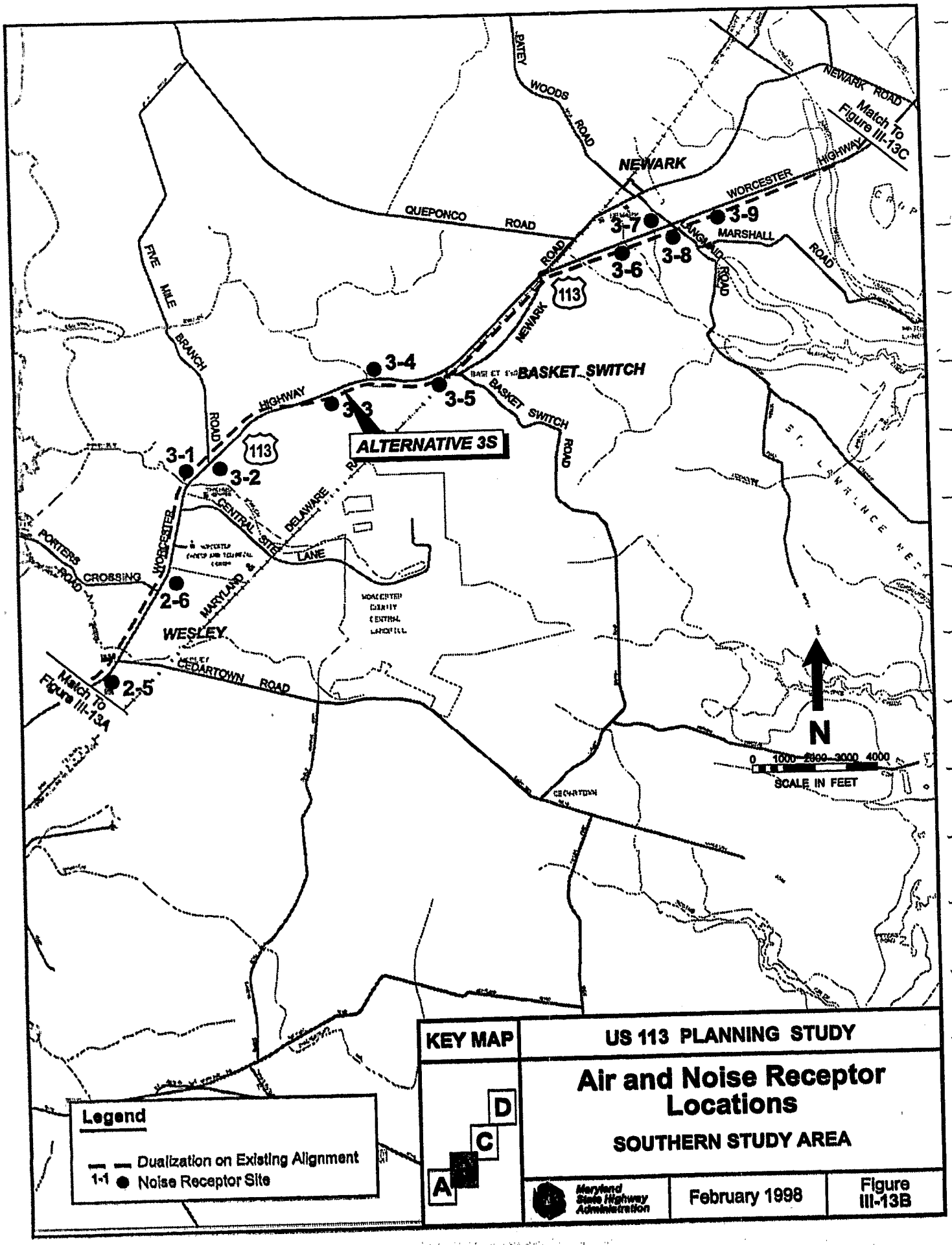
Ambient Noise Measurements

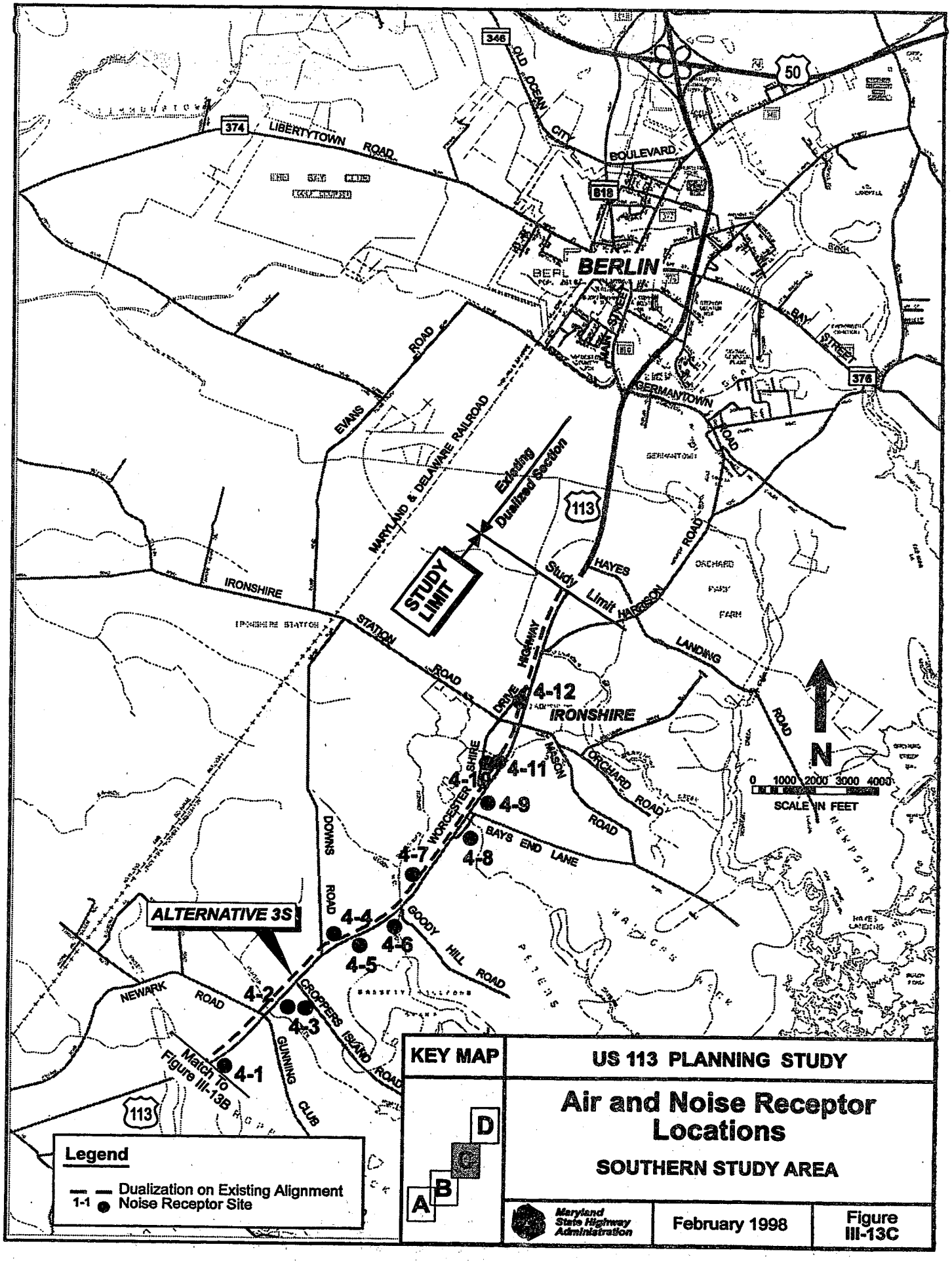
In order to determine the existing noise characteristics present within the corridors of the various build alternatives being considered, ambient noise measurements were recorded at 65 receptor locations during November, 1996. Results of the ambient measurements at the receptor locations chosen, indicate a variety of contributing sources to the local noise environment. These include birds chirping, leaves rustling, dogs barking, and trains, in addition to traffic-related noise from US 113. The local street network within the study area has minimal influence on the respective communities. Major arterials intersecting with US 113 also contribute to the noise environment for select sensitive receptor sites, however, they do not influence the overall result of the proposed improvements.

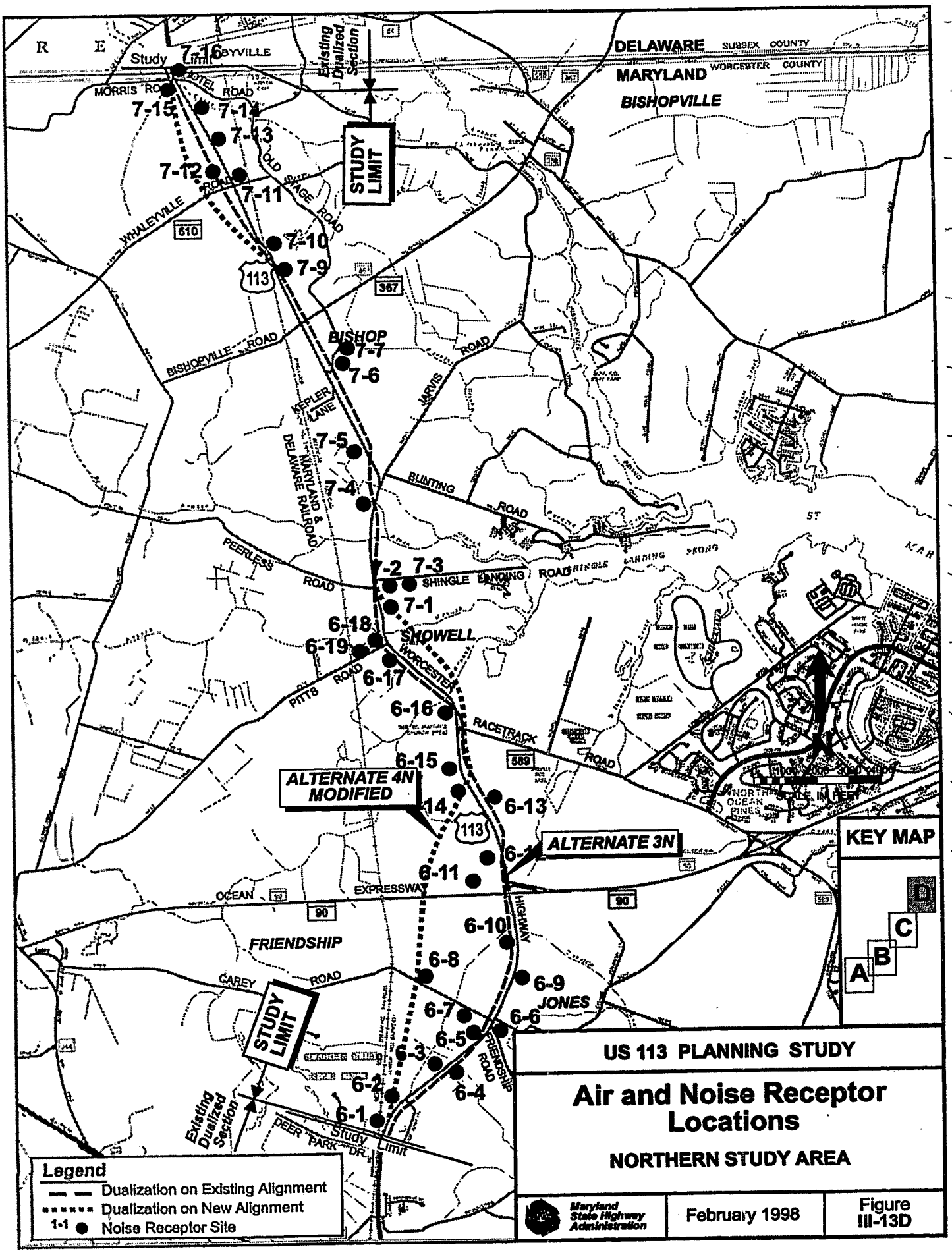
Description of Noise Receptor Sites and Recorded Ambient L_{eq} Noise Levels

The results of the ambient noise measurements are presented in Table III-20. Sixty-five receptor sites, representing residences, places of worship, and historic sites, were selected to represent the worst case conditions for noise quality impacts associated with the proposed project. Where feasible, sites were selected to represent groupings of residences. Additionally, sites were chosen where the proposed alternate would be close to the noise sensitive area, and also in areas where normal exterior human activity would occur. The location of the noise receptor sites are shown on Figures III-13A through 13D.


Match To Figure III-13B
2-4
2-3
2-2
2-1
1-3
1-2
113
MARYLAND & DELAWARE RAILROAD
TIMMONS ROAD
POCOMOKE RIVER
MARKET STREET
ALTERNATIVE 3S
SNOW HILL
SNOW HILL
PUBLIC LANDING ROAD
WASHINGTON STREET
SNOW HILL ROAD
BRICK KILN ROAD
STUDY LIMIT
Existing Dualized Section
Study Limit
CASTLE HILL ROAD
WORCESTER HIGHWAY
WOODSIDE LANE
12
354
394
365
N
0 1000 2000 3000 4000
SCALE IN FEET
POCOMOKE
FOREST
Legend
Dualization on Existing Alignment
1-1 Noise Receptor Site
KEY MAP
A
B
C
D
US 113 PLANNING STUDY
Air and Noise Receptor Locations
SOUTHERN STUDY AREA
Maryland State Highway Administration
February 1998
Figure III-13A


NEWARK
BASKET SWITCH
ALTERNATIVE 3S
WESLEY
QUEPONCO ROAD
PATEY WOODS ROAD
NEWARK ROAD
Match To Figure III-13C
WORCESTER HIGHWAY
MARSHALL ROAD
FIVE MILE BRANCH ROAD
BASKET SWITCH ROAD
DELAWARE LANE
CENTRAL SITE
PORTERS CROSSING ROAD
MARYLAND & WORCESTER
CEDARTOWN ROAD
Match To Figure III-13A
3-1
3-2
3-3
3-4
3-5
3-6
3-7
3-8
3-9
2-5
2-6
113
N
0 1000 2000 3000 4000
SCALE IN FEET
KEY MAP
A
C
D
Legend
Dualization on Existing Alignment
1-1 Noise Receptor Site
US 113 PLANNING STUDY
Air and Noise Receptor Locations
SOUTHERN STUDY AREA
Maryland State Highway Administration
February 1998
Figure III-13B


346
50
374
LIBERTYTOWN ROAD
OLD OCEAN CITY BOULEVARD
818
BERLIN
BAY STREET
376
GERMANTOWN ROAD
EVANS ROAD
MARYLAND & DELAWARE RAILROAD
Existing Dualized Section
113
STUDY LIMIT
Study Limit
HAYES ROAD
HARRISON LANDING ROAD
ORCHARD FARM
IRONSHIRE
IRONSHIRE STATION ROAD
HIGHWAY
DRIVE
4-12
IRONSHIRE
WORCESTER
MASON
ORCHARD ROAD
4-11
4-10
4-9
4-8
4-7
BAYS END LANE
DOWNS ROAD
ALTERNATIVE 3S
4-4
4-6
4-5
GOODY HILL ROAD
NEWARK ROAD
4-2
4-3
CROPPERS ISLAND ROAD
GUNNING CLUB
4-1
Match To Figure III-13B
N
0 1000 2000 3000 4000
SCALE IN FEET
Legend
Dualization on Existing Alignment
1-1 Noise Receptor Site
KEY MAP
A
B
C
D
US 113 PLANNING STUDY
Air and Noise Receptor Locations
SOUTHERN STUDY AREA
Maryland State Highway Administration
February 1998
Figure III-13C



US 113 PLANNING STUDY

Air and Noise Receptor Locations

NORTHERN STUDY AREA

Maryland State Highway Administration | February 1998 | Figure III-13D

Table III-19: Noise Abatement Criteria, Activity Relationships in CFR 772 *

Activity Category	Design Noise Level Leq	Description of Activity Category
A	57 dBA (Exterior)	Tracts of land in which serenity and quietest 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. Such areas could include amphitheaters, particular parks or portions of parks, or open spaces which are dedicated or recognized by appropriate local officials for activities requiring special qualities of serenity and quiet.
B	67 dBA (Exterior)	Residences, motels, hotels, public, meeting rooms, schools, churches, libraries, hospitals, picnic areas, recreation areas, playgrounds, active sports areas, and parks.
C	72 dBA (Exterior)	Developed lands, properties or activities not included in categories A and B above.
D	--	Undeveloped lands.
E	52 dBA (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals and auditoriums.

* Adapted from Title 23 Code of Federal Regulations Part 772, FHWA - 1988

Table III-20: Sensitive Receptor Sites and Ambient Noise Levels

Site No.	Receptor Description	Ambient Noise Level L_{eq} (dBA)
1 - 1	Residence - 3932 Market Street (MD 394)	65
1 - 2	Residence - 4624 Snow Hill Road (MD 12)	56
1 - 3	Residence - 4712 Washington Street	59
2 - 1	Residence - 6108 Public Landing Road	58
2 - 2	Residence - 5658 Worcester Highway (US113)	60
2 - 3	Residence - 5809 Worcester Highway (US113)	58
2 - 4	Snow Hill Mennonite Church - Worcester Highway (US113)	63
2 - 5	Residence - 6074 Worcester Highway (US113)	64
2 - 6	Residence - 6224 Worcester Highway (US113)	67
3 - 1	Residence - 6369 Worcester Highway (US113)	63
3 - 2	Residence - Mason Bros. (Perdue) - Worcester Highway (US113)	66
3 - 3	Residence - 6570 Worcester Highway (US113)	65
3 - 4	Residence - 6641 Worcester Highway (US113)	71
3 - 5	Residence - 6858 Basket Switch Road	62
3 - 6	Residence - 7016 Worcester Highway (US 113)	58
3 - 7	Residence on Langmaid Road with no address posted; 250 feet west of US 113	56
3 - 8	Residence - 8412 Langmaid Road	61
3 - 9	Residence - 7170 Worcester Highway (US 113)	63
4 - 1	Residence on Worcester Highway (US 113) with no address posted; 2000 feet south of Gunning Club Road	58
4 - 2	Residence on Worcester Highway (US 113) with no address posted; 450 feet south of Croppers Island Road	64
4 - 3	Residence - 9118 Croppers Island Road	64
4 - 4	Residence - 7575 Worcester Highway (US 113)	58
4 - 5	Residence - 7620 Worcester Highway (US 113)	61
4 - 6	Residence - 9314 Goody Hill Road	58
4 - 7	Residence - 7809 Worcester Highway (US 113)	60

Table III-20: Sensitive Receptor Sites and Ambient Noise Levels, continued

Site No.	Receptor Description	Ambient Noise Level L_{eq} (dBA)
4 - 8	Residence - 7924 Worcester Highway (US 113)	63
4 - 9	Residence - 8028 Worcester Highway (US 113)	64
4 - 10	Residence - 811 Shire Drive	58
4 - 11	Residence on Worcester Highway (US 113) with no address posted; 750 feet north of Shire Drive	63
4 - 12	Residence on Worcester Highway (US 113) with no address posted; 300 feet south of Ironshire Station Road	65
6 - 1	Residence - 10347 Worcester Highway (US 113)	63
6 - 2	Residence - 10421 Worcester Highway (US 113)	69
6 - 3	Residence - 10485 Worcester Highway (US 113)	69
6 - 4	Residence - 10494 Worcester Highway (US 113)	64
6 - 5	Residence on Worcester Highway (US 113) with no address posted; 450 feet south of Carey Road	63
6 - 6	Vic's Store - US 113; 125 feet south of Jones Road (Historic Site)	72
6 - 7	Residence on Carey Road with no address posted; 500 ft. west of US 113	59
6 - 8	Residence - 10239 Carey Road	58
6 - 9	Residence - 10680 Worcester Highway (US 113)	67
6 - 10	Residence - 10804 Worcester Highway (US 113)	60
6 - 11	Calvary Chapel - Victory Lane	52
6 - 12	Residence - 11047 Worcester Highway (US 113)	67
6 - 13	Residence - 11206 Worcester Highway (US 113) (Historic Site)	54
6 - 14	Residence - 11217 Worcester Highway (US 113)	65
6 - 15	Residence - 11241 Worcester Highway (US 113)	66
6 - 16	St. Martin's Church - Worcester Highway (US 113);300 ft. north of MD 589 (Historic Site)	65
6 - 17	Residence - 11628 Worcester Highway (US 113) (Historic Site)	65
6 - 18	Residence - 10129 Pitts Road	65
6 - 19	Showell Methodist Church - corner of Pitts Road and Church Road	65

Table III-20: Sensitive Receptor Sites and Ambient Noise Levels, continued

Site No.	Receptor Description	Ambient Noise Level L_{eq} (dBA)
7 - 1	Residence on Worcester Highway (US 113) with no address posted; 500 feet south of Shingle Landing Road	73
7 - 2	Residence - 10122 Shingle Landing Road	55
7 - 3	Residence - 10204 Shingle Landing Road	59
7 - 4	Residential Property - 10045 Worcester Highway (US 113)	60
7 - 5	Residential Property - 12235 Worcester Highway (US 113)	68
7 - 6	Residence - 12538 Old Stage Road	56
7 - 7	Residence - 12558 Old Stage Road	53
7 - 9	Mausoleum - 1800 feet north of Bishopville Road	61
7 - 10	Residence - 12914 Worcester Highway (US 113)	69
7 - 11	Residence - 13102 Worcester Highway (US 113)	70
7 - 12	Residence on Worcester Highway (US 113) with no address posted; 400 feet north of MD 610	69
7 - 13	Residence - 13222 Worcester Highway (US 113)	70
7 - 14	Elk's Lodge 2173 on Worcester Highway (US 113) - no address posted; 1050 feet south of Hotel Road	72
7 - 15	Residence - 13419 Morris Road	62
7 - 16	Transpeninsular Line Marker (Historic Site)	65

L. Visual Quality

From a recreational standpoint, it is common for Americans to drive for pleasure along scenic roads. Additional mobile viewers of the landscape include commuters to work and truck drivers, among others. Stationary viewers of visual landscape include residents, farmers, business employees, consumers, and tourists.

1. Existing Visual Environment

The topography of the study area is relatively flat and the viewsheds are large. No scenic vistas or visually sensitive receptors exist within the study area.

The existing study area is predominantly rural farmland with small residential areas and communities scattered along the project limits. The visual landscape in the study area is dominated by these farms, mostly chicken farms, with vegetation bordering the roadway.

2. Methodology

Viewsheds were determined by review of land use mapping and field reconnaissance throughout the study area to assist in the evaluation of the visual quality of the area. A viewshed is "the surface area visible from a given viewpoint or series of viewpoints; it is also the area from which that viewpoint or series of viewpoints may be seen" (FHWA, 1981). It may also be defined as, "a tool for identifying the views that a project could actually affect" (FHWA, 1981).

M. Municipal, Industrial and Residual Waste Sites

1. Initial Site Assessment

Municipal, industrial and residual wastes and other environmentally sensitive materials may pose a considerable threat to human or environmental health if improperly treated, stored, or disposed of. An Initial Site Assessment (ISA) was conducted to identify and inventory municipal, industrial, and private properties which are known to or suspected to contain waste materials. The investigation consisted of a database search, property records research, field reconnaissance, and potential liability determination. The following databases were used during the background research:

- National Priority List (NPL)
- Delisted NPL (NPL Deletions)
- Resource Conservation and Recovery Information System (RCRIS-TSD)
- Comprehensive Environmental Response, Compensation, and Liability Information System

(CERCLIS)

- Comprehensive Environmental Response, Compensation, and Liability Information System

(CERC-NFRAP)

- Corrective Action Report (CORRACTS)
- Permitted Aboveground Storage Tanks (AST)
- RCRA Administrative Action Tracking System (RAATS)
- Hazardous Materials Information Reporting System (HMIRS)
- PCB Activity Database System (PADS)
- Toxic Chemical Release Inventory System (TRIS)
- Federal Superfund Liens (NPL Liens)
- Toxic Substance Control Act (TSCA)
- Former Manufactured Gas Sites (Coal Gas)
- EPA Emergency Response Notification System (ERNS)
- State Hazardous Waste Site (SHWS)

The search of available Federal and state databases was conducted in accordance with the specific requirements of American Society for Testing and Materials (ASTM) standard practice for Environmental Site Assessment (E 1527-94). Full documentation for all sites found within the ASTM-specified study radii is located in the Initial Site Assessment prepared for this project in December, 1995 (Ganett Fleming, 1995). A review of the Maryland Department of the Environment (MDE) Hazardous Waste Management Section's files was made in conjunction with this study.

2. Preliminary Field Reconnaissance Results

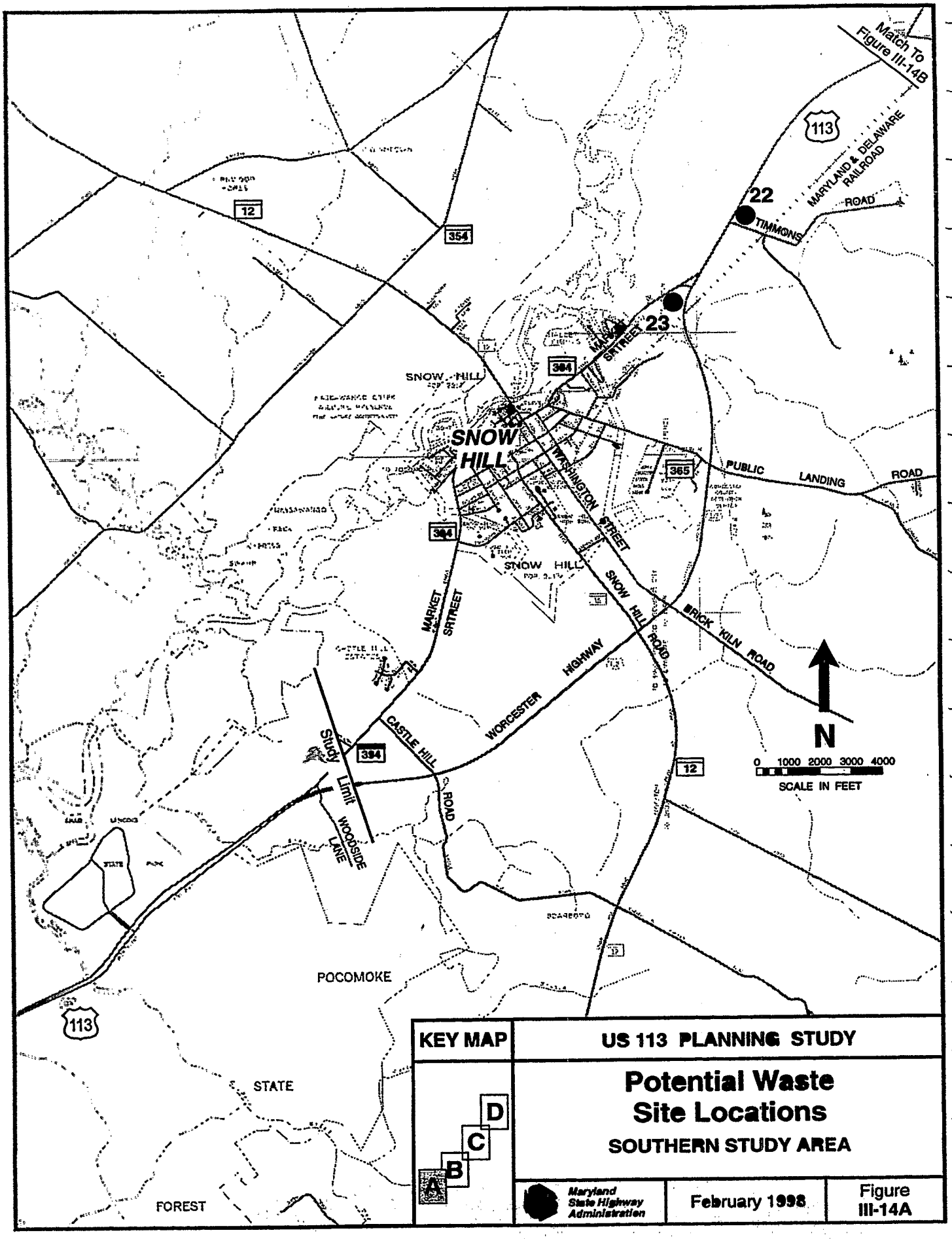
In general, the corridor is characterized agricultural and residential land uses. Many of the residential properties use fuel oil for home heating. This however, represents a minimal threat to the project and unless other factors of concern were noted, these residential sites were not included in the potential waste inventory.

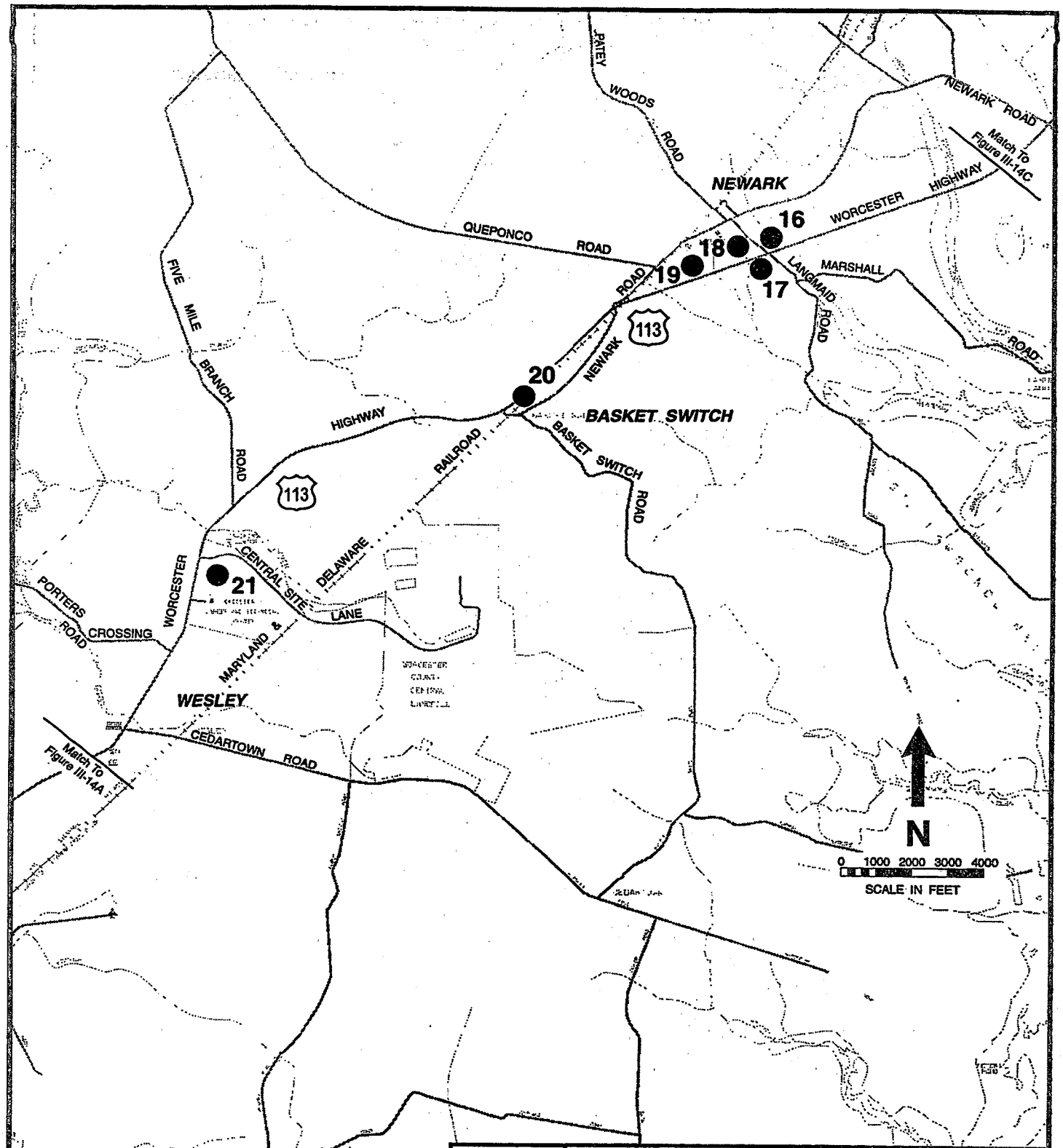
The preliminary field reconnaissance revealed 23 potentially contaminated sites within the southern and northern study areas. Sites were ranked, based upon the perceived potential to pose a waste materials liability to the proposed project. The rankings are high, moderate, and low potential liability. Factors influencing the ranking of perceived potential threats include:

- The nature of the site activity,
- History of site use,
- Location of the site in relation to the study area,
- The observed condition of the site,
- Significance of database records for the site,
- Whether the site has a history of controlled material spills, hazardous materials handling, or waste production.

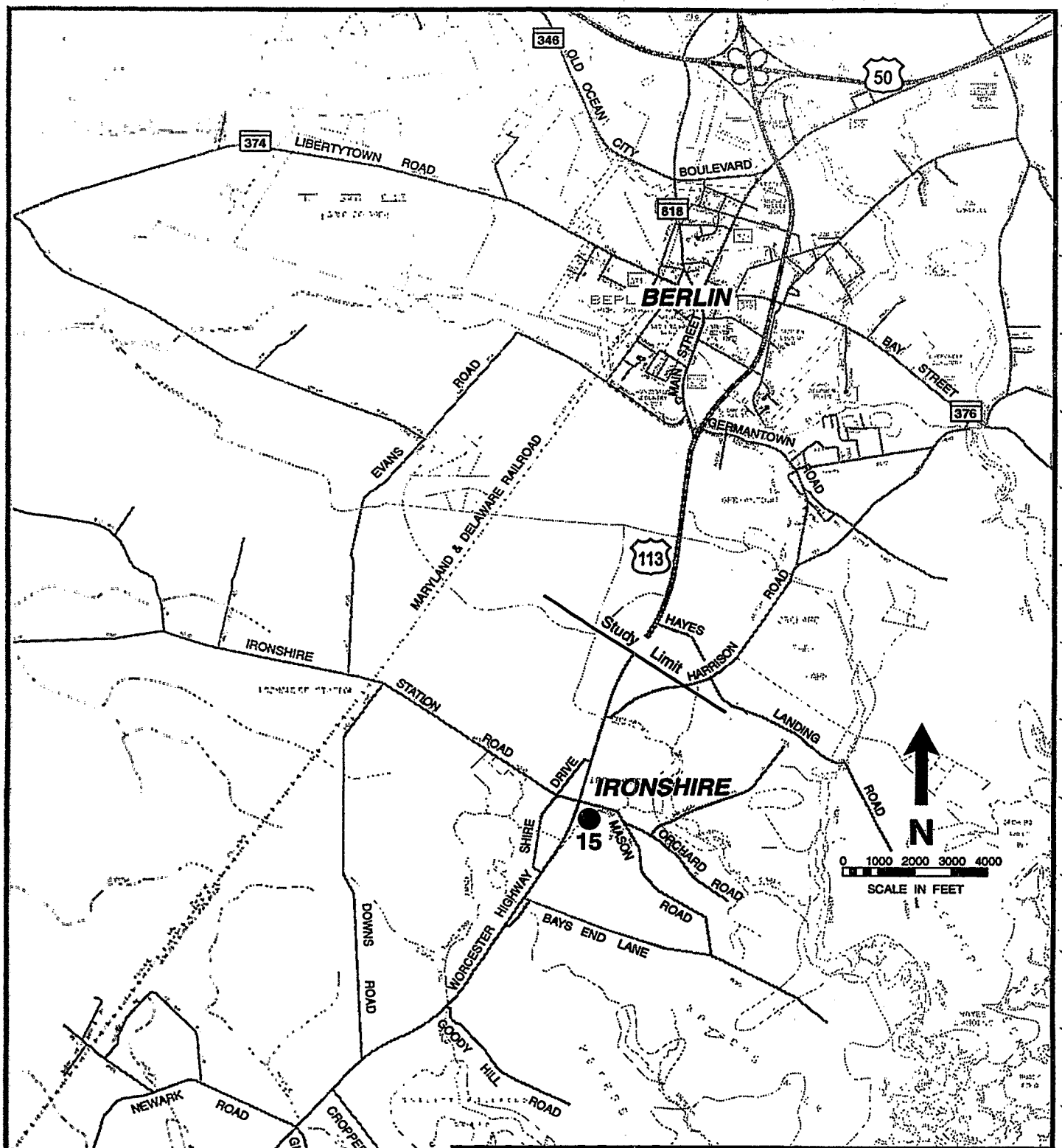
Sites that possess a high potential for liability are sites that either via direct observation, database records, or site use history present some potential to contain contamination. Sites that possess a moderate potential usually are included based on current or historic site use or documentation, but no evidence of potential contamination was revealed during the ISA. Sites that possess a low potential are included based on current or historic site use or documentation, however evidence gathered during the ISA revealed little likelihood of contamination. The analysis of the databases and preliminary field reconnaissance data that these sites may warrant further investigation and possible sampling and analysis. Three sites have a high potential for liability and warrant formal Phase I study and may require Phase II investigation. Sixteen sites possess a moderate potential for liability and while needing formal Phase I study will probably not require a Phase II investigation. Four additional sites have a low liability potential and should not require any additional investigation after the formal Phase I studies. Table III-21 lists the identified potential waste sites with the nature of the contamination and potential for liability. The locations of these sites are shown on Figures III-14A through 14D. More detailed information concerning the assessment methodology and findings is contained in the Hazardous Waste Initial Site Assessment (Gannett Fleming, 1995) and Preliminary Site Screening Investigations (PSI) (Gannett Fleming, 1997).

An area containing drums was identified by the U.S. Army Corps of Engineers during wetland field reviews. This area was not identified as a site during preparation of the ISA. There are no records of waste material sites or source events at the identified location. The contents of the drums is unknown. This site, identified as site 24, was added to the list of potential waste sites. During the PSI, an additional site was identified. This site, located at the northwest corner of US 113 and Bishopville Road and identified as Site 25, appeared to be a "demolished abandoned service structure of undetermined use".


Match To Figure III-14B
113
MARYLAND & DELAWARE RAILROAD
ROAD
22
TIMMONS
23
12
354
SNOW HILL
SNOW HILL
SNOW HILL
MARKET STREET
WASHINGTON STREET
365
PUBLIC LANDING ROAD
SNOW HILL ROAD
BRICK KILN ROAD
WORCESTER HIGHWAY
CASTLE HILL ROAD
Study Limit
WOODSIDE LANE
N
0 1000 2000 3000 4000
SCALE IN FEET
POCOMOKE
STATE
FOREST
KEY MAP
A
B
C
D
US 113 PLANNING STUDY
Potential Waste Site Locations
SOUTHERN STUDY AREA
Maryland State Highway Administration
February 1998
Figure III-14A



KEY MAP	US 113 PLANNING STUDY	
A B C D	**Potential Waste Site Locations** SOUTHERN STUDY AREA	
	Maryland State Highway Administration	February 1998	Figure III-14B



KEY MAP

A B C D

US 113 PLANNING STUDY

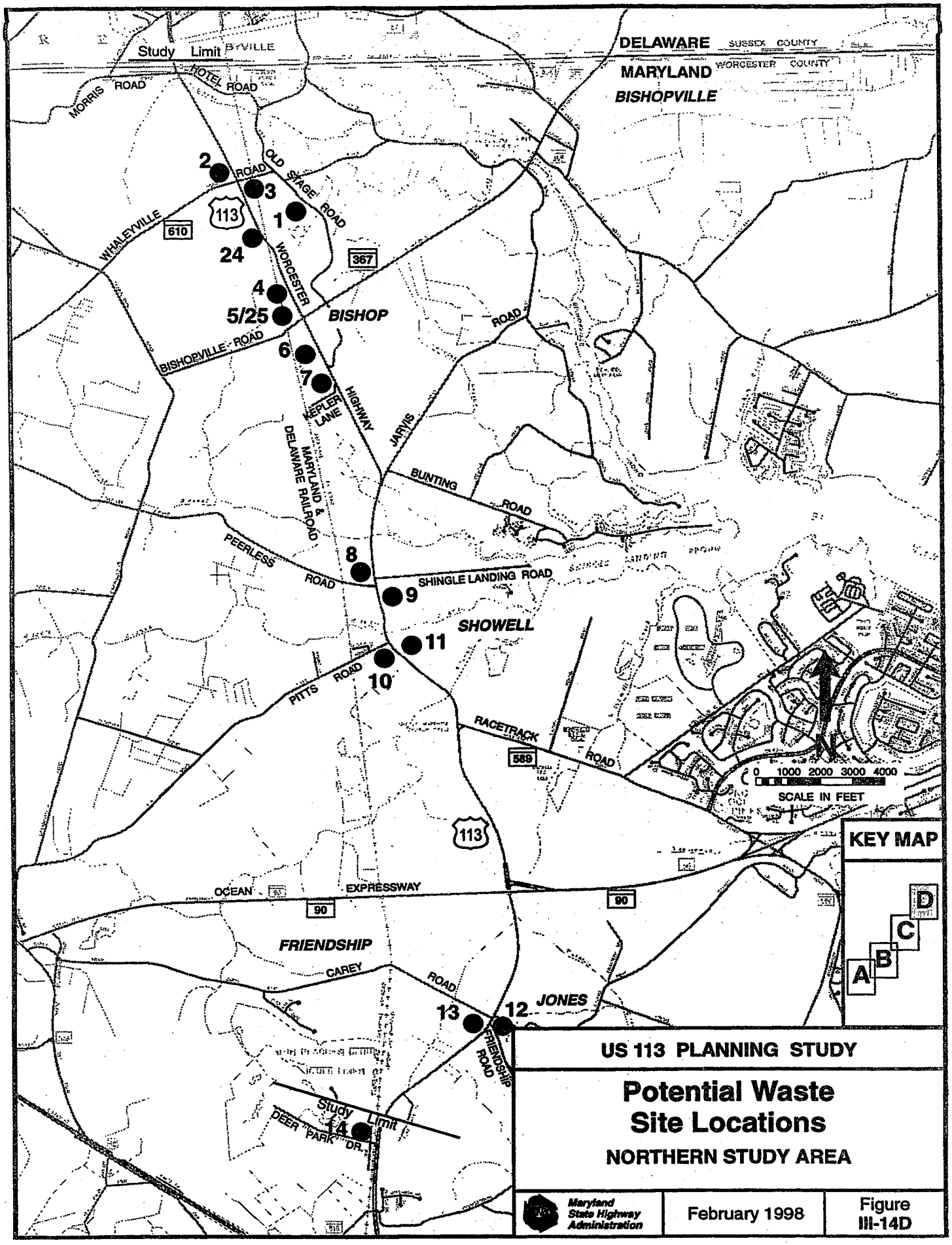
Potential Waste Site Locations

SOUTHERN STUDY AREA

Maryland State Highway Administration

February 1998

Figure III-14C



US 113 PLANNING STUDY

Potential Waste Site Locations

NORTHERN STUDY AREA

Maryland State Highway Administration | February 1998 | Figure III-14D

Table III-21: Potential Wastes Sites

Site ID	Potential Site	Nature of the Potential Contamination	Potential Liability
1	Ocean Designs Fiberglass and Boat Works	Boat repair; paint, solvent, petroleum products storage	Moderate
2	Cross Roads Carry Out	Possible former gasoline pumping station	Low
3	Abandoned Rendering Plant	Former industrial site; abandoned tanker trucks, process vessels, and 55-gallon drums found on site	High
4	TMT Design Co. 12829 Worcester Highway	Vehicle storage	Low
5	Sharpgas Propane Tank Enclosure	Propane storage and 55-gallon drums of solvents	Low
6	Open Field	Possible former mobile home manufacturing site; rusted paint cans and a 55-gallon drum found on site	Moderate
7	Kary Asphalt	Active asphalt processing facility	Moderate
8	Perdue Farms Hatchery #7	Above-ground and underground storage tanks	High
9	Hammonds Store	Gasoline pumps, a small repair garage, propane tank, fuel oil tank, and several 55-gallon drums on site	Moderate
10	Showell Poultry Processing Plant	Underground storage tanks	High
11	Davis Electric	Old gasoline pump	Moderate
12	Vic's Country Store	Former gasoline pumping station	Moderate
13	Sandbar Marine	Boat repair; paint, solvent, petroleum products storage	Moderate
14	9941 Deer Park	55-gallon drums	Moderate
15	The Little Country Store Deli/Gas Station	Former Gasoline pumping station	Low
16	Newark Station Strip Stores	Gasoline pumping station and kerosene pump; offices of Ocean Petroleum	Moderate
17	Air Illusions Paint Shop	Paint and solvent storage	Moderate
18	Custom Screen Printing Company	Inflammable materials storage	Moderate
19	Town of Newark Sewage Treatment Ponds	Sewage treatment ponds and chlorine storage	Moderate
20	Residential/Manufacturing Property	Vehicle storage and gasoline pumping	Moderate
21	Landfill Office	Underground storage tanks	Moderate
22	Worcester County Roads Maintenance Facility	Vehicle maintenance and storage, materials storage, and fuel pumping	Moderate
23	Duck-in Convenience Store	Gasoline pumping station	Moderate
24	Station 2315±	Drums of unknown content	Not Applicable
25	Northwest corner of US 113 and Bishopville Road	Demolished Enterprise	Not Applicable

IV.
ENVIRONMENTAL CONSEQUENCES

US 113 Planning Study
Snow Hill, Maryland to Delaware State Line

Office of Planning and Preliminary Engineering
Maryland State Highway Administration

IV. ENVIRONMENTAL CONSEQUENCES

Introduction - Preferred Alternatives

On the basis of public and agency comments received as a result of circulation of the **Draft EIS/ Section 4(f) Evaluation** in May, 1997 and the **Combined Location/Design Public Hearing** held June 17, 1997, the Project Planning Team recommended the **Preferred Alternatives**. Federal and state resources agencies have concurred with this preference as follows: US Environmental Protection Agency (letter dated September 15, 1997); US National Marine Fisheries (September 15, 1997); Federal Highway Administration (September 16, 1997); Maryland Department of the Environment (September 16, 1997); Maryland Department of Natural Resources (September 16, 1997); US Fish and Wildlife Service (September 17, 1997); and, US Army Corps of Engineers (September 18, 1997) -- copies of these letters are presented in Section V of this document.

For the purpose of simplicity throughout this section of the Final EIS, the term **Preferred Alternatives** means the combined full-length **Southern Preferred Alternative** plus the **Northern Preferred Alternative.** Please see Section II.E. of this document for a full description and typical sections of the **Preferred Alternatives**. Individually, the **Southern** and **Northern Preferred Alternatives** are briefly described as follows:

◆ **SOUTHERN PREFERRED ALTERNATIVE** — **DRAFT EIS ALTERNATIVE 3S - 34' Median**
from South of Snow Hill, Maryland
to South of Berlin, Maryland
16.3± Miles

The dualization of existing US 113 consists of two northbound lanes (with shoulders) and two southbound lanes (with shoulders) typically separated by a median 34-feet in width with guardrail (8-feet paved and 26-feet grass). At the crossing of Purnell Branch (Wetland W-8), a narrower 16-foot wide median and an epoxy coated sheet pile retaining wall will be provided along the west side of the roadway to minimize wetland impacts. At Wetlands W-15, W-16 and W-17, a 16-foot wide median is also provided, and at Wetlands W-2 and W-12, the median further narrows to 10-feet paved, also to minimize wetland impacts. The design speed and roadside grading will be consistent with AASHTO standards for 60 MPH. For the majority of this length, existing US 113 is used as either the northbound or southbound roadway. See Figures S-3A -3B and -3C. The seven (7) plates for the **Southern Preferred Alternative** are presented in Appendix A of this document (scale: 1" = 400').

◆ **NORTHERN PREFERRED ALTERNATIVE**
from North of Berlin, Maryland
to Delaware State Line
7.3± Miles

DRAFT EIS COMBINATION ALTERNATIVE
- 3N/4N Modified - 34' Median

These improvements will provide a new four-lane divided highway (with shoulders) from north of Berlin to Shingle Landing Road/Peerless Road and dualization along existing US 113, consisting of two northbound lanes (with shoulders) and two southbound lanes (with shoulders). A new interchange will be provided at MD 90, and the roadway will typically be separated by a median 34-feet in width with guardrail (8-feet paved, 26-feet grass). At wetland W-30, the dualized roadway will be separated by a 10-foot wide paved median to minimize impacts. At Wetland W-31, a median 16-feet wide in width will be provided. Near Racetrack Road, the alignment has been shifted slightly west to permit use of a portion of the existing US 113 box culvert crossing of Church Branch, thereby reducing impacts at Wetland W-28 and avoiding W-29. This shift places the southbound roadway for new US 113 in approximately the same location as the existing two-lane/two-way roadway for US 113 adjacent to St. Martin's Church. The design speed and roadside grading will be consistent with AASHTO standards for 60 MPH. See Figure S-3D. The three (3) plates for the **Northern Preferred Alternative** are presented in Appendix A of this document (scale: 1" = 400').

The environmental consequences of the alternatives presented in the **Draft EIS/Section 4(f) Evaluation** and at the Public Hearing, as well as the **Preferred Alternatives**, are described in this chapter. Following receipt of public and agency comments, extensive avoidance and minimization studies were completed for the **Preferred Alternatives**; these studies are also presented in this chapter. During preliminary engineering and final design, these measures to avoid and minimize impacts will be further refined.

A. Traffic and Transportation Network

Worcester County's transportation system is dominated by a combination of Federal, state and county roads. US 113, the major north-south route serving the county, accommodates a wide range of vehicular traffic, including rural agricultural/residential trips, commercial trips, recreational trips, and through trips. Bus service consists of numerous school bus trips and demand response rural transit operated by the County's Commission on Aging. As discussed in Section III.A, the extensive poultry industry throughout the Eastern Shore contributes to the truck traffic along US 113. Tourist attractions, such as Ocean City, Pocomoke River State Forest, Shad Landing State Park, Assateague Island State Park and National Seashore and additional shoreline attractions located along the Eastern Shore, contribute to traffic demands that increase substantially during the summer months. US 113 is a four-lane divided roadway south of Snow Hill, through the Berlin area, and north of the Delaware State line. The remaining two segments of US 113 consist of two-lane undivided highway.

The current **ADT** (year 1995) ranges from 3,500 to 7,500 vehicles per day for the southern study area and 6,400 to 12,200 vehicles per day for the northern study area. The current **summer ADT** (1995) ranges from 4,900 to 8,900 vehicles per day for the southern study area and 8,300 to 18,500 vehicles per day for the northern study area. Summer ADT volumes range from 19 percent to 52 percent higher than the yearly ADT for the same portion of US 113. Existing ADT volumes are presented in Table I-1 and on Figures IV-1A through 1D. Trucks currently make up 14 percent of the ADT volumes on US 113.

Design year (2020) traffic forecasts were prepared in accordance with the Comprehensive Development Plan for Worcester County and assume completion of four lanes along US 113 in Delaware. These design year forecasts indicate a 1 percent difference in traffic volumes among the alternatives considered (i.e., between the No-Build and Dualize alternatives). The design year ADT for the southern study area ranges from 5,000 to 10,800 vehicles per day and 7,000 to 12,900 vehicles per day during the summer months. The design year ADT for the northern study area ranges from 10,100 to 20,000 vehicles per day during non-summer time frame (or months) and 13,600 to 30,400 vehicles per day during the summer months. Projected ADT volumes are presented in Table I-1 and Figures IV-1A through 1D.

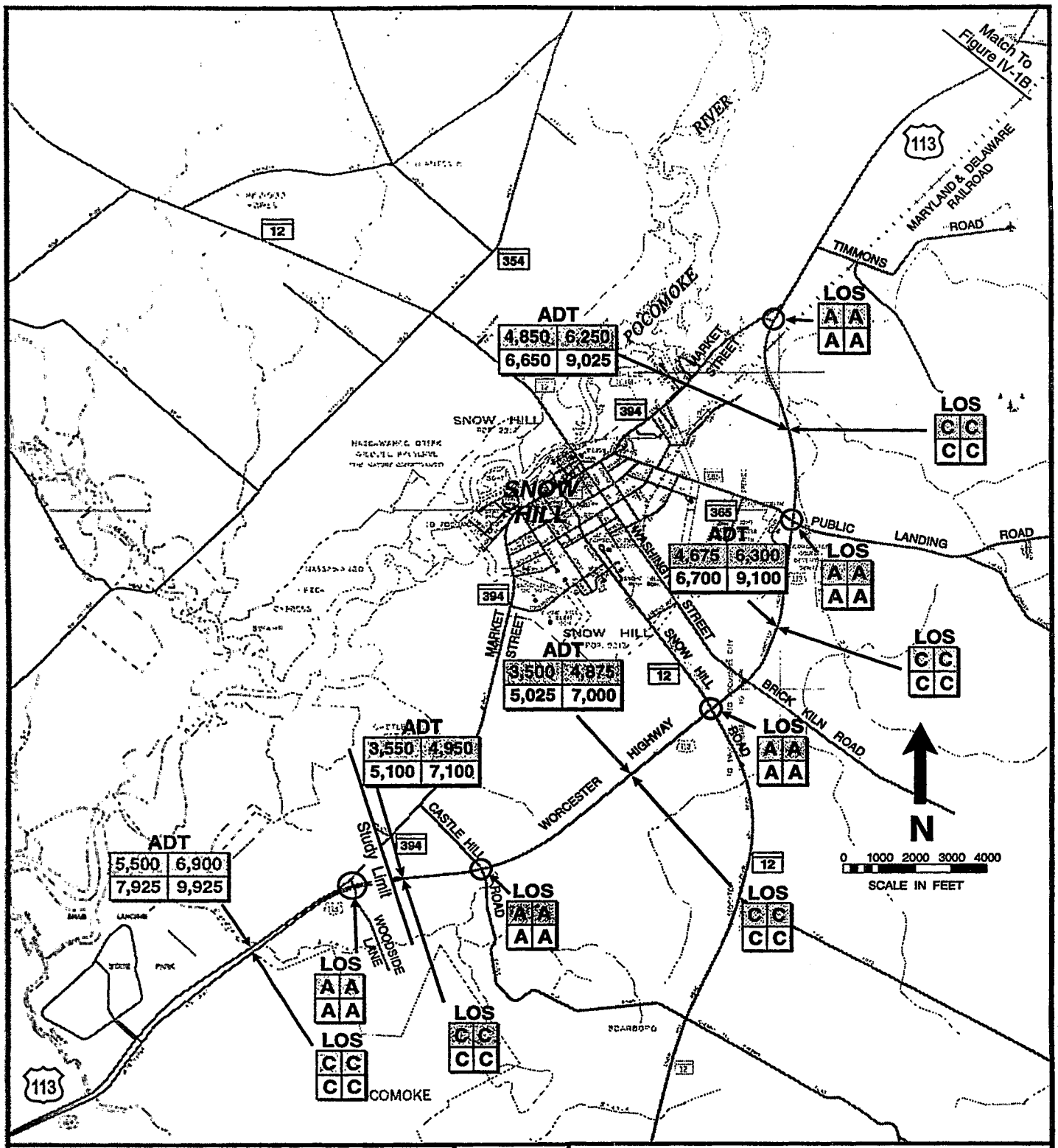
A comparison of traffic volumes between 1995 and 2020 indicates that on average, the ADT for the **southern study area** will increase by approximately 44 percent during both the summer and non-summer months. The greatest increase is expected to occur just south of Berlin where the ADT is anticipated to increase by 45 percent. In the **northern study area**, the ADT is expected to increase by an average of 62 percent between 1995 and 2020 during the summer months. The higher traffic volumes in the northern study area are consistent with the higher levels of development expected north of Berlin, as explained in Section I (Purpose & Need). The greatest increase is anticipated to occur just south of the Delaware State line where the ADT is anticipated to increase by approximately 64 percent in both the summer and non-summer months.

Traffic flow is measured by determining a level of service (LOS) for the roadway (see Chapter I, Section C for a description of each level of service). Each level of service coincides with conditions that drivers experience while traveling along a roadway. LOS designations, from A to F, are used to define traffic operations on any given section of highway. LOS A indicates ideal conditions and LOS F indicates severe congestion with substantial delays. In the rural/agricultural areas through which US 113 passes (i.e., outside of the corporate limits of Berlin), travelers expect traffic conditions to be free of congestion, as represented by LOS A, B, or C.

The following paragraphs summarize expected traffic operations under the alternatives presented in the **Draft EIS/Section 4(f) Evaluation** as well as the **Preferred Alternatives**:

1. No-Build Alternatives Baseline (Alternatives 1S and 1N)

The No-Build Alternatives, as described in Section II.D.2, would not provide major improvements to the existing US 113 roadways. Specific improvements recently implemented or programmed for implementation are listed in Tables II-1A through 1D, and



Legend

Average Daily Traffic (ADT)

Yearly (weekdays all year) / Summer (Saturdays Memorial Day to Labor Day)

	ADT	
1995	5,500	6,900
2020	7,925	9,925

Level of Service (LOS)

Yearly (weekdays all year) / Summer (Saturdays Memorial Day to Labor Day)

	LOS	
1995	C	C
2020	C	C

KEY MAP

A B C D

US 113 PLANNING STUDY

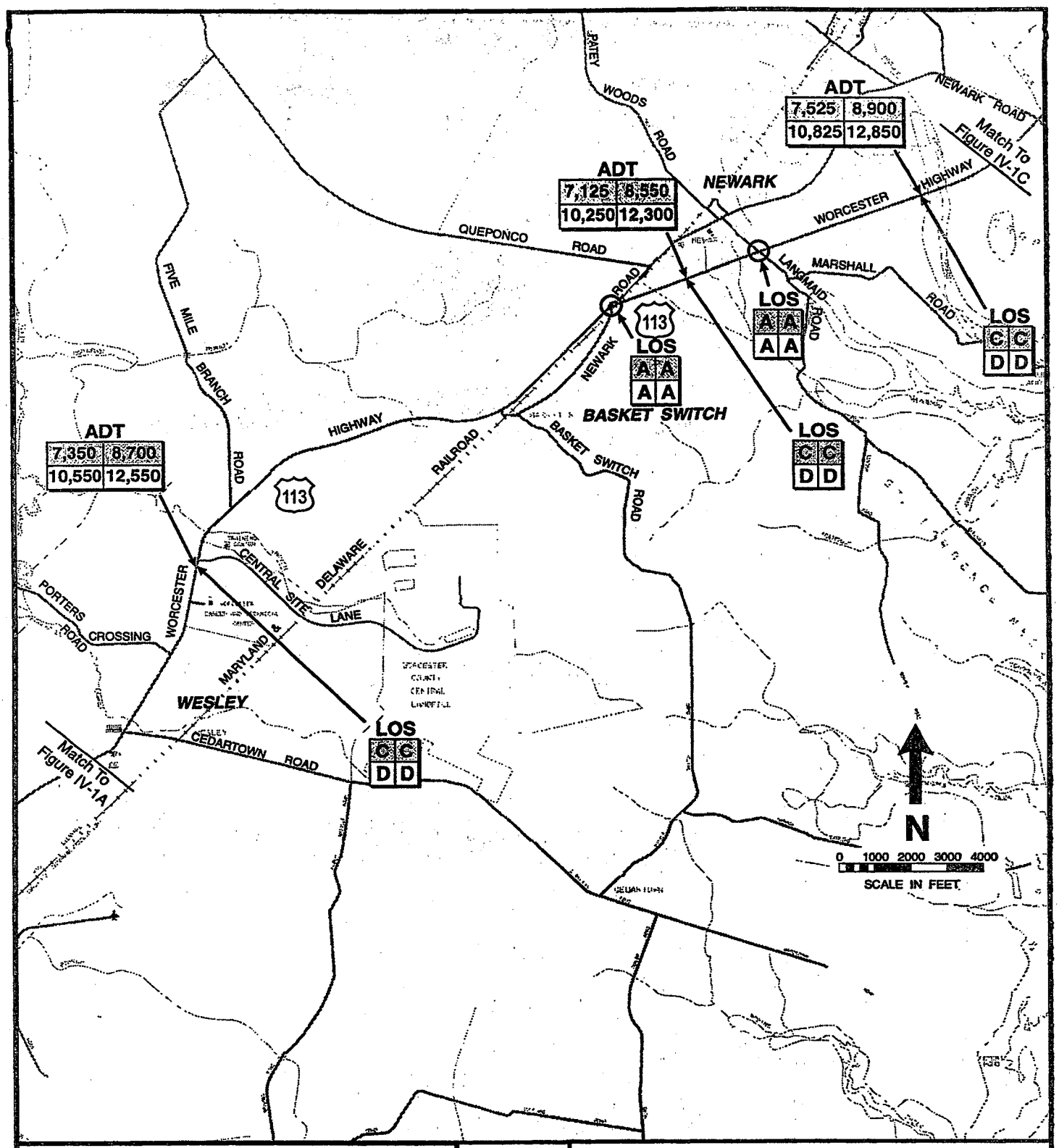
1995 & No-Build 2020 ADT & LOS

SOUTHERN STUDY AREA

Maryland State Highway Administration

February 1998

Figure IV-1A



Legend

Average Daily Traffic (ADT)

Yearly (weekdays all year) / Summer (Saturdays Memorial Day to Labor Day)

	ADT	
1995	5,500	6,900
2020	7,925	9,925

Level of Service (LOS)

Yearly (weekdays all year) / Summer (Saturdays Memorial Day to Labor Day)

	LOS	
1995	C	C
2020	C	C

KEY MAP

A B C D

US 113 PLANNING STUDY

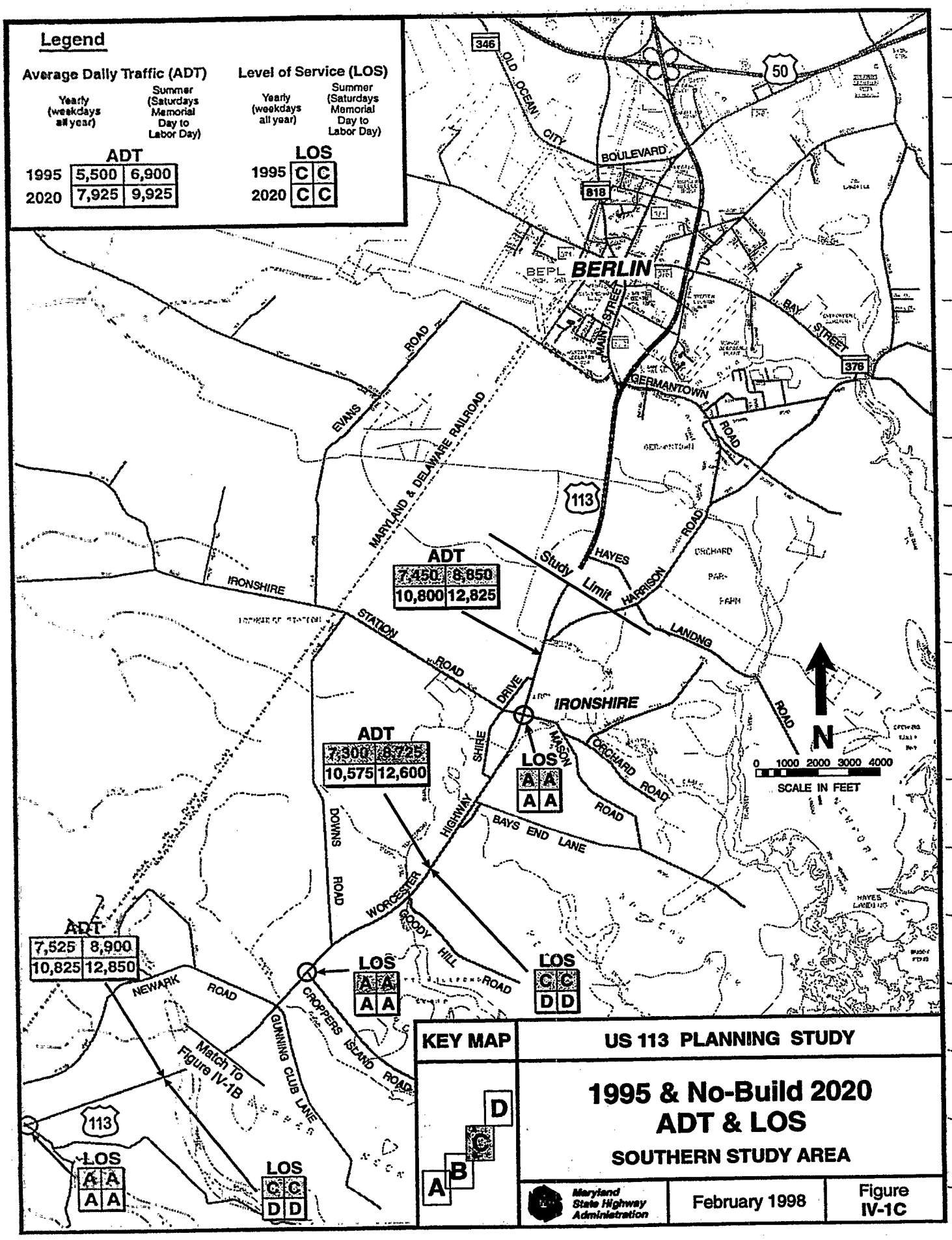
1995 & No-Build 2020 ADT & LOS

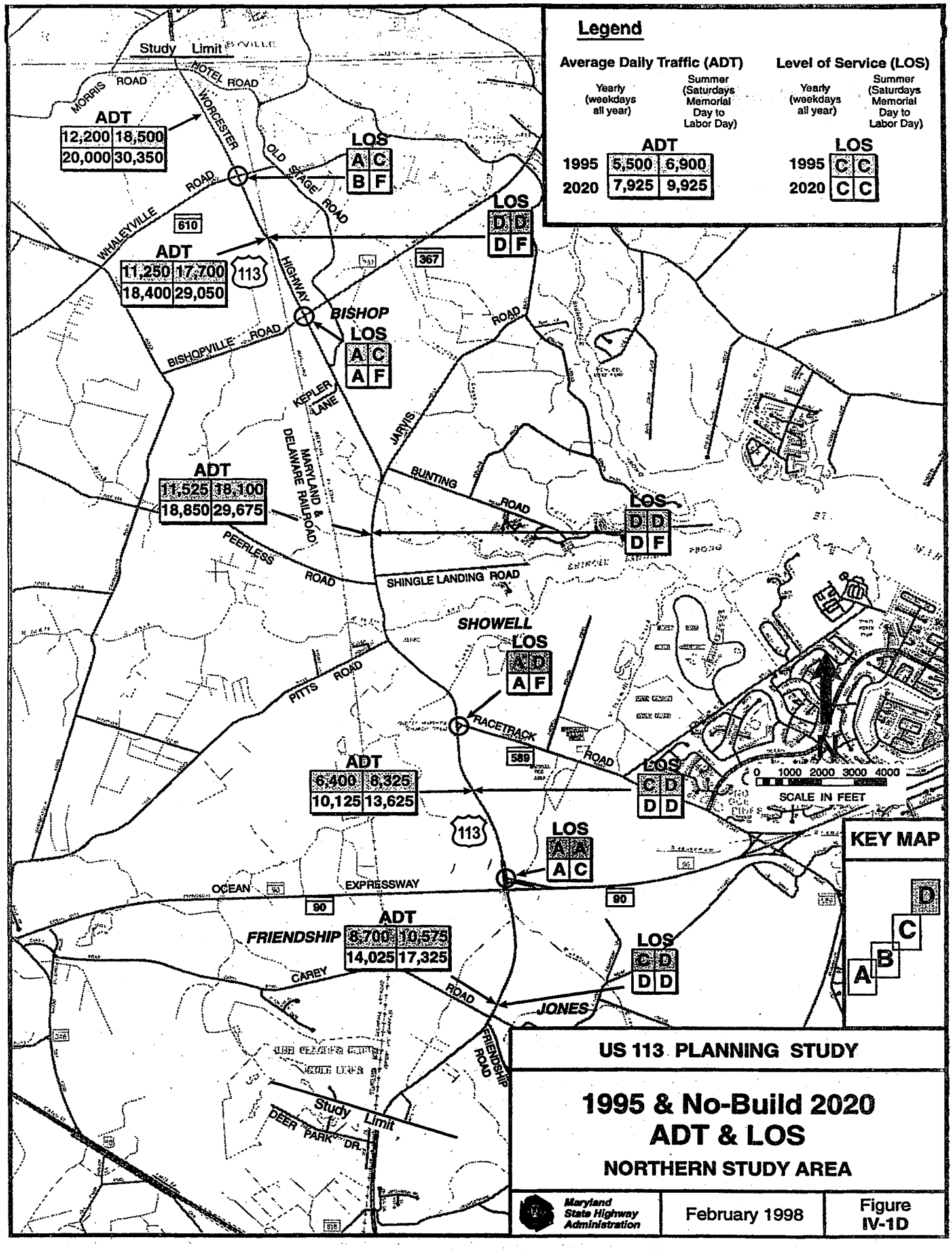
SOUTHERN STUDY AREA

Maryland State Highway Administration

February 1998

Figure IV-1B


Legend
Average Daily Traffic (ADT)
Yearly (weekdays all year)
Summer (Saturdays Memorial Day to Labor Day)
ADT
1995 5,500 6,900
2020 7,925 9,925
Level of Service (LOS)
Yearly (weekdays all year)
Summer (Saturdays Memorial Day to Labor Day)
LOS
1995 C C
2020 C C
346
OLD OCEAN CITY BOULEVARD
50
818
BERLIN
MAIN STREET
BAY STREET
376
GERMANTOWN ROAD
EVANS ROAD
MARYLAND & DELAWARE RAILROAD
113
HAYES
Study Limit
HARRISON ROAD
ADT
7,450 8,850
10,800 12,825
IRONSHIRE
STATION ROAD
LANDING ROAD
DRIVE
IRONSHIRE
MASON
ORCHARD ROAD
ADT
7,300 8,725
10,575 12,600
LOS
A A
A A
HIGHWAY
BAYS END LANE
DOWNS ROAD
WORCESTER
GOODY HILL ROAD
N
0 1000 2000 3000 4000
SCALE IN FEET
ADT
7,525 8,900
10,825 12,850
NEWARK ROAD
LOS
A A
A A
LOS
C C
D D
CROPPERS ISLAND ROAD
GUNNING CLUB LANE
Match To Figure IV-1B
113
LOS
A A
A A
LOS
C C
D D
KEY MAP
A B C D
US 113 PLANNING STUDY
1995 & No-Build 2020
ADT & LOS
SOUTHERN STUDY AREA
Maryland State Highway Administration
February 1998
Figure IV-1C



US 113 PLANNING STUDY

1995 & No-Build 2020 ADT & LOS

NORTHERN STUDY AREA

Maryland State Highway Administration | February 1998 | Figure IV-1D

the locations of these improvements are shown on Figures II-2A through II-2D. Typical sections are shown on Figure II-3. The routine maintenance operations are not expected to measurably affect roadway capacity. Spot improvements would continue as funding becomes available. Although the No-Build Alternatives would not meet the project need, they were used as a basis of comparison for the analysis of the other alternatives. Existing and design year 2020 levels of service for the No-Build Alternatives are presented on Figures IV-1A through 1D and summarized on Table S-1.

2. Transportation Systems Management Alternatives (Alternatives 2S and 2N)

The Transportation Systems Management (TSM) Alternatives, as described in Section II.D.3, would have provided improvements along the existing roadway to enhance safety and reduce traffic congestion without adding through traffic capacity or other major alterations to the existing two lane highway. The TSM improvements included intersection improvements and additional measures to improve the safety of the existing two-lane roadway. The TSM Alternatives included continued short-term spot improvements such as signing and marking, street lighting, and warning flashers, and addresses longer-term improvements with additional turning, acceleration/deceleration, and bypass lanes; skid resistant pavement overlays; and rumble slots along the centerline and along the outside edges of pavement. The improvements would have been prioritized during the final design phase. The TSM improvements are listed in Tables II-1A through 1D, and locations of these improvements are shown on Figures II-2A through 2D. Typical sections are shown on Figure II-3. Traffic operations (LOS) would be similar to the No-Build Alternatives, as shown on Figures IV-1A through 1D and as summarized on Table S-1.

3. Two-Lanes with 20' Median Alternative (Alternative 2S-20' Median)

This alternative would have provided a 20-foot wide median (either paved or grass) with guardrail and typically one (1) lane per direction along existing US 113 in only the southern study area (see Section II.D.4.). At intersections, left turn lanes would have been provided in the median; right turn lanes would have been provided where warranted by traffic volumes. In order to facilitate passing maneuvers, four (4) passing lanes 12-feet in width and approximately 1 to 1.25 miles in length (2 for northbound and 2 for southbound traffic) would have been provided. Typical sections are shown on Figure II-4. The seven (7) plates for this alternative were presented in Appendix A of the **Draft EIS/Section 4(f) Evaluation.**

Traffic operations at intersections under this alternative would have improved over the No-Build due to the provision of turn lanes at cross streets; although the basic number of lanes would have remained at two with passing opportunities being severely limited in comparison to the No-Build and all other alternatives (i.e., passing would only be permitted along the four (4) passing lanes). In summary, traffic operations (LOS) would have probably averaged slightly better than the No-Build Alternative 1S, as shown on Figures IV-1A through 1C and as summarized on Table S-1.

4. Dualization Alternatives and Preferred Alternatives (Alternatives 3S, 3N, 4N Modified, and 3N/4N Modified Combination Alternatives)

Each of the dualization alternatives (described in Sections II.D.5. through II.D.9) including the **Preferred Alternatives** (described in Section II.E.), propose a four-lane divided roadway with a median (both 20- foot wide and 34-foot wide medians were evaluated). Access would be partially controlled. The dualization alternatives in the southern study area were evaluated in accordance with 60 MPH design criteria; 50 MPH and 60 MPH design criteria were evaluated for the dualization alternatives along existing US 113 in the northern study area (3N alternatives); and the new location and combination alternatives were evaluated for 60 MPH design criteria. The **Preferred Alternatives** will be designed with 60 MPH criteria.

The typical sections for the **Preferred Alternatives** are presented on Figures II-9 and II-10; the ten (10) plates for the **Preferred Alternatives** are presented in Appendix A of this document.

Traffic volumes for the design year 2020 are forecast to increase slightly (less than 1 percent) over the No-Build, primarily because the land use and new development are assumed to be essentially unchanged between the Build and No-Build. LOS, however, would greatly improve given the increased operational flexibility and capacity of the roadway under the dualization alternatives.

Intersections projected to operate at LOS F under No-Build conditions in the year 2020 would improve to LOS C or D under each of the dualization alternatives, including the **Preferred Alternatives.** Through traffic on the roadway would improve to LOS C or better under each of the dualization alternatives. See Figures IV-1A through 1D and the summary on Table S-1.

5. Safety

Table I-2 presents a detailed analysis of the accidents that occurred along the two-lane portions of US 113 for the 7-year period from 1990 through 1996. Accident statistics from other routes in Maryland are presented in Appendix D of this Final EIS. The following observations may be drawn from these 7-years of accident data:

- the statistically determined fatal accident rate is equal to or higher than the statewide average rate for **both study areas** and **significantly** greater in the **northern study area.**

- the injury accident rate and the overall accident rate in the **northern study area** are both greater than the respective statewide average rates for each category.

- the accident rates in the **northern study area** for angle collisions, fixed object and left turn accidents are greater than the statewide average, and **significantly** greater statistically for angle collisions.

- furthermore, in the **northern study area,** the wet surface related accident rate and alcohol related accident rate are **significantly** greater statistically than the statewide average rate. In the **southern study area,** the nighttime accident rate is greater than the statewide average rate.

Accidents occurring in the study area are discussed in Chapter I, Purpose and Need. The high number of fatal accidents is a primary purpose for conducting this study. Fall and summer have represented the seasons that experience the highest number of fatal accidents. Figures I-1A through 1D identifies the locations and provides a description of the 42 fatal accidents for the period January 1980 through September 1997 (17 years plus 9 months). **A total of 49 people have died as a result of vehicular accidents along the two-lane portions of US 113 during the January 1980 through September 1997 period. Additional details on these fatal accidents are presented in Table I-3.**

An analysis of the potential consequences of the alternatives presented for consideration in the **Draft EIS/Section 4(f) Evaluation** as well as the **Preferred Alternatives** in terms of the total number of accidents has been completed, as follows (and are summarized in Table IV-1 and Table S-1).

◆ **Alternatives 1S and 1N (No-Build)** The No-Build alternatives would not have provided major improvements to the existing US 113 roadways. The minor improvements which would occur as part of normal maintenance and safety operations do not provide features that would prevent further opposite direction collisions where the probable cause was identified as the failure to drive in the designated lane or failure to keep right of the centerline. In addition, the No-Build alternatives would not have removed obstructions along the edges of the existing shoulders, obstructions which contribute to hit-fixed-object accidents. Therefore, accidents would have been expected to occur at a rate similar to the historical rate along the two-lane portions of US 113 for Alternatives 1S and 1N. Increasing traffic volumes will, correspondingly, increase the total number of accidents from the number being experienced today.

◆ **Alternatives 2S and 2N (TSM)** The TSM Alternatives would have provided operational improvements as previously discussed and could have been expected to produce minor improvements in the overall accident rates. The pavement overlays, rumble strips, and intersection improvements would slightly reduce the overall accident rate, although opposite direction and hit-fixed-object accidents would not have been substantially altered. While the rate at which these accidents are predicted to occur would have been lower than the rate anticipated for the No-Build, the total number of accidents would, with increasing traffic volumes, also increase.

- **Alternative 2S-20' Median:** This alternative would have provided a 20-foot wide median with traffic barrier separating the single northbound and southbound traffic lanes. Designed in accordance with 60 MPH criteria, 10-foot wide paved shoulders and 20-foot wide safety grading would have been provided (except in environmentally sensitive areas, where the safety grading would have been replaced by guardrail to reduce impacts). The provision of this median would have nearly eliminated opposite direction accidents (although the narrow median could have been expected to increase the number of hit-fixed-object accidents due to the presence of guardrail in the median). The provision of full safety grading would have reduced the hit fixed object accidents now occurring along the roadside edges. Because this typical section (i.e., one lane per direction separated by a median with traffic barrier) is somewhat unusual, and due to the narrow median width, however, the overall accident rate was expected to experience an improvement in comparison to the No-Build but less than the degree of improvement anticipated for the dualization and **Preferred Alternatives.**

- **Alternatives 3S, 3N, 4N Modified, 3N/4N Modified Combination and Preferred Alternatives:** An analysis of the accident rates for the dualized/new location alignments was conducted based on two sources of research pertaining to median widths and their relation to accident experience. The first source (NYS DOT Traffic Safety Report, 1985, printed in *Traffic Conflict Techniques for Safety and Operations,* USDOT/FHWA, 1990) lists proposed roadway improvements and their predicted effect on overall accident rates. Based on this research, reconstructing a two-lane road to provide a median (no width specified) with left turn refuge areas should reduce accidents by 24 percent. A second source *(Association of Median Width and Highway Accident Rates,* TRR 1401, 1993) provided a log-linear regression analysis to predict the effect of median width on accident rates. This research, based on research from the states of Utah and Illinois, predicted a net reduction of accidents of 25 percent by increasing the median width from 0-feet to 34-feet. Applying the results from these sources to the dualization of US 113 with a median, a 24 percent reduction of the existing accident rates for both the northern and southern study areas is appropriate to establish the corresponding predicted accident rates.

  As indicated in the safety discussion for Alternative 2S-20' Median, the provision of a dualized roadway would virtually eliminate opposite direction collisions. The use of a wider median will also provide greater recovery area for vehicles that leave the roadway. The full-length median traffic barrier/divider included in the **Preferred Alternatives** will eliminate the majority of the opposite direction accidents.

  Access control measures along the new location portions of the **Preferred Alternatives** and the provisions of roadside safety grading (20-feet for the 60 MPH design speed) will also reduce angle collisions and hit fixed object accidents.

While the predicted number of accidents shown in Table IV-1 for the dualization alternatives and **Preferred Alternatives** may not be dramatically less than the numbers shown for the other alternatives, the accident severity is predicted to be substantially improved due to the provision of safety recovery areas, medians, and control of access to the extent possible.

The following table summarizes the results of these accident analyses:

Table IV-1: Projected Accident Data

Alternative	Existing Year (1996)	Design Year 2020
◆ SOUTHERN STUDY AREA		
Alt. 1S No-Build	32 accidents	44 accidents
Alt. 2S - TSM	---	42 accidents
Alt. 2S - 20' Median (60 MPH)	---	38 accidents
Alt. 3S - 20' Median (60 MPH)	---	34 accidents
Alt. 3S - 34' Median (60 MPH)	---	34 accidents
SOUTHERN PREFERRED ALTERNATIVE	---	34 accidents
◆ NORTHERN STUDY AREA		
Alt. 1N No-Build	41 accidents	81 accidents
Alt. 2N - TSM	---	77 accidents
Alt. 3N-20' (50 MPH)	---	65 accidents
Alt. 3N-20' (60 MPH)	---	62 accidents
Alt. 3N-34' (50 MPH)	---	65 accidents
Alt. 3N-34' (60 MPH)	---	62 accidents
Alt. 4N Modified-20' Median (60 MPH)	---	57 accidents
Alt. 4N Modified-34' Median (60 MPH)	---	57 accidents
Alt. 3N/4N Modified-20' Median (60 MPH)	---	60 accidents
Alt. 3N/4N Modified-34' Median (60 MPH)	---	60 accidents
NORTHERN PREFERRED ALTERNATIVE	---	60 accidents

Footnote: Fatal accidents are much more difficult to predict. Clearly, however, the provision of a highway separated by a median with traffic barrier will result in fewer catastrophic opposite direction and sideswipe accidents, and should reduce the fatal accident rate.

B. Social, Economic and Land Use

1. Social Environment

a. Residential Displacements

Residential property acquisition and relocations would be required in certain areas by Alternative 2S-20' Median, and all dualize alternatives, including the **Preferred Alternatives** (see mapping in Appendix A). All properties will be acquired in accordance with the requirements of the Uniform Relocation and Real Property Acquisition Policies Act of 1970, as amended in 1987. Residential property acquisition includes unimproved property not owned by SHA that does not require the acquisition of a structure as well as relocations that will require the acquisition of a structure for any of the alternatives. Most of the residences are one- to two-story detached dwellings and mobile homes. Table IV-2 shows the number of relocations and estimated right-of-way cost of each alternative.

Alternatives 1S and 1N would not impact any residential properties, nor would it displace any residences. Alternatives 2S and 2N would not require any residential relocations, although right-of-way would need to be acquired from some residential properties. This would allow for intersection improvements, roadside safety modifications and improved signalization.

The Coastal Association of Realtors, located in Salisbury, Maryland, was contacted to determine the availability of housing in the study area. As of April 1997, over 90 single family houses are available in Berlin, Newark and Snow Hill. The list price of housing ranges between $25,000 and $692,000. There are also over 100 residential lots for sale in these areas ranging in price from approximately $10,000 to $1.4 million. Most of the residences displaced by this project are valued between $50,000 and $200,000. According to SHA's District 1 Right-of-Way Office in Salisbury, adequate replacement housing within the area is available for these price ranges.

The provisions of the Federal and State laws require SHA to provide payments and services to persons displaced by a public project. The payments include replacement housing payments and moving costs. In the event comparable replacement housing is not available within the monetary limits for owners and tenants to rehouse persons displaced by public projects or available replacement housing is beyond their financial means, replacement "housing as a last resort" will be utilized to accomplish the rehousing. Detailed studies must be completed by SHA before "housing as a last resort" can be utilized. A person displaced by the acquisition of property by the State will not be required to move from their house until at least one comparable house or apartment has been located and offered to that person. A summary of the Relocation Assistance Program of the State of Maryland is provided in Appendix C of this document.

After the SHA relocation counselor's study has been completed, the displaced person(s) will receive a letter stating the amount of replacement housing payment eligibility. This letter contains a promise that the displaced person will not have to vacate the property for at least 90 days. Once the state acquires the property, the displaced person(s) will receive a 30-day notice which contains a specific date to vacate (Maryland State Highway Administration, no date).

Title VI Statement

It is the policy of SHA 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 or sexual orientation in all SHA projects funded in whole or in part by the Federal Highway Administration. SHA will not discriminate in highway planning, design, or construction, the acquisition of right-of-way, or the provision of relocation advisory assistance. This policy has been incorporated into all levels of the highway planning process to ensure that proper consideration may be given to the social, economic and environmental effects of all highway projects. Alleged discriminatory actions should be addressed to the Equal Opportunity Section of SHA for investigation.

Table IV-2: Right-of-Way Impacts and Displacements by Alternative

Alternatives	Additional Right-of-Way Required	Residential Displacements	Business Displacements	Total Right-of-Way Costs
◆ SOUTHERN STUDY AREA				
1S - No-Build	None	None	None	None
2S - TSM	Minimal	None	None	Minimal
2S-20' Median	31 acres	4	1*	Minimal
3S-20' Median	67 acres	2	1*	$ 1.6 M
3S-34' Median	74 acres	2	1*	$ 1.7 M
SOUTHERN PREFERRED ALTERNATIVE	74 acres	2	1*	$ 1.7 M
◆ NORTHERN STUDY AREA				
1N - No-Build	None	None	None	None
2N - TSM	Minimal	None	None	Minimal
3N-20' Median (50 MPH)	86 acres	19	7	$12.8 M
3N-20' Median (60 MPH)	122 acres	23	6	$12.8 M
3N-34' Median (50 MPH)	78 acres	22	7	$12.8 M
3N-34' Median (60 MPH)	136 acres	24	6	$14.2 M
4N Modified -20' Median	111 acres	7	4*	$ 9.4 M
4N Modified -34' Median	123 acres	8	4*	$10.4 M
3N/4N Modified -20' Median	102 acres	15	4*	$ 8.8 M
3N/4N Modified -34' Median	113 acres	15	4*	$ 9.8 M
NORTHERN PREFERRED ALTERNATIVE	109 acres	15	4*	$ 9.8 M

Notes: * One business is located on one of the residential units to be displaced

b. Effects on Elderly and Handicapped Groups

There are no known concentrations of elderly residents in the study area. Alternatives 1S, 1N, 2S, and 2N would not displace any elderly residents. All of the proposed alternatives in the northern study area (including the **Northern Preferred Alternative**) are located in census tracts 9913, 9915, 9916, and 9917, which have elderly populations of 16.0 percent, 14.4 percent, 21.8 percent, and 16.0 percent, respectively. All of the proposed alternatives in the southern study area (including the **Southern Preferred Alternative**) are located in census

tracts 9919 and 9920, which have elderly populations of 14.2 percent and 17.2 percent, respectively. Adverse impacts to the elderly community are not anticipated as a result of the proposed improvements.

Concentrations of handicapped individuals are located either in the existing dualized portion of the US 113 study area or outside of the proposed right-of-way of any of the alternatives. Adverse impacts to this population group are not anticipated by any of the alternatives. If required, appropriate relocation advisory services will be offered to displaced elderly and handicapped individuals.

c. Environmental Justice

Some minority residential displacements would be required as a result of the proposed roadway improvements. In order to determine the likelihood that minority communities may be impacted, each alternative was studied to determine which census tract it would impact and what percentage of minorities are present in those census tracts. The SHA District Office of Real Estate conducted an evaluation to determine the presence of minority-owned and occupied residences and businesses in the study area and drafted a Detailed Relocation Assistance Report.

African-Americans are the predominant minority population in Worcester County. The proposed alternatives in the northern study area (including the **Northern Preferred Alternative**) are located in census tracts 9913, 9915, 9916, and 9917, which have African-American populations of 15.6 percent, 28.4 percent, 1.1 percent, and 1.6 percent, respectively. The proposed alternatives in the southern study area (including the **Southern Preferred Alternative**) are located in census tracts 9919 and 9920, which have African-American populations of 24.1 percent and 40.7 percent, respectively. This information may not be indicative of the local racial population group distribution where displacements are projected to occur. In a public outreach effort to supplement the census tract information, the SHA sent correspondence to area churches requesting their assistance in informing their members of the project and helping to identify minority and/or low income concentrations in the project area. SHA also offered to meet with the churches to discuss the project.

All of the northern study area dualization alternatives (including the **Northern Preferred Alternative**) would widen the existing roadway on the east side where the minority community of twelve houses is located just south of Bishop between US 113 and Old Stage Road. None of these houses will be displaced as a result of these alternatives. No additional right-of-way would need to be acquired from the unimproved roadway leading into this community. Indirect impacts as a result of land use growth patterns are not anticipated as a result of the proposed transportation improvements. This community is located in a light industrial (M-1) zone adjacent to land zoned agricultural A-1. A worst case scenario of five residential dwellings (which is the allowable residential density for a parcel of land zoned A-1) being constructed adjacent to this community is not anticipated to create adverse living conditions for this community.

Alternatives 1S, 1N, 2S, 2N, 4N Modified -20' Median and 4N Modified -34' Median would not generate any minority displacements and would not impact any minority communities. All of the 3N alternatives would require the acquisition of five minority residences. The 3N/4N Modified alternatives (including the **Northern Preferred Alternative**) would require the acquisition of four minority residences, located at individual locations along the alignment. The 3S alternatives (including the **Southern Preferred Alternative**) would require the acquisition of one minority residence as would Alternative 2S-20' Median. No minority businesses will be displaced by any of the proposed alternatives.

According to SHA, income levels of families affected by the proposed improvements range from middle to lower income. Appropriate relocation advisory services will be offered to displaced minority or low income persons, if required. Adequate replacement housing is available within the study area. Related environmental justice impacts will be addressed according to the provisions of Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations." Also, Title VI of the Civil Rights Act, as highlighted previously in the "Residential Displacements" discussion of this Chapter, ensures that no person will be discriminated against by actions of the SHA, relating to the project.

Noise and air quality sampling were conducted in the small minority community along Old Stage Road near Bishop. The ambient and design year (2020) noise levels did not exceed FHWA noise abatement criterion (see Table IV-18). The air quality analysis indicates that carbon monoxide impacts generated by any of the proposed alternatives would not result in a violation of the S/NAAQS 1-hour CO concentration of 35 ppm or the 8-hour CO concentration of 9 ppm (see Tables IV-15). Adverse noise and air quality impacts to this community are not anticipated as a result of the proposed alternatives.

The analysis of minority population groups and low income population groups in the study area indicates that no disproportionate adverse impacts will occur as a result of any of the proposed alternatives, including the **Preferred Alternatives**. The proposed dualization alternatives would provide better access to community facilities and services for minority and low income populations living in the study area.

d. Effects on Community Facilities

Places of Worship

No places of worship would need to be acquired with any of the alternatives considered. Alternatives 1S, 1N, 2S and 2N do not require acquisition of right-of-way from places of worship in the study area. All of the proposed dualization alternatives (including the **Preferred Alternatives**) would provide improved access to worship facilities in the study area with the additional lane provided in the design of these alternatives. All of the 3N Alternatives would provide a service road or improved driveway to Calvary Chapel and Temple Bat Yam. Parishioners of the Calvary Pentecostal Church near Bishop who travel north on US 113 would have to perform a U-turn at an intersection north of the church, to

access it. The Snow Hill Mennonite Church would have a median break placed in front of it allowing left turns with the 3S Alternatives, including the **Southern Preferred Alternative.**

The **Southern Preferred Alternative** will require approximately 0.1 acres of right-of-way from the Snow Hill Mennonite Church property. The **Northern Preferred Alternative** will require approximately 0.3 acres of right-of-way from the Calvary Pentecostal Church. Alternative 3N-34' Median (60 MPH) would have required 0.3 acres of right-of-way from Temple Bat Yam, 0.5 acres of right-of-way from Calvary Chapel, 0.4 acre of right-of-way from the site of Trinity Charismatic Episcopal Church and approximately 0.3 acre from Calvary Pentecostal Church. Impacts would have been less with the 20' median alternatives. SHA will negotiate the acquisition of right-of-way with affected property owners. The Maryland Historical Trust (MHT) has determined that the Northern Preferred Alternative (along with all of the northern build alts.) would have an adverse visual effect on the St. Martin's Church, because of the change in the historic setting, which is one of the characteristics which qualifies the church for eligibility in the National Register. The existing direct access onto US 113 will be closed and a service road will be provided to access US 113 opposite Racetrack Road.

Emergency Services

US 113 is the primary north/south route used by emergency personnel and is a crucial link between study area communities and emergency services. According to the Worcester County Fire Marshal's office, there have been no problems or complaints regarding response times to fires and other emergencies with existing US 113 (Taylor, 1996). The dualization alternatives (including the **Preferred Alternatives**) would each add one travel lane in each direction, and the 2S-20' Median alternative provided an approximately one mile long passing lane in both the northbound and southbound lanes in the vicinities of Basket Switch and Snow Hill, allowing emergency vehicles to safely pass other vehicles. The proposed interchange at US 113 and MD 90 associated with all of the dualize alternatives in the northern study area (including the **Northern Preferred Alternative**) would provide better access to emergencies as compared to the existing interchange (a flashing red light at the existing interchange warns vehicles to stop before proceeding onto MD 90 as the speed limit here is 50 miles per hour). The TSM Alternatives (Alternatives 2S and 2N) incorporated additional turning, acceleration/deceleration and bypass lanes in its design which would have provided better accessibility for emergency vehicles. The No-Build Alternative would not have adversely impacted emergency services.

Response times by emergency vehicles may increase with the alternatives that include a median, including the **Preferred Alternatives**. The median acts as a barrier, changing the access route for emergency vehicles. For example, emergency vehicles traveling north would have to perform a U-turn at the nearest intersection to reach an emergency situation located on the southbound side of the road. This may be offset somewhat by the increased level of service associated with the dualization alternatives, including the **Preferred Alternatives.** The Worcester County Office of Emergency Services was requested to review the

alternatives under consideration and provide additional analysis as to how the alternatives might affect response times and service. Each Fire Chief in the effected service areas responded in favor of an expedient completion of the dualization and identified a slight increase in response times as the only negative issue. The Chiefs' requested SHA to insure that an adequate number of cross overs be included for emergency responders. Specific locations for crossovers will be determined during final design.

The Showell volunteer fire department, located on the northbound side of US 113 in the northern study area, is the only fire station located directly along US 113 in the study area. This fire station is not effected by the **Northern Preferred Alternative.**

Other Community Facilities

No libraries, health care facilities, schools, public parks, or senior citizens centers will be displaced or require the acquisition of land by the proposed alternatives. The additional travel lane incorporated into the dualization alternatives (including the **Preferred Alternatives),** along with the passing lanes associated with the 2S-20' Median alternative would provide better access to these facilities within the study area.

Recreation Opportunities

The additional travel lanes incorporated into the dualization alternatives (including the **Preferred Alternatives**) and the passing lane included in the design of Alternative 2S-20' Median would improve access to recreational facilities and the beach resorts within the study area. Newark Road, which is part of the View Trail 100 Scenic bike trail, intersects with US 113 at Newark. Bicyclists would have additional travel lanes to cross on US 113 with Alternatives 3S-20' Median and 3S-34' Median (the **Southern Preferred Alternative**); however, the median provides refuge. The View Trail 100 will remain in the same location. There will be no loss in use or continuity of the trail, even during the construction phase. Construction will occur within SHA right-of-way and will not require additional right-of-way from other roads which comprise the trail. No parks or recreational facilities in the study area will be adversely affected by any of the alternatives, including the **Preferred Alternatives,** or require the acquisition of right-of-way.

As a separate project, SHA may look at ways to alert motorists to the presence of bicyclists in the area where the View Trail 100 crosses US 113. No other mitigation measures are considered necessary for recreational facilities in the study area.

Utilities

Permanent disruption of utility services is not anticipated as a result of any of the alternatives considered, including the **Preferred Alternatives**. Temporary disruption of utility service may occur if utility lines located along the right-of-way need to be relocated. It will be necessary for SHA to coordinate with the utility companies and Worcester County to locate utility lines and prevent or minimize the amount of disruption of electric, gas, water, sewer, telephone and cable television service within the study area. The utility companies, in

conjunction with the SHA, should inform their service areas by signage and/or media outlets regarding any planned service interruptions as a result of the proposed roadway improvements.

The Worcester County Comprehensive Development Plan states that one of the most powerful growth management tools available is the provision of sewerage and sewage disposal systems. The plan states that "new service should be extended only to those areas where control sewer facilities are required to accommodate anticipated higher growth" and that "new sewer service should not be extended to areas where high density growth is not desired." Future high density growth is not anticipated in the areas adjacent to US 113. Most of the future development is anticipated to occur east of US 113 along the waterfront of the coastal bay areas.

Transportation Systems

No adverse impacts to the County's transportation network are anticipated with the proposed alternatives, including the **Preferred Alternatives.** The TSM Alternatives 2S and 2N provided improvements to the existing roadway without major alteration to enhance safety and reduce traffic congestion. Improvements would have been prioritized, based on detailed accident and traffic analyses. The dualize alternatives (including the **Preferred Alternatives)** and Alternative 2S-20' Median reduce the risk of a head-on collision between vehicles by separating northbound and southbound traffic with a median. The interchanges incorporated into the design of all of the northern study area dualization alternatives at US 113 and MD 90, including the **Northern Preferred Alternative,** provide safer east/west and north/ south access.

Air and water transportation would not be disrupted as a result of the proposed action. The Maryland and Delaware Railroad crosses US 113 just south of Market Street near Snow Hill; near the intersection of US 113 and Newark Road; and just north of Bishop within the study area. Coordination between the railroad and SHA will be undertaken to avoid delays in any scheduled rail service during construction and to determine if additional signage or traffic control devices are needed for safety.

e. Disruption of Neighborhoods and Communities

Impacts to the existing level of community cohesion are anticipated with the dualization and 2S-20' Median alternatives (including the **Preferred Alternatives**). Although these alternatives would not physically bisect any communities not already divided by US 113, they would create residential relocations as previously identified in Table IV-2 and disrupt the community cohesion of several communities with residences located on both sides of US 113 in the study area. These alternatives have a median incorporated into their designs. The median is a physical barrier, allowing only right in/right out access to and from the existing roadway. The median would change the access and travel patterns compared to the unlimited access northbound and southbound that US 113 currently provides. For example, a resident who lives on the northbound side of US 113 and wants to go somewhere located on the

southbound side would have to drive northbound to the nearest intersection and perform a U-turn.

The **Northern Preferred Alternative** will displace 15 residences. The 3N-34' Median (60 MPH) alternative would have required the displacement of 24 residences, the highest number of residential displacements out of all of the alternatives under consideration. The 1S, 1N, 2S and 2N alternatives did not displace any residences. The communities that will experience residential displacements are the Showell area, with 5 residential displacements, and the Bishop area, with 10 residential displacements.

Relocating displaced residents in proximity to their former residences would reduce the impacts of the dualization and 2S-20' Median alternatives considered on community cohesion in the study area. The construction phase of the proposed project may lead to increased travel times between communities as detours and delays in the flow of traffic are enacted to allow construction equipment access to the project area. This is considered a temporary impact. Alternatives 1S and 1N would not have directly impacted any neighborhoods; however, these alternatives would do nothing to improve safety between neighborhoods for motorists, bicyclists and pedestrians, negating any opportunities for better community cohesion. By providing localized intersection and safety improvements, the 2S and 2N Alternatives would have benefitted neighborhoods to a limited degree on an interim basis and provided opportunities for improved community cohesion throughout the US 113 corridor.

County land use objectives include "encourage new development projects to locate in or near the existing population centers and service centers (where planned) but also discourage development of the rural areas of the county" and "maintain the rural character of Worcester and its existing population centers, small towns and villages" (Worcester County Planning Commission, 1989). The responsibility of regulating land use and development rests with the Worcester County Commission and the Worcester County Planning, Permits and Inspections (WCPPI) office. Some new single family houses have been constructed along Shingle Landing Road in the northern study area adjacent to the lot where a new garden center is being developed. A new place of worship, Temple Bat Yam, is presently under construction just north of the MD 90/US 113 interchange. No new development is currently taking place in the southern study area. New development is being targeted toward the existing population centers where infrastructure and community facilities and services are located. Development is occurring along the coastal bay areas of Ocean Pines, Cape Isle of Wight, St. Martin's Neck and West Ocean City.

Citizens of the Friendship/Jones community located in the northern study area along both sides of existing US 113 have expressed their concern regarding property values, residential displacements, access issues and noise levels as they related to Alternative 3N-34' Median (60 MPH). Because of its proximity to the existing roadway, Alternative 3N-34' Median (60 MPH) would have required right-of-way from property located adjacent to US 113, with some residential units and businesses being displaced. Eight residences in the Friendship/Jones area would have been displaced with this alternative. This alternative was perceived by the community as a disruption to their cohesion because of the dualization of

the existing road. In addition, residents who wanted to enter their vehicles onto the roadway from their driveways would not be able to cross the highway in most locations because of the grass median associated with this alternative separating northbound and southbound traffic.

The citizens in this community were in support of the 4N Modified and the 3N/4N Modified alternatives (including the Northern Preferred Alternative) because they avoided impacts to this established community and the quality of life currently experienced. The **Northern Preferred Alternative** follows the 4N Modified -34' Median alignment in the area of the Friendship community. The **Northern Preferred Alternative** will not impact any of the residences in the Friendship/Jones area that would have been displaced by Alternative 3N-34' Median (60 MPH). Alternative 3N-20' Median (50 MPH) was designed in an effort to minimize the amount of right-of-way required. The right-of-way line would have been located further away from residences and would have required less residential takes than Alternative 3N-34' Median (60 MPH). The changes in accessibility associated with Alternative 3N-34' Median (60 MPH) would have also occurred with those alternatives.

Access control issues (see Section II.E.) will be addressed on a property-by-property basis during the final design phase of the project. There are no new residences in the study area that would become frontal property as a result of the dualize alternatives. Residences already front existing US 113 where the 3S, and 3N alternatives, including the **Southern Preferred Alternative**, would be located parallel to the existing roadway. Farmland and forest front the 4N Modified and 3N/4N Modified alternatives, including the **Northern Preferred Alternative**. According to the Worcester County Assessment Office, property values, in the long term, may increase with the dualize alternatives (Slater, 1997).

f. Effects on Access to Services and Facilities

The schools, churches, health care facilities, recreational facilities, libraries and senior citizen centers would be provided with improved accessibility with the dualization and 2S-20' Median alternatives. The additional lane of travel incorporated into the design of the dualization alternatives (including the **Preferred Alternatives**) and the passing lane associated with the 2S-20' Median would allow faster moving vehicles to safely pass slower moving vehicles. The service roads incorporated into the design of the 3N Alternatives would have provided access to businesses, residences, and emergency vehicles in Jones and Showell. The service roads also limit the number of access points to US 113, which would improve safety. Although the latest data shows that there have been no head-on collisions involving public safety vehicles, (Wilson, 1997), the dualization and 2S-20' Median alternatives provide additional lanes allowing northbound and southbound traffic to safely pass without the risk of a head-on collision. The alternatives with a median also allow motorists to stop for school buses traveling in the same direction letting motorists in the opposite travel lanes to continue moving. Alternatives 4N Modified -20' Median, 4N Modified -34' Median, 3N/4N Modified -20' Median and 3N/4N Modified -34' Median (including the **Northern Preferred Alternative**) would separate through traffic from local traffic in sections of its design. This would allow those who want to bypass the local services

to do so while providing motorists the opportunity to visit a local business, residence, or community facility. The 2S and 2N alternatives would have only provided localized improvements and would not have reduced traffic congestion in the region over the long term. Alternatives 1S and 1N did not provide improved access to the services and facilities in the study area.

The dualization alternatives (including the **Preferred Alternatives**) and 2S-20' Median alternatives would change the access for area residents compared to current conditions. Motorists and emergency vehicles requiring access to the opposite side of US 113 from which they are driving would have to travel to the nearest intersection to make a U-turn. This situation would slightly increase the travel time to a destination compared to the existing condition of unlimited northbound and southbound access on US 113.

2. Economic Environment

a. Effects on Existing Businesses

Businesses would be displaced by roadway improvements associated with Alternative 2S-20' Median and by the dualization alternatives, including the **Preferred Alternatives**. Table IV-3 shows the business displacements associated with each alternative. Alternatives 2S-20' Median, 3S-20' Median and 3S-34' Median (the **Southern Preferred Alternative**) would require the acquisition of one business. The relocation of a produce stand will also be required with both 3S alternatives. Alternatives 3N-20' Median (50 MPH) and 3N-34' Median (50 MPH) would have required the acquisition of seven businesses. Alternatives 3N-20' Median (60 MPH) and 3N-34' Median (60 MPH) would have required the acquisition of six businesses. Alternatives 4N Modified -20' Median, 4N Modified -34' Median, 3N/4N Modified -20' Median and 3N/4N Modified - 34' Median (the **Northern Preferred Alternative**) would require the acquisition of four businesses (see Table IV-3). The 1S, 1N, 2S and 2N Alternatives did not generate any business displacements.

All of the proposed dualization alternatives in the northern study area (including the **Northern Preferred Alternative**) would indirectly impact three businesses. Storage areas associated with Ocean Designs and a welding shop will be displaced by these alternatives (see Table IV-3). In addition, approximately half of the existing parking area in front of the Delmarva Veterinary Hospital will be relocated to the northern side of the facility. The welding shop and Ocean Designs may require total acquisition if replacement storage areas cannot be provided. A more detailed analysis of this situation will occur during final design of the **Northern Preferred Alternative**.

The employees of displaced businesses will also be affected by the roadway improvements. The distance and commute times to the relocated locations may increase so that employees would not be able to remain with their current employers. These business owners also have the option of relocating their businesses outside of the study area. No minority-owned businesses will be displaced as a result of the proposed roadway improvements. An inventory of the number of people employed at each displaced business was not conducted; however,

the types of businesses that are to be displaced do not appear to employ a significant number of people and therefore, would not create a hardship to the community.

Based on a review of the local real estate market, suitable commercial property is presently available in all areas of the project. All commercial properties acquired by SHA for construction of the project will be compensated at fair market value and in accordance with the requirements of the Uniform Relocation and Real Property Acquisition Act of 1970, as amended in 1987. It is the responsibility of the individual owners to select new properties for their businesses.

Table IV-3: Business Displacements by Alternative

Alternatives	Name of Business								Total
	General Store & Antiques	Vic's Country Store	Showell Store	Used Furniture and Collectibles	Pop Pop's Repairs	K.L. Bradford Ceramic Tile & Marble	Warehouse	Cactus Cafe	
	Station 1353-L	Station 2035-R	Station 2177-R	Station 2182-R	Station 2194-R	Station 2201-L	Station 2268-R	Station 2371-L	
◆ SOUTHERN STUDY AREA									
1S - No-Build	0	0	0	0	0	0	0	0	0
2S - TSM	0	0	0	0	0	0	0	0	0
2S-20' Median	X	0	0	0	0	0	0	0	1
3S-20' Median	X	0	0	0	0	0	0	0	1
3S - 34' Median	X	0	0	0	0	0	0	0	1
SOUTHERN PREFERRED ALTERNATIVE	X	0	0	0	0	0	0	0	1
◆ NORTHERN STUDY AREA									
1N - No-Build	0	0	0	0	0	0	0	0	0
2N - TSM	0	0	0	0	0	0	0	0	0
3N-20' Median 50 MPH	0	X	X	X	X	X	X	X	7
3N-34' Median 50 MPH	0	X	X	X	X	X	X	X	7
3N-20' Median 60 MPH	0	X	X	0	X	X	X	X	6
3N-34' Median 60 MPH	0	X	X	0	X	X	X	X	6
4N Modified -20' Median	0	0	0	0	X	X	X	X	4
4N Modified -34' Median	0	0	0	0	X	X	X	X	4
3N/4N Modified - 20' Median	0	0	0	0	X	X	X	X	4
3N/4N Modified - 34' Median	0	0	0	0	X	X	X	X	4
NORTHERN PREFERRED ALTERNATIVE	0	0	0	0	X	X	X	X	4

Note - Alternatives 1S, 1N, 2S and 2N do not displace any businesses
X - Denotes displacement
L - Left of centerline of alternative (looking north)
R - Right of centerline of alternative (looking north)

Alternatives with a median, including the **Preferred Alternatives**, would change the access to local businesses compared to the existing conditions. For example, potential customers traveling northbound may have to travel to the nearest intersection and make a U-turn, generally less than 1/4 mile travel distance, to visit a business located on the southbound side of the road.

The types of businesses in the study area are mixed. There are some restaurants, produce stands, and retail merchants that rely on drive-by traffic for their business. There are other businesses of a more industrial nature (feed mills, poultry-related industries) that do not rely on drive-by traffic for their business. There may be some loss of patronage of businesses by motorists not familiar with the study area or area residents who may decide it is not worth the effort to make a U-turn to patronize a business. However, it is anticipated that most area residents will make the turning movements necessary to patronize businesses with which they have a relationship. Providing more signing along US 113 to alert motorists to businesses located on the opposite side of the roadway would increase the visibility of local businesses and may encourage patronage.

b. Effects on Regional Business Activities

US 113 provides a critical link to the movement of goods and services along the east coast between Philadelphia and the Virginia Tidewater area. Roadway improvements can be an incentive to businesses to relocate or remain in an area by providing a safer, more efficient transportation system.

The poultry and tourism industries are vital to the regional economy. Farmers in the area contract with poultry processors to grow crops for feed and raise chickens for processing. Trucks use US 113 to travel to and from farms, processing plants and feed mills in the region. The addition of a travel lane in each direction associated with the dualization alternatives, including the **Preferred Alternatives** would facilitate the efficient movement of goods and services, improve safety, reduce traffic congestion, and reduce travel time. Improvements to US 113 would also make it safer for vacationers and truck drivers traveling in the Delmarva region. A one percent increase in traffic volume over the No-Build Alternative traffic volume is projected with the Build Alternatives. Travel characteristics are not anticipated to change with any of the Build Alternatives, including the **Preferred Alternatives**. The interchange associated with the dualization alternatives in the northern study area, including the **Northern Preferred Alternative**, would provide an easier and safer connection between US 113 and MD 90. Alternatives 2S and 2N would have provided only localized improvements in safety conditions and would not reduce traffic congestion in the region over the long term. Alternatives 1S and 1N would not have improved the safety or improved the efficiency of traffic flow along US 113.

The majority of the land use in the study area is agricultural. The County's 1989 Comprehensive Development Plan, and supported by the 1997 Supplement, states that the County's land use objectives include encouraging growth in the existing population centers and discouraging new development in the rural areas. The proposed build alternatives,

including the **Preferred Alternatives** would not adversely impact the local economy with the loss of businesses required for right-of-way.

c. Tax Base Effects

Residential, commercial and agricultural property would be displaced for this project with the proposed Build Alternatives, including the **Preferred Alternatives**. According to the Worcester County Assessment Office, an adverse effect on the tax base is not anticipated with the right-of-way acquisition and displacements associated with the proposed roadway improvements. If traffic volumes are increased by the dualization (although this is not expected) of the roadway, the value of properties fronting the roadway may increase, which would also increase the tax base (Slater, 1997).

3. Land Use

a. Existing

The purpose of the proposed roadway improvements is to improve the safety of the existing US 113 roadway. Current land use would be altered by the proposed dualization and 2S-20' Median alternatives through conversion of residential and commercial properties, farmland and natural resources to transportation use. Table IV-4 shows the additional right-of-way required by each proposed alternatives.

Presently, the following residential and commercial developments are taking place in the northern study area; each of the residential developments is anticipated to include large single family homes (typically 2,500 SF and greater) on individual lots with septic systems (indicated lot sizes include preservation of forested areas):

- Hudson Farm: US 113 @ Shingle Landing Road
  5 lots (ranging in size from 5± Acres to 12± Acres)

- Bishop Farms: 1,400' east of US 113 along Shingle Landing Road
  5 lots (ranging in size from 4± Acres to 6± Acres)

- Baker Farm: US 113 @ Bunting Road
  4 lots (ranging in size from 11± Acres to 16± Acres)
  1 lot @ 49± Acres

- Sea Bright Garden Center :
  US 113 @ Shingle Landing Road
  1 lot - Garden Center and proposed green house and display area
  1 lot @ 7.39 Acres

- US Post Office: US 113 @ Pitts Road
  1 lot @ 0.88 Acres

The US Post Office in Showell is proposing a relocation to the west side of US 113 just south of its current location. In addition, in the vicinity of the US 113/MD 90 interchange, a new place of worship (Temple Bat Yam) is being constructed. The site of the future home of the Trinity Episcopal Charismatic Church is also located near this interchange.

Table IV-4: Additional Right-of-Way Impacts by Alternative

Alternative	Additional Right-of-Way Required (Acres)
◆ SOUTHERN STUDY AREA	
1S - No-Build	None
2S - TSM	Minimal
2S-20' Median	31
3S-20' Median	67
3S-34' Median	74
SOUTHERN PREFERRED ALTERNATIVE	74
◆ NORTHERN STUDY AREA	
1N - No-Build	None
2N - TSM	Minimal
3N-20' Median (50 MPH)	86
3N-34' Median (50 MPH)	78
3N-20' Median (60 MPH)	122
3N-34' Median (60 MPH)	136
4N Modified -20' Median	111
4N Modified -34' Median	123
3N/4N Modified - 20' Median	102
3N/4N Modified - 34' Median	113
NORTHERN PREFERRED ALTERNATIVE	109

b. Future

Worcester County's population is projected to grow from 35,028 today to 46,000 by the year 2000; 58,000 by the year 2010; and 67,000 by the year 2020 (Hagar, 1997). New residential development, businesses, community facilities and services will likely be needed to accommodate the anticipated growth in the county's population. A study is underway by the Worcester County Planning, Permits and Inspection (WCPPI) to evaluate the need for additional housing units in the county. According to the WCPPI office, there has been little interest in developing areas along the US 113 corridor. Most of the new development has been projected to occur in the coastal bays in the northern and central portions of the county. Based on a review of county plans and discussions with local government officials, there does not appear to be any development in the study area that is dependent on the US 113 roadway improvements for access. Access to land areas adjacent to existing US 113 is expected to remain virtually the same with all of the alternatives under consideration, including the **Preferred Alternatives**. The actual growth distribution will depend on the implementation of land use controls to focus potential growth into appropriate areas. The responsibility to guide development and land use rests with the Worcester County Commission and the WCPPI office.

Coastal Bay Area

The entire northern study area and the southern study area between Berlin and Newark are located in the Maryland Coastal Bay area. This area is an ecologically sensitive watershed in Worcester County that drains into the coastal bays. A review of the Maryland Coastal Bays Projected Land Use (Year 2005) Map was conducted to evaluate future land use in this area. Land use projections are consistent with those stated in the County's 1989 Comprehensive Development Plan and its 1997 Supplement. Generally, higher density residential and commercial development are projected for the northern part of the coastal bay area east of the US 113 project area, while little development is projected for the southern coastal bay area.

Most of the land in the US 113 study area located in the coastal bay area is projected to be cropland/agriculture and forest/orchard. Some additional low density residential development is projected east of US 113 in the area bounded by Ocean Pines, US 113, St. Martin's Neck and US 50. Today, most of this land is farmland or forest. Medium density residential development exists around the communities of Bishopville in the northern study area and Newark in the southern study area and is projected to remain at this density. The only extensive high density residential development in the study area is in Ocean Pines in addition to a small amount of commercial development. There is sufficient land in this community to support additional high density residential development. No additional commercial/ industrial development is projected along US 113 in the coastal bay area.

Regions of the coastal bay area outside of the study area where high density residential development exists and is projected for expansion include Berlin, Ocean City, West Ocean City, Cape Isle of Wight, the MD 611 corridor paralleling Sinepuxent Bay and the area east

of Berlin between US 50, MD 611 and Assateague Road. Commercial/industrial development exists and is projected to expand for Berlin, Ocean City, West Ocean City and the US 50 corridor east of Berlin. The rest of the coastal bay area is projected for cropland/ agriculture, forest/orchard, beaches and wetlands.

Much of the land in the northern study area that is projected for future low-density residential development is currently in agricultural use. The commitment to retaining the rural nature of the county and preservation of agricultural lands as stated in the 1997 Supplement to the 1989 Worcester County Comprehensive Development Plan, makes the development of this land unlikely. The dualization alternatives considered, including the **Preferred Alternatives**, provide improved access to these areas with the additional travel lanes and may encourage residential development in Ocean Pines and St. Martin's Neck, areas currently zoned for low density residential development. The southern study area is projected to remain mostly forested or cropland. The alternatives under consideration in the southern study area are not anticipated to promote residential development in this area.

Maryland has a federally approved Coastal Zone Management Program. The US 113 project is located in the Maryland coastal zone as defined by Maryland's federally approved program. The requirements of Section 307 of the Federal Coastal Zone Management Act of 1972 apply to the project and are being addressed through the NEPA/404 review process. These requirements are carried out by the Maryland Department of the Environment.

Indirect Impacts

Indirect impacts are described in the Council on Environmental Quality regulation (401508.8(b)) as "...caused by the action and are later in time or further removed in distance, but one still reasonably foreseeable". In general, an improved transportation facility may result in future zoning change requests to allow higher density development in areas not currently zoned for such development. However, Worcester County, the 1989 Comprehensive Development Plan and its 1997 Supplement, has stated their commitment to conserving the rural character and natural resources of the county. Among the indirect impacts associated with the proposed roadway improvements is the potential for secondary development. Secondary development is defined as development which could potentially occur as a result of new highway construction.

Although the potential for secondary development exists, there are physical conditions, land use controls, and legislative regulations which limit the amount of development occurring within the study area. In addition, the suitability of some of the soils to support development within the study area is questionable (Winbrough, 1997). Except in Newark, public sewer service is not available within the US 113 corridor. Although this does not prohibit development from occurring, a developer would be responsible for installing the sewerage and sewage disposal facilities if the proposed development cannot be supported by septic systems. In addition, there has not been much interest in developing areas along US 113 as most of the people who relocate to the area want to live adjacent to the water (Morris, 1997).

For that reason, most of the growth in Worcester County is projected for the northern and central coastal bays east of the US 113 study area.

County land use objectives stated within the Worcester County Comprehensive Development Plan are to "encourage new development projects to locate in or near the existing population centers and service centers (where planned) but also discourage development of the rural areas of the county" and "maintain the rural character of Worcester and its existing population centers, small towns and villages". In addition, most of the land located within or in proximity to the study area is zoned for agricultural use. Minor subdivisions of five residential units per property are allowed under this zoning classification. A description of the zoning classifications and a zoning map are located in Section III.A., Land Use. Any request for a zoning change requires a public hearing by the Worcester County Commission. Development of agriculturally-zoned land for non-agricultural use is not consistent with the goals and objectives expressed in the County's Comprehensive Development Plan or its 1997 Supplement.

The Maryland Office of Planning which has determined the **Preferred Alternatives** to be consistent with the Maryland Economic Growth Resources Protection Planning Act, has projected future land use changes to the year 2020. These land use changes are shown on Table III-10 and are projected to occur regardless of any roadway improvements to US 113. Worcester County does not have an adequate public facilities (APF) ordinance. An APF ordinance is a land use control measure that requires adequate schools, transportation facilities, and sewer and water services to be in place to support development before the development is allowed to occur.

In the northern study area, the 3N alternatives would have provided only right-in/right-out access from driveways and minor service roads. The median incorporated into the design of each of these alternatives would have changed the access compared to the unlimited access now associated with the existing roadway. These four alternatives would also have had a new partial cloverleaf interchange which would replace the existing US 113/MD interchange. New loops and ramps would be located in the northeast and southwest quadrants of the interchange. The land area around this interchange is developed or is in agricultural production.

The 4N Modified alternatives would have provided east/west access at a new interchange with MD 90 located west of existing US 113. As currently planned, no driveways or minor service roads would have been given direct access to the new dualized US 113. Median breaks and left turn bays would have been restricted or limited to local public roads. The 3N/4N Modified alternatives (including the **Northern Preferred Alternative**) would also provide east/west access at a new interchange with MD 90 located west of existing US 113 and right-in/right-out access above Bishopville Road. Wetlands, forest and farmland are adjacent to the location of the proposed interchange associated with these alternatives (impacts to these resources are tabulated in other sections of this Chapter).

In the southern study area, the additional travel lane associated with the 3S alternatives (including the **Southern Preferred Alternative**) would generally increase the efficiency of the movement of goods and services within the corridor. The 2S-20' Median alternative provided two passing lanes in each direction spaced approximately 4 miles apart. The median associated with these alternatives would have allowed only right-in/right-out access from existing minor access points along US 113.

Existing US 113 currently provides access to developable land from the northbound and southbound lanes. Under the No-Build and TSM alternatives this access would not change. The majority of the land in the study area is zoned for agriculture use (A-1). Farming activity and minor subdivisions up to five dwelling units are permitted in these zones. Adding one lane in each direction with the dualize alternatives along existing alignment (3S and 3N Alternatives, including the **Southern Preferred Alternative**) and a passing lane with Alternative 2S-20' Median would not substantially improve access to developable lands. These alternatives change the existing access by providing right-in/right-out access only from driveways and minor service roads. The 4N Modified and 3N/4N Modified alternatives, including the **Northern Preferred Alternative**, would be partially controlled access in some locations. Because access will be permitted only at existing public crossroads, no new access to developable lands is provided. Access management strategies of all alternatives under consideration are discussed in Chapter II. If land is to be developed, plans must be submitted to local, state or federal agencies, or a combination thereof, for review, depending on the scale of the project and appropriate permits obtained prior to approval of the proposed project. A public hearing is required by the Worcester County Commission for any request for a zoning change. The Worcester County Commission and the WCPPI office are the local government agencies responsible for guiding land use.

As previously discussed in the Future Land Use sections in Chapters III and IV, the future growth projected for Worcester County is not projected to occur in the US 113 study area. Growth is projected to occur in the northern and central coastal bay areas of the county located east of the US 113 study area. This growth is not contingent on the dualization of US 113 providing access.

The US 113 corridor was added to SHA's Access Management Program in 1997. Corridors in this program are eligible to use funds programmed in the Consolidated Transportation Program for the purchase of access controls along agricultural frontage and in some instances to purchase residential and commercial property. In the near term, the Maryland State Highway Administration's Access Management Team (AMT) will meet every few weeks to review all access permit requests in the corridor to make recommendations on limiting the number of access points and in some situations to recommend denial of access. The goal of these initiatives is to balance access to adjoining land with the need to preserve the flow of traffic and to improve safety and capacity of the highway system.

The AMT meets a minimum of once every three weeks. The Team consists of representatives from SHA Office of Planning and Preliminary Engineering, Division of Engineering Access Permits, the Office of Council, Office of Real Estate and the Office of Traffic and Safety. The AMT will meet regularly to review opportunities for improving access to US 113. This will be done through the development process by reviewing site plans, building permit application, property sale listings and access permit applications. These reviews will be coordinated with the Worcester County Office of Planning. Access management has been ongoing within the SHA since 1987.

Property owners and developers submit their plans to the local planning offices who in turn forward those on the Primary Highway System, to the Access Management Team. The plans are reviewed on a case by case basis to determine the best options.

- If the property has access via another public road the team will recommend that the owner use the alternate means of access to the Primary highway.
- If access can only be obtained via a future service road or a public road a "TEMPORARY" access permit may be issued. Once the improvement is realized, access to the Primary highway would be via the service road or public road and the "temporary" access would be closed.
- If a property were to be landlocked by the State Highway Administration's proposed improvement or it is not cost effective to construct a service road the team may recommend the purchase of the property.

Existing permitted entrances remain as long as there is no change in land use or traffic operation problems do not occur. However, these entrances could be closed as alternate access is provided.

Through enforcement at the local level of the county's zoning ordinance and subdivision controls; use of the guidelines established in the county Comprehensive Development Plan; and implementation of SHA's Access Management Program, county land use objectives can be achieved, economic and population growth can be accommodated and unplanned development can be avoided.

The alternatives with a median, including the **Preferred Alternatives**, would also increase indirect impacts to farmland, travel patterns and community cohesion, as discussed in Section IV.B. The alternatives on new alignment (4N Modified and 3N/4N Modified, including the **Northern Preferred Alternative**) would bisect some productive farmland parcels, creating access difficulties for the property owners. Farmland impacts are discussed in more detail in Section IV.D. The alternatives with a median would only allow residents living on US 113 right in/right out access to and from their driveways. Left turns would be allowed only at intersections with these alternatives. These alternatives would change the travel patterns for area residents, emergency vehicles, farm machinery and those who frequent the area for business or social purposes. The community cohesion would be disrupted temporarily as area residents would need some time to adjust to a new travel pattern.

C. Cultural Resources

1. Historic Structures

Historic resources in the study area were identified and evaluated in accordance with the requirements of 36 CFR 800.4 for each alternative under consideration. Table IV-5 summarizes the effects of the various construction alternatives on identified historic standing structures. The specific effects of each alternative are described below, and the overall impacts on historic resources of each alternative are evaluated. No historic structures were identified in the southern study area. Therefore, none of the alternatives considered for the southern study area, including the **Southern Preferred Alternative** would impact historic structures. The Maryland Historical Trust (MHT) rendered an adverse effect determination (see Draft EIS/Section 4(f) Evaluation Chapter VI, MHT letter April 23, 1997) for the 3N alternatives, the 4N Modified alternatives and 3N/4N, and the Combination Alternative as identified on the table below. The Maryland Historical Trust determined that the **Northern Preferred Alternative,** as well as other dualization alternatives considered, resulted in an adverse effect on St. Martin's Church (see MHT letter dated October 31, 1997 in Chapter V of this document).

Table IV-5: Summary of Impacts to Historic Structures

Alternative	Impact by Alternative: Historic Resource Inventory Number (1)					
	WO-283	WO-472	WO-23	WO-284	WO-289	WO-479
◆ SOUTHERN STUDY AREA						
1S - No-Build	n/a	n/a	n/a	n/a	n/a	n/a
2S - TSM	n/a	n/a	n/a	n/a	n/a	n/a
2S-20' Median	n/a	n/a	n/a	n/a	n/a	n/a
3S-20' Median	n/a	n/a	n/a	n/a	n/a	n/a
3S-34' Median	n/a	n/a	n/a	n/a	n/a	n/a
SOUTHERN PREFERRED ALTERNATIVE	n/a	n/a	n/a	n/a	n/a	n/a
◆ NORTHERN STUDY AREA						
1N - No-build	n/a	n/a	n/a	n/a	n/a	n/a
2N - TSM	No Effect	No Effect	No Effect	No Effect	No Effect	No Effect
3N-20' Median / 50 MPH	Adverse	Adverse	Adverse	Adverse	Adverse	NAE
3N-34' Median / 50 MPH	Adverse	Adverse	Adverse	Adverse	Adverse	NAE
3N-20' Median / 60 MPH	Adverse	Adverse	Adverse	Adverse	Adverse	NAE
3N-34' Median / 60 MPH	Adverse	Adverse	Adverse	Adverse	Adverse	NAE
4N Modified-20' Median	No Effect	No Effect	Adverse	NAE	No Effect	NAE
4N Modified-34' Median	No Effect	No Effect	Adverse	NAE	No Effect	NAE
3N/4N Modified- 20' Median	No Effect	No Effect	Adverse	NAE	No Effect	NAE
3N/4N Modified -34' Median	No Effect	No Effect	Adverse	NAE	No Effect	NAE
NORTHERN PREFERRED ALTERNATIVE	No Effect	No Effect	Adverse	NAE	No Effect	NAE

1. Key to Resources:
   - WO-283 - Hale Farm/ Mariner Farm
   - WO-472 - Vic's Country Store
   - WO-23 - St. Martin's Church
   - WO-284 - Lemuel Showell House
   - WO-289 - Showell Store
   - WO-479 - Transpeninsular

2. Legend
   - n/a - not applicable
   - NAE - No Adverse Effect

St. Martin's Church. St. Martin's Church (WO-23), which is on the National Register, is within the APE (Area of Potential Effect) of all of the 3N alternatives, 4N Modified alternatives and 3N/4N Modified alternatives. These alternatives share an alignment segment south of Racetrack Road, but begin to diverge on the north side of the road just north of the church. The resource is on a slight rise above existing US 113 as the highway descends to cross Church Branch to the north. The area through which 4N Modified alternatives would cross is at the same elevation as the resource. The **Northern Preferred Alternative** is at the same elevation as the existing two-lane/two-way US 113.

TSM improvements consisting of a skid resistant pavement overlay and rumble slots along the centerline and outside edges of the roadway, are proposed within existing right-of-way. Because the resource already fronts on a major highway, it does not appear that these minor improvements will affect the resource or substantially alter its setting. The location, setting, and use of the resource will remain the same. For these reasons, MHT concurred that the TSM improvements will have no effect on the St. Martin's Church.

Although no right-of-way will be acquired from the resource under any of these alternatives, the Maryland Historical Trust (MHT) has determined that the 3N, 4N Modified, and 3N/4N Modified alternatives, including the **Northern Preferred Alternative**, will all adversely affect its setting. Under all of these alternatives, the new roadway would be wider than the existing, and would have an adverse visual impact. This visual impact will likely occur due to the placement of the alternatives in agricultural and forested land east of the resource. The Maryland Historical Trust has determined that this visual effect will be adverse, because the increased width of the roadway would cause a change in the historic setting (March 18, 1997 letter to SHA). The MOA has been submitted to the Advisory Council on Historic Places (ACHP) for signature. A final signed MOA will be appended to this Final EIS.

The MOA's stipulations require SHA to:

- design and construct a new entry from US 113 to the church and a parking area with a connecting accessible pathway to the church*‡
- retain the traffic signal at the corner of US 113 and Racetrack Road (MD 598) and maintain a 55 mph speed limit in the vicinity of the church (this is consistant with the 60 MPH design speed)
- provide historic markers for the church and, after consultation with the MD SHPO on content and site, a monument related to the church's history*
- construct a suitable fence on the eastern and southern boundary of the church property*
- coordinate with the MD SHPO to consider the effects of proposed church mitigation measures on archeological resources
- obtain approval of the Director of the Maryland Historical Trust, pursuant to the terms of the perpetual historic preservation easement the Trust holds on the property

* Consultation with the Maryland SHPO will be required for all designs and constructs.

‡ Identification of Waters of the U.S., including jurisdictional wetlands, will be done prior to the design of parking area and pathway. Aquatic resources will not be altered for these mitigation measures.

The criteria for constructive use of a Section 4(f) resource was examined and determined not applicable because the proximity impacts to St. Martin's Church are not "so severe that the protected activities, features, or attributes that qualify a resource for protection under Section 4(f) are substantially impaired".

Regarding audible impacts, the predicted noise level for a No-Build scenario is higher at 69.9 dBA than the levels predicted for the 3N alternatives (65.3 dBA) and for the 4N Modified and 3N/4N Modified alternatives (63.7 dBA). Additionally, the predicted noise level for the 4N Modified and 3N/4N Modified alternatives is lower than the existing level at the resource (64.9 dBA).

The projected noise level increase attributable to the **Preferred Alternative** is, at 69 dBA, only four (4) dBA above the existing noise level and one (1) dBA below the projected No-Build level of 70 dBA. These changes were deemed to be barely perceptible. Since approximately half of the existing traffic will be farther away from the church than it is presently (due to the median and additional lanes), there will not likely be a perceivable increase in noise levels at the church.

Although MHT determined that the **Preferred Alternative** will adversely affect the setting of the St. Martin's Church, the "proximity of the proposed project does not substantially impair the aesthetic features or attributes considered important contributing elements to the value of the resource." The church, being architecturally significant as one of the few mid-18th century structures in Maryland (criterion A) and significant under criterion C for its fine construction features, conveys a strong association with the early history of Worcester County. Although part of that conveyance lies in the church's placement in an agricultural and forested setting, which would be changed, its existing proximity to the roadway would not. The adverse effect is attributed solely to the visual changes associated with a four-lane divided highway as compared to the existing two-lane road. However the setting is only part of that association with the county's early history; the architectural type is another, and its architectural significance (its fine construction features) would remain unaltered.

The **Preferred Alternative** does not result in a "restriction of access which would substantially diminish the utility" of the church. Access and utility would be improved with a safer access and a parking lot whose design has been coordinated with the property owners, MHT, and the Trust's Easement Committee. The location of the proposed parking area has not been finalized. The potential effects to farmlands, woodlands, and wetlands from the parking area will be investigated and a wetland delineation completed.

Hale Farm/Mariner Farm. The National Register eligible Hale Farm/Mariner Farm (WO-283) is in the area of potential effect of the 3N, 4N Modified, and 3N/4N Modified alternatives.

TSM improvements, consisting of a skid resistant pavement overlay and rumble slots along the centerline and outside edges of the roadway, would have been within existing right-of-

way. Because the resource already fronts on a major highway, it does not appear that these minor improvements will affect the resource or substantially alter its setting. The location, setting, and use of the resource will remain the same. For these reasons, MHT concurred that the TSM improvements would have had no effect on the Hale Farm/Mariner Farm.

Each of the 3N alternatives would have affected the setting and use of the resource. The effect will be adverse because elements of the resource's integrity - its design, setting, materials, workmanship, and feeling - will be diminished. Approximately 17,500 square feet along the west edge will be acquired for right-of-way, amounting to roughly 14 percent of the total square footage of the historic property.

In accordance with 36 CFR Part 800.9, this action would have constituted an adverse effect because a portion of the historic resource will be physically destroyed and altered, and visual, audible, and atmospheric elements out of character with the resource and its setting will be introduced. Construction of Alternative 3N would have resulted in locating the highway 60 feet closer to the existing residential structure within the site boundary (at a distance of 465 feet instead of the existing 520 feet). A portion of the yard, entrance driveway, and ornamental plantings would have been removed, as will the two brick walls flanking the driveway. Regarding audible impacts, the predicted noise level (56.0 dBA) will increase over the existing level (53.9 dBA) and that of the predicted for a No-Build scenario (54.2 dBA). For the above reasons, MHT has determined that all of the 3N alternatives will have an adverse effect on the Hale Farm/Mariner Farm.

The 4N Modified and 3N/4N Modified alternatives, including the **Preferred Alternative**, will not affect the location, setting, or use of the resource. These alternatives, which share the same alignment in this segment, will lie much farther from the resource boundary than the existing highway (some 565 feet farther to the northwest and 1,000 feet or more to the west and southwest). No right-of-way will be acquired from the resource boundary; however, right-of-way will be taken from the larger tax parcel containing the resource. It does not appear that a visual impact on the setting outside the boundary will occur due to the distance involved and the placement of the alignment in areas already concealed by tree lines and plantings. Where sections of the new road will be visible - to the southwest and northwest - the views will be distant, and the road will be on existing grade. In addition, the ornamental plantings along the resource's south and north boundaries will partially obscure some views in those directions. The end result will be a road farther from and better concealed from the resource. This will provide the resource with an ample new buffer. Views toward the new road will be similar to those available at present. Due to the distance, which is more than 970 feet, noise levels should be much reduced in the area of the resource. For these reasons, the MHT has concurred with the determination that the 4N Modified and 3N/4N Modified alternatives will have no effect on the Hale/Mariner Farm.

Lemuel Showell House. The National Register eligible Lemuel Showell House (WO-284) is in the area of potential effect of the National Register eligible Lemuel Showell House (WO-284) include the 3N, 4N Modified, and 3N/4N Modified alternatives.

TSM improvements, consisting of a skid resistant pavement overlay and rumble slots along the centerline and outside edges of the roadway, were proposed within existing right-of-way. Because the resource already fronts on a major highway, it does not appear that these minor improvements will affect the resource or substantially alter its setting. The location, setting, and use of the resource will remain the same. For these reasons, MHT concurred that the TSM improvements would have had no effect on the Lemuel Showell House.

The 3N alternatives would not have affected the location, setting (within the historic boundary), or use of the resource. These proposed alternatives will lie some 90 feet farther west of the resource boundary than the existing highway (Figures 2 and 7). Access to the new road will be provided via a four-way intersection at Pitts Road (existing US 113 will become a local access road). No right-of-way will be acquired from the resource boundary.

An adverse visual impact on the setting would have occurred, however, due to changes in the setting necessitated by the construction of the road. Alternative 3N would have required the removal of the Showell Store (WO-289) at the intersection of US 113 and Pitts Road and the removal of a non-eligible historic dwelling across US 113 from the resource (part of the Showell Survey District, previously determined not eligible for the National Register). This would have resulted in the loss of the west side of the cluster of buildings at the intersection that helps to define the character of Showell and will open up views to the west and northwest that currently do not exist. A line of small trees on the west side of US 113 may provide some concealment; however, this line would have been removed some 500 feet to the south as the 3N alternatives rejoin the existing US 113 alignment. Although the new road would have been farther from the resource, the changes in the setting across US 113 would appear to negate this benefit. In accordance with 36 CFR Part 800.9, the construction of the 3N alternatives would have constituted an adverse effect because visual elements out of character with the resource and its setting would have been introduced. Regarding audible impacts, the predicted levels associated with 3N alternatives (64.1 dBA) would have been slightly lower than the existing level (65.7 dBA) and those predicted for a No-Build scenario (66.4 dBA). For the reasons noted above, MHT has concurred with the determination that the 3N alternatives would have had an adverse effect on the Lemuel Showell House.

The 4N Modified and 3N/4N Modified alternatives, including the **Northern Preferred Alternative**, will not affect the location, setting (within the historic boundary), or use of the resource. The alternatives, which share the same alignment in this segment, will lie approximately 585 feet east of the resource boundary. Additional right-of-way will not be acquired from the resource boundary. A visual impact on the setting will likely occur, however, due to the placement of the alternative in open land east of the resource that is presently used for crops and forest. For a number of reasons, it does not appear that this visual effect will be adverse. First, the resource already fronts on a major highway and is located at a major intersection. Second, the new alignment will be farther from the resource, affording it a buffer zone that currently does not exist. Third, the new alignment will run at existing grade. Fourth, a heavy buffer of mixed evergreen/deciduous vegetation currently shields views from the resource to the north and northeast, and this buffer will remain in place under the new alignment. Fifth, non-historic buildings currently obscure views from

the resource to the south, and these will remain in place under the new alternative. Sixth, views of the fields and tree lines farther east will still be possible with the new road in place. Concerning noise impacts, the predicted noise level for the 4N Modified and 3N/4N Modified alternatives (53.6 dBA) is substantially lower than the levels predicted for the 3N alternatives, the No-Build scenario, and existing US 113. For the above reasons, MHT determined that the 4N Modified and 3N/4N Modified alternatives and the **Northern Preferred Alternative** will have no adverse effect on the Lemuel Showell House.

Showell Store. The National Register eligible Showell Store (WO-289) is in the area of potential effect (APE) for 3N, 4N Modified, and 3N/4N Modified alternatives. The resource is on a slight rise above existing US 113. The 3N alternatives would have run at this elevation, while the 4N Modified, and 3N/4N Modified alternatives would run at the slightly lower grade equal to that of existing US 113.

The 3N alternatives would have affected the location, setting, and use of the resource. The effect will be adverse because all elements of the resource's integrity will be destroyed by demolition of the resource. The setting outside the historic resource boundary would have also been adversely affected through the loss of the resource and a non-eligible historic dwelling on the south side of Pitts Road (part of the Showell Survey District, WO-286, previously determined not eligible for the National Register). The loss of these two buildings would have removed the western edge of the cluster of buildings at the US 113/Pitts Road intersection, a cluster that defines the character of Showell. In addition, views to the west and northwest would have been opened up. Noise levels for the Showell Store were not monitored or modeled because the structure would have been taken under the 3N alternatives. Additionally, noise and atmospheric levels would be essentially the same as those for the Lemuel Showell House which is just across the street from this site. For the above reasons, MHT concurred with the opinion that the 3N alternatives would have had an adverse effect on the Showell Store.

TSM improvements, consisting of a skid resistant pavement overlay and rumble slots along the centerline and outside edges of the roadway, were proposed within existing right-of-way. Because the resource already fronts on a major highway, it does not appear that these minor improvements will affect the resource or substantially alter its setting. The location, setting, and use of the resource will remain the same. For these reasons, MHT concurred that the TSM improvements would have had no effect on the Showell Store.

Investigations to date indicate that the prehistoric and historic archeological site 18WO209 identified on the property of the Showell Store is potentially eligible for the National Register, based on criterion D (ability to provide important information). The investigations indicate that the site does not warrant preservation in place. The 3N alternatives would have adversely impacted 18 WO209.

The 4N Modified and 3N/4N Modified alternatives, including the **Preferred Alternatives**, will not affect the location, setting, or use of the resource. These alternatives, which share the same alignment in this segment, will lie much farther from the resource boundary than the

existing highway (some 865 feet farther to the east). No right-of-way will be acquired from the resource boundary. It does not appear that a visual impact on the setting will occur due to the distance involved and the placement of the alignment in areas already concealed by buildings, tree lines, and plantings. The end result will be a road farther from the resource and better concealed from the resource. This will provide the resource will an ample new buffer zone than today. Views toward the new road will be the same as those available at present. Due to the distance, audible levels would be much reduced in the area of the resource. For these reasons, MHT concurred that the 4N Modified and 3N/4N Modified alternatives and the **Northern Preferred Alternative** will have no effect on the Showell Store.

Vic's Country Store. The National Register eligible Vic's Country Store (WO-472) is in the area of potential effect of the 3N, 4N Modified, and 3N/4N Modified alternatives.

Improvements (under the No-Build Alternative) have been proposed for the intersection of US 113 and Friendship Road. These will consist of a northbound acceleration/deceleration lane and a southbound bypass lane. TSM improvements, consisting of a skid resistant pavement overlay, rumble slots along the centerline and outside edges of the roadway, and painted stop lines at Carey Road and Jones Road. All of the improvements would have been constructed within existing right-of-way. Due to the fact that the resource already fronts a major highway within a major intersection, MHT concurred that these minor improvements would have had no effect on the resource or substantially alter its setting, location, or use.

The 3N alternatives would have affected the setting and use of the resource, and the effect would have been adverse because right-of-way acquisition would have diminished or destroyed its integrity. The alternative called for the edge of pavement for the northbound lanes to be moved closer to the resource. The new lanes will require acquisition of approximately 13,440 square feet of additional right-of-way, equaling roughly 27 percent of the historic property area, and may require demolition of the structure. For the above reasons, MHT concurred that the 3N alternatives would have had an adverse effect on Vic's Country Store.

A visual impact on the setting outside the boundary would have also occurred, due to shifting of the northbound lanes to the east and the provision for southbound lanes on the west side of US 113 (the existing highway will be incorporated into the northbound lanes and the median in this area). For a number of reasons, it does not appear that this visual effect would have been adverse. First, the resource already fronts on a major highway and is located within a major intersection. Second, much of the area to be used for the northbound lanes is already paved in front of the resource. Third, the new alignment will follow the same grade as the existing highway. Fourth, the buildings and landscape features on both sides of US 113 will be retained, except for the eastern edge of a large wooded tract on the west side of US 113 north of Carey Road. The majority of this tract will remain, however. Fifth, views of the fields, tree lines, and buildings beyond the existing highway will still be possible with

the new alignment in place. Concerning noise impacts, the predicted noise levels for the 3N alternatives (70.6 dBA) and the No-Build improvements (69.7 dBA) would have been slightly lower than the existing level (72.1 dBA).

Investigations to date indicate that historic period archeological site 18WO213 identified on the property of Vic's Country Store is ineligible for the National Register, and gave no indication that the site warrants preservation in place. The 3N alternatives would not have impacted significant archeological resources.

The 4N Modified and 3N/4N Modified alternatives, including the **Northern Preferred Alternative**, will not affect the location, setting, or use of the resource. These alternatives, which share the same alignment in this segment, will lie much farther from the resource boundary than the existing highway (some 2,600 feet farther to the west). No right-of-way will be acquired from the resource boundary. It does not appear that a visual impact on the setting outside the boundary will occur due to the distance involved and the placement of the alignment in areas already concealed by buildings, tree lines, and plantings. The end result will be a road farther from the resource and better concealed from the resource. This will provide the resource with an ample buffer not presently provided. Views toward the new road will be the same as those available at present. Due to the distance (more than 2,600 feet), audible and atmospheric levels should be much reduced in the area of the resource. For these reasons, MHT concurred that the 4N Modified and 3N/4N Modified Alternatives and **Northern Preferred Alternative** will have no effect on Vic's Country Store.

Transpeninsular Line Marker. The National Register eligible Transpeninsular Line Marker (WO-479) is in the area of potential effect for the 3N, 4N Modified, and 3N/4N Modified alternatives. All of these alternatives share the same alignment in the vicinity of this site.

TSM improvements, consisting of a skid resistant pavement overlay, rumble slots along the centerline and outside edges of the roadway, the addition of a southbound acceleration lane from Morris Road and oversized intersection warning and stop signs, were proposed within existing right-of-way. Because the resource already fronts on a major highway, it does not appear that these minor improvements would have affected the resource or substantially altered its setting. The location, setting, and use of the resource would have remained the same. For these reasons, MHT concurred that the TSM improvements would have had no effect on the Transpeninsular Line Marker.

The 3N, 4N Modified and 3N/4N Modified alternatives, including the **Preferred Alternatives**, will not affect the location, setting (within the historic boundary), or use of the resource. These alternatives call for the edge of pavement for the northbound lanes in front of the resource to remain as is. No right-of-way will be required.

A visual impact on the setting outside the boundary will likely occur, due to the shifting of the southbound lanes and the incorporation of a much larger median. For a number of reasons, it does not appear that this visual effect will be adverse. First, the resource already

fronts on a major highway and has direct views of the wider US 113 alignment in Delaware. Second, the new alignment will follow the same grade as the existing highway. Third, the buildings and landscape features on both sides of US 113 will be retained. Fourth, views of the west side of US 113 from the resource will still be possible with the new alignment in place. Concerning audible impacts, the predicted noise levels for the dualize alternatives (66.6 dBA) are slightly higher than the existing levels of 65 dBA and No-Build of 62 dBA range (see Table IV-18). For the above reasons, MHT has concurred that the alternatives including the **Northern Preferred Alternative** will have no adverse effect on the Transpeninsular Line Marker.

2. Archeological Sites

Identification of archeological resources was carried out in accordance with the requirements of 36CFR800.4 for each alternative under consideration.

The Phase IB archaeological survey of the US 113 corridor covered all of the high-probability areas for which access was obtained, as well as a 20 percent sample of the low-probability areas. The survey identified 18 potentially significant archeological sites that might be impacted by one or more of the proposed alternates, 12 of which would be affected by the **Preferred Alternatives.** Preliminary eligibility recommendations are summarized in Table IV-6. A Phase II site evaluation has been initiated for the **Preferred Alternatives.**

At the close of Phase I identification survey, about one-half of the recorded prehistoric sites were considered potentially eligible for the register under criterion D, based on their potential to provide important information about the past. The Phase I archeological survey indicates that the remaining prehistoric sites lack the artifact density, patterned artifact distributions, or intact deposits necessary to provide significant data concerning the prehistoric occupation of the Eastern Shore. For these reasons, they are unlikely to yield important information, and are not considered eligible for the National Register of Historic Places.

Supplemental survey investigations identified three additional archeological sites that may be affected by proposed wetland mitigation sites identified for the project, one of which may require further work, Phase II investigations, if it is impacted by the project.

The preliminary indications from the Phase II site evaluations are that prehistoric sites 18WO185 and 18WO203 are ineligible for listing on the National Register of Historic Places. Preliminary results indicate that 18WO184 and 18WO193 may be eligible for the Register, pending completion of detailed artifact analysis.

Survey data suggested that about one-third of the historic period sites are also potentially eligible for the Register under criterion D, their information potential. The presence of structural features, intact subplowzone remains, and information-rich artifact assemblages were used to identify potentially significant historic sites. The remaining historic period sites appear to lack the artifact density, patterned artifact distributions, or intact deposits necessary to provide important information about the history of the region. For these reasons, they are

unlikely to be able to yield important information, and are not considered eligible for the National Register of Historic Places.

Preliminary indications from the Phase II site evaluations, sites 18WO181, 18WO183, 18WO185, 18WO190, 18WO191, 18WO204, and 18WO212 are ineligible for the National Register of Historic Places. Site 18WO201 is preliminarily considered eligible for the National Register, pending completion of detailed artifact analysis, while no preliminary determination has yet been made regarding the eligibility of 18WO196.

Completion of the Phase II evaluation studies will allow conclusive evaluation of the 12 potentially significant archeological sites that may be impacted by the **Preferred Alternatives.**

Based on the results of archeological investigations to date, all potentially significant archeological resources that might be affected by the project are considered important chiefly for the information they contain. At this stage of work, there is no evidence to suggest that any of the sites warrant preservation in place, although confirmation of this must await completion of Phase II investigations. Avoidance and/or minimization of the impacts of construction will be considered for National Register archeological resources. Any mitigation efforts required for archeological resources would be accomplished chiefly through data recovery investigations, along with other appropriate measures such as interpretation of the results of investigations.

Preliminary eligibility recommendations are summarized in Table IV-6.

Table IV-6: Preliminary National Register of Historic Places Archeological Site Recommendations For US 113 Sites

Components	Age	Probably Not Eligible	Possibly Eligible
Prehistoric	Woodland	2	4
	Unknown	6	3
	Prehistoric Total	8	7*#
Historic	18th-19th century	2	5
	18th-20th century	3	2
	19th century	8	4‡
	19th-20th century	6	5
	20th century	3	1
	Unknown	2	0
	Historic Total	24*	17‡
TOTAL SITES‡		22*	21‡

* The assessment of three of the potentially National Register eligible prehistoric/historic period sites is based on the potential of the prehistoric component only; the remaining three have both prehistoric and historic components that may be eligible for the National Register.

\# One potentially eligible prehistoric/historic period site is outside the Area of Potential Effects (APE) of the undertaking.

‡ Two potentially eligible historic period sites are outside the Area of Potential Effects (APE) of the undertaking.

Summary of Impacts to Cultural Resources

Section 106 of the National Historic Preservation Act requires that Federal agencies take into account the effects of their undertakings on properties included in or eligible for National Register of Historic Places, and afford the Advisory Council the opportunity to comment on such undertakings. Section 101(a)(1) of the Act defines properties "significant in American history..." among those that may be included in the Register.

Council comments are rendered through the process described in the Council's regulations (36 CFR Part 800). This process characteristically involves consultation among the Executive Director, agency officials, and the responsible State Historic Preservation Officer(s) to decide on methods to avoid, reduce, or mitigate adverse effects on historic and

cultural properties. In this consultation process, the Executive Director is guided by certain basic principles about the nature of such properties and about appropriate and inappropriate methods of treating them.

Review of inventories and documentary resource material was undertaken in an integrated approach of the full range of cultural properties. The potential of the Area of Potential Effect to yield sites of cultural significance was assessed using the Maryland Historical Trust historic standing structures and archeology inventory maps. In compliance with this, SHA has undertaken studies to identify significant cultural resources in the project's Area of Potential Effect, and is now evaluating the significance of the resources identified. SHA will explore means of avoiding and minimizing any adverse effects to significant archeological and historic resources and will undertake actions to mitigate any adverse effect that can not be avoided.

The Maryland Historical Trust has determined that Alternative 2S - 20' Median would have impacted two archeological sites that are potentially eligible for the National Register: 118WO190 and 18WO 196. Alternative 3S (and the **Southern Preferred Alternative**) will impact ten archeological sites that may be eligible for the National Register of Historic Places: 18WO181, 18WO183, 18WO184, 18WO185, 18WO190, 18WO191, 18WO196, 18WO201, 18WO203, and 18WO204. Alternative 3N would have impacted six archeological sites that may be eligible for the National Register: 18WO194, 18WO195, 18WO197, 18WO202, 18WO209, and 18WO214. Two sites that may be eligible for the National Register would have been impacted by Alternative 4N Modified: 18WO193 and 18WO212. The same two potentially eligible National Register sites will be impacted by the Combination Alternatives, including the **Northern Preferred Alternative**: 18WO193 and 18WO212.

The Maryland Historical Trust (MHT) has determined that the **Northern Preferred Alternative** does have an adverse effect on the National Register St. Martin's Church and a no adverse effect determination on the National Register eligible Transpeninsular Line Marker and the Lemuel Showell House. Because the **Preferred Alternatives** do not require the acquisition of property from any National Register Eligible historic properties, a Section 4(f) Evaluation is not required in this Final Environmental Impact Statement.

The **Northern Preferred Alternative** is preferable since it results in adverse effects on one historic standing structure (St. Martin's Church) as compared to the 3N alternatives which resulted in adverse effects on five historic standing structures (St. Martin's Church, Hale/Mariner Farm, Lemuel Showell house, Showell Store, and Vic's Country Store).

Coordination with MHT and the Advisory Council for Historic Preservation (ACHP) was carried out in accordance with Section 106 of the National Historic Preservation Act of 1966. To address the adverse effects to St. Martin's Church, a Memorandum of Agreement (MOA) (summarized in Section IV.C. and presented in Appendix F of this document) was coordinated with MHT.

D. Farmlands

Active farmland (including properties which raise poultry), prime farmland soils and farmland soils of statewide importance will be impacted as a result of this project. Based on the alignments of the alternatives considered in the Draft EIS, no farming operations will be put out of business. Table IV-7 is a summary of farmland and soil impacts.

In accordance with the Farmland Protection Policy Act (FPPA), a Farmland Conversion Impact Rating form has been completed for this project and evaluated by the Worcester County NRCS office to fulfill FPPA compliance. On this form, the amount in the block "Total Acres in Site" was derived from SHA right-of-way calculations which do not include right-of-way already owned by SHA. Farmland impacts, however, include farmland within SHA right-of-way limits. A copy of the completed rating form along with the rationale used for the evaluation of the site assessment criteria is included in Appendix B.

According to the FPPA, the USDA recommends that the alternatives scoring more than 160 points be given higher levels of consideration for protection and alternatives receiving less than 160 points be given a minimal level of consideration for protection. Alternatives 4N-20' Median, 4N-34' Median, 3N/4N - 20' Median, 3N/4N -34' Median and the **Northern Preferred Alternative** all scored above 160 points. The USDA recommends for alternatives scoring 160 or more points that agencies consider alternatives that would serve the proposed purpose but convert either fewer acres of farmland or other farmland that has a lower alternative value.

In the southern study area, the **Southern Preferred Alternative** will directly impact the most agricultural land (115 acres) of all alternatives considered. The **Northern Preferred Alternative** will directly impact 60.4 acres of active farmland. The 1N alternative directly impacts approximately 0.5 acres of farmland on one parcel associated with the relocation of Bunting Road. The 2S alternative would only require small sliver takes of farmland for bypass and acceleration/deceleration lanes. The proposed dualize and 2S-20' Median alternatives would generally improve access on US 113 by allowing faster moving vehicles to safely pass slower moving farm machinery; however, slow moving farm machinery requiring access to the opposite side of the roadway from which they are traveling would have to cross 2 or 3 lanes (depending on if the equipment is traveling on the shoulder or right lane) to get to the left turn lane at an intersection in order to make a U-turn.

The alternatives on new alignment are the only alternatives that would have indirect impact to farmland. These alternatives would bisect the same six farmland parcels, creating accessibility difficulties for the property owner. The amount of indirect impacts are shown on Table IV-7.

SHA will look at ways to minimize, where possible, the amount of farmland acreage necessary while maintaining required safety standards. Accessibility concerns will be addressed on a property-by-property basis during final design. Just compensation at fair market value will be offered to farm owners whose property is needed for right-of-way or for acquired property that is too small to profitably farm.

Table IV-7: Farmland Impact Summary

Alternatives	Subject					
	Prime Farmland Soils Impacted (acres)	Soils of Statewide Importance Impacted (acres)	Direct Productive Farmland Impacts (acres)	Indirect Farmland Impacts* (acres)	Number of Parcels Directly Impacted	Number of Parcels Indirectly Impacted
◆ SOUTHERN STUDY AREA						
1S - No-Build	0.0	0.0	0.0	0.0	0	0
2S - TSM	0.2	0.0	0.2	0.0	3	0
2S-20' Median	20.0	10.0	19.8	0.0	19	0
3S-20' Median	39.4	19.4	103.5	0.0	48	0
3S-34' Median	43.8	21.6	115.0	0.0	48	0
SOUTHERN PREFERRED ALTERNATIVE	43.8	21.6	115.0	0.0	48	0
◆ NORTHERN STUDY AREA						
1N - No-Build	0.5	0.0	0.5	0.0	1	0
2N - TSM	0.0	0.0	0.0	0.0	0	0
3N-20' Median 50 MPH	42.6	31.5	34.9	0.0	24	0
3N-34' Median 50 MPH	47.9	35.5	39.2	0.0	24	0
3N-20' Median 60 MPH	47.9	35.5	39.2	0.0	24	0
3N-34' Median 60 MPH	53.2	39.4	43.6	0.0	24	0
4N Modified-20' Median	103.4	81.1	55.0	47.0	19	6
4N Modified-34' Median	114.9	90.1	61.1	40.9	19	6
3N/4N Modified - 20' Median	107.1	68.4	55.7	47.1	20	6
3N/4N Modified - 34' Median	119.0	76.0	61.9	40.9	20	6
NORTHERN PREFERRED ALTERNATIVE	116.1	74.2	60.4	39.9	20	6

* Indirect impacts are a result of the alternatives bisecting a productive farmland parcel which may create accessibility difficulties for farmers.

Note: Additional farmland acreage may be required for wetland mitigation requirements.

E. Soils, Geology and Topography

The No-Build and TSM Alternatives would have had minor localized impacts to soils where acceleration/deceleration, bypass and turning lanes would have been constructed. These small projects may have required earth disturbances of up to 0.25 acres for construction. No bypass or turning lanes were planned for the southern study area under either Alternative 1S (No-Build) or Alternative 2S (TSM). Alternative 1N (No-Build) in the northern study area included the planned relocation of the Jarvis Road intersection as well as the construction of three acceleration/

The majority of water to recharge aquifers comes from precipitation that filters through the soil or water that seeps in from streams. Precipitation will recharge aquifers to sufficient levels throughout the year. Fluctuations of the groundwater level depend on variations in temperature and precipitation. Aquifers in this region are generally saturated. It is anticipated that a minimal change in relief and decrease in recharge area will not significantly affect water recharge to the aquifers in this region. Additional usage of ground water as a result of an increase in growth and population is not anticipated to significantly affect the water supply in the study area (Maryland Department of Geology, Mining and Water Resources, 1955; Heath, 1984).

Highway runoff can have a substantial impact on groundwater quality in the vicinity of the highway (Barrett et al., 1993). The potential constituents of highway runoff have been characterized in Section IV.G. of this Final EIS. Elevated groundwater concentrations of metals, nitrogen compounds, and organic compounds have been found in the vicinity of highways and runoff control structures. It has also been found that the effects of runoff on groundwater are often spatially limited and attenuated by natural soil processes (Young et al., 1996; Barrett et al., 1993). Yousef et al. (1990) found that high metal concentrations found in the sediments of highway stormwater ponds were almost completely attenuated in the top eight inches (20 cm) of the pond bottom. The highway runoff control methods described in Section IV.G. of this Final EIS should help to minimize the potential adverse impacts to groundwater quality.

Adverse impacts to groundwater quality during construction of the **Preferred Alternatives** will be mitigated through strict adherence to the Maryland Department of the Environment's (MDE) erosion and sediment control procedures. All borrow material will be obtained from clean upland sites. All areas of exposed soil will be vegetatively or structurally stabilized as soon as practical. An SHA approved stormwater management plan will also be required for this project. The stormwater management plan will include both quantity and quality management for stormwater runoff prior to discharge into receiving waters.

Stormwater management facilities can cause several negative environmental impacts including: increasing downstream water temperatures, reducing downstream dissolved oxygen level during dry weather discharge, sacrifice of upstream channels, provide a barrier to the downstream movement of bedload, provide a barrier to fish movement, and the disturbance of wetlands (Schuler and Galli, 1991). These negative impacts will be minimized by the careful placement of these facilities outside stream channels and wetlands.

G. Surface Water Resources

Surface water resources consisting mainly of major streams, minor drainage ditches, and intermittent stream channels, may be impacted by pollutants within highway runoff. The constituents of this runoff may include particulates, metals, oil and grease, organics, nutrients and other substances. Table IV-8 lists common highway runoff constituents and their primary sources. All of these constituents may not be found in runoff from the proposed US 113 project.

Roadway traffic directly and indirectly contributes much of the pollutants found in highway runoff. As seen in Table IV-8, vehicle operation is a source of the metals, chemical oxygen demand (from

rubber and other organic compounds), oil and grease, sulphates, and other materials deposited on highways (Barrett et al., 1993; Muschack, 1990; Kobringer, 1984). The maintenance of the roadway can also contribute chloride, sodium, calcium, cyanide, PCB's, pesticides, and other compounds (Young et al., 1996; Muschack, 1990; Kobringer, 1984). Relatively high levels of pathogenic bacteria can also be found in the runoff from highways routinely used to haul livestock (Barrett et al., 1993) such as US 113. Other major sources of contaminants include atmospheric dustfall and dissolved constituents in the rainfall itself (Barrett et al., 1993; Muschack, 1990; Kobringer 1984). Rainfall can contribute up to 78% of the major ionic contaminants and 48% of the suspended solids representing a substantial portion of the pollutant loadings. This is especially true for highways near urban areas (Barrett, 1993; Muschack, 1990). Thus, the surrounding land use has a major impact on the amount of pollution in dustfall deposited on a highway and on the resulting quality of highway stormwater runoff (Barrett, 1993; Muschack, 1990).

Traffic volume is an important factor in predicting highway runoff quality (Barrett, 1993). Driscoll et al., (1990) found that roadways with Average Daily Traffic (ADT) greater than 30,000 vehicles produced two to five times the pollutant levels present in runoff from rural highways (less than 30,000 ADT). Table IV-8A shows the mean pollutant concentrations based on over 900 storm events in 31 states for high and low ADT roadways. Barrett et al., (1993) found that while some studies show that ADT greatly influences runoff pollutant levels, other studies show less correlation between ADT and pollutant loads and suggest that ADT may simply be an indicator of the surrounding land-use (e.g., urban, high ADT roadways versus rural, low ADT roadways). In these low correlation cases, the pollutant sources from surrounding land uses (i.e., atmospheric deposition from urban pollution sources) may be more important than ADT in determining pollutant loads (Barrett et al., 1993; Young et al., 1996). Muschack (1990) found that freeways generally had lower pollutant loads than local streets due to the acceleration/deceleration activities associated with traffic lights and stop signs, increased tire and roadway abrasion, brake wear, and vehicle emissions and leakages.

Table IV-8A: Mean Pollutant Concentrations in Highway Runoff from Urban and Rural Highways*

Pollutant	Mean Pollutant Concentration (mg/L) for Urban Highways (ADT > 30,000)	Mean Pollutant Concentration (mg/L) for Rural Highways (ADT < 30,000)
Total Suspended Solids	142	41
Volatile Suspended Solids	39	12
Total Organic Carbon	25	8
Chemical Oxygen Demand	114	49
Nitrite + Nitrate	0.76	0.57
Total Kjeldahl Nitrogen	1.83	0.87
Phosphorus	0.40	0.16
Total Copper	0.054	0.022
Total Lead	0.40	0.080
Total Zinc	0.329	0.080

* Source: Driscoll et al., 1990

The precipitation characteristics that may impact the water quality of highway runoff include the number of dry days preceding the runoff event, intensity of the storm, and the duration of the storm. Storm intensity has a strong impact on water quality because many of the pollutants are associated with suspended solids including metals, organic compounds, and total organic carbon that are more easily moved by high-intensity storms. Larger storms dilute highway runoff and lower concentrations of contaminants but the total pollutant loads are generally higher in larger storms (Barrett et al., 1993; Young et al., 1996). Higher pollutant concentrations are generally observed during the first part of a storm event as the accumulated pollutants wash off the road surface and are quickly depleted (Young et al., 1996).

Factors that influence the impact of highway runoff include the type and size of the receiving water body, the potential for dispersion, and the size of the catchment area. Highways increase the amount of impervious cover in a watershed and can increase runoff volume and peak discharge and result in increased streambank erosion. This erosion adds to the suspended solid and other pollutant loads associated with the highway runoff. Soluble pollutants can adversely affect algae and zooplankton and toxic effects can greatly reduce production in the aquatic system. Particulates and sediments in highway runoff can cause a number of problems including decreasing flow capacity in drainageways, reducing the storage volume of ponds, smothering benthic organisms, decreasing water clarity, and interfering with the respiration of small fish. Also, toxic materials such as metals, hydrocarbons, pesticides, and PCB's often attach to and are transported by suspended solids presenting both acute and chronic threats to aquatic organisms (Barrett et al., 1993). Sediments from roadways which are

deposited in waterways may be a reservoir for toxic metals and a primary source for the bioaccumulation of metals (Barrett et al., 1993; Yousef et al., 1990).

Dupuis (1985) reported that highways with traffic densities ranging from 12,000 to 120,000 ADT had little effect on the biota of receiving waters. Various studies cited by Barrett et al., (1993) show conflicting results regarding the chronic and acute effects of highway runoff on aquatic organisms. While some studies showed that highway runoff had little or no effect on aquatic life, other studies did identify the bioaccumulation of metals with ADTs as low as 10,000 (Barrett et al., 1993). Dilution of runoff can play an important role in the toxic effect of highway pollutants and smaller receiving bodies may be at greater risk (Barrett et al., 1993; Muschack, 1990). The ADT of US 113 for the build design year is expected to range from 5,000 to 11,000 vehicles for the **Southern Preferred Alternative** and from 14,000 to 20,000 vehicles for the **Northern Preferred Alternative.**

Control of pollution from highway runoff can be achieved through both source management and structural controls. Because much of the pollutant load is either suspended particulate matter or material adsorbed to the suspended solids, control measures that reduce the amount of particulates available or settle and/or filter particulates are most effective. Non-structural source management controls may include the elimination of curbs and other barriers, limiting the use of fertilizers on the right-of-way and the implementation of various Best Management Practices (BMP) such as integrated pest management, litter and debris controls and other similar techniques (Young et al., 1996; Barrett et al.,1993). The proposed open typical section for the US 113 build alternatives, including the **Preferred Alternatives,** does not use curbs and therefore encourages overland flow conditions which should help improve water quality. Beyond the initial establishment of vegetative cover on the right-of-way, SHA generally avoids the use of fertilizers in the regular maintenance of its right-of-ways.

Structural controls for water quality improvement appropriate for highways may include attenuation and vegetative practices, ponds, and constructed wetlands. Vegetative controls, including grass lined swales and vegetated buffer strips, have been shown to be effective at reducing metals, oil and grease, and suspended solids but are generally less effective at reducing nutrient loads. The efficiency of vegetative controls is influenced by various factors such as vegetation type and density and the length of contact. Detention ponds (stormwater management ponds that are designed to detain water for only a short time and are generally dry between rain events) are effective at reducing peak discharges and therefore reducing stream bank erosion but, are generally not reliable or effective for water quality treatment of highway runoff. Extended-detention ponds with shallow marsh systems (stormwater management ponds that are designed to temporarily detain water for longer periods of time and support the growth of various emergent wetland plants) and retention ponds (stormwater management ponds that are designed maintain a permanent pool of water and retain a certain amount of storm runoff) have been shown to be much more effective at pollutant removal (Young et al., 1996; Barrett et al., 1993). Physical and biological processes in these ponds have been shown to be very effective at removing pollutants, including metals (Young et al., 1996; Barrett et al., 1993; Yousef et al., 1990). Constructed wetlands have the ability to assimilate large quantities of dissolved and suspended solids and nutrients. Pollutant removal is achieved through plant uptake, physical filtration, adsorption, gravitational settling, and microbial decomposition (Young et al., 1996; Barrett et al., 1993). Combinations of control measures may increase the ability

to effectively filter suspended solids and the redundancy can increase the overall reliability and performance of the pollutant removal (Barrett et al., 1993). The design of stormwater management facilities and the selection of appropriate water quality control measures will be completed during final design when detailed hydrology data is available. The stormwater management plans developed for the US 113 project will not be placed in Waters of the US or wetlands and will be designed to minimize adverse effects on aquatic resources. These stormwater management plans will have to be approved for both quantity and quality management of highway runoff by the Maryland Department of the Environment. The resulting approved plan will reduce the adverse effects of highway runoff pollution.

During construction of the build alternatives, including the **Preferred Alternatives**, surface water quality may be temporarily impacted by increased sedimentation associated with grading operations. Further discussions of construction related impacts on water quality are included in Section IV.F.5 of this Final EIS.

The proposed construction will add 43.6 acres of impervious surface in the approximately 324,128 acre Pocomoke River watershed (Sipple, 1994) representing only 0.013% of the watershed. The **Southern Preferred Alternative** will also require the filing of 1.87 acres of the approximately 63,422 acres of wetlands (0.003%) in the Pocomoke River watershed (Sipple, 1994). Also, the *Pfiesteria* outbreaks have been linked to high levels of nitrogen in runoff (North Carolina State University, 1997) and highway runoff is not a major source of nutrient rich runoff (Kobringer, 1984). The primary sources of nitrogen and phosphorus in highway runoff are atmospheric deposition and fertilizers used on the right-of-ways (Kobringer, 1984). The atmospheric deposition of nitrogen and phosphorus will continue to occur with or without the construction of this project (although nutrient loads are likely to be somewhat higher from impervious surfaces). As standard practice, SHA only uses fertilizers on their right-of-ways for the initial establishment of vegetation, therefore, this will not be a persistent source of nutrients.

Impacts to the aquatic biota of the streams located within the study areas will include a variety of temporary and permanent construction impacts and may impact local biota in various ways. Impacts to the streams and their biota may result from structures such as culverts, pipes, piers and abutments. Stream crossings using culverts and/or pipes have the potential to disrupt fish migrations, cause streambank and cause substrate instability which could lead to the loss of invertebrate biota and suitable fish habitat, especially fish spawning habitats. These situations can be avoided with the careful design of the stream crossings. Measures to maintain fish passage can include maintenance of low flow channels, provision of baffles, and the suppression of the culvert bottom to maintain a natural stream bottom or other methods and will be incorporated into the design of all new culvert crossings and culvert extensions.

The TSM Alternatives are not expected to cause any disruption of major or minor stream systems.

Alternative 2S-20' Median and the dualization alternatives, including the **Preferred Alternatives**, will require the crossing of several streams, tributaries and other drainageways within the study areas.

The perennial streams have water quality which is conducive to the support of aquatic plant materials, migratory fish species as well as other aquatic organisms. Other waterways are minor drainage ditches or intermittent streams which provide spatially and temporarily limited habitats for aquatic organisms. Table IV-9 lists the number, probable type, and preliminary size of each proposed stream crossing. Culvert sizes, the possible use of bridges, and the expansion of culvert and bridge crossings to facilitate animal passage will be investigated during final design when detailed hydrologic and hydraulic data become available.

Table IV-8: Common Highway Runoff Constituents and Their Primary Sources*

Constituent	Primary Sources
Particulates	Pavement wear, vehicles, atmosphere, maintenance
Nitrogen, Phosphorous	Atmosphere, roadside fertilizer application
Lead	Leaded gasoline (auto exhaust), tire wear (lead oxide filler material), lubricating oil and grease, bearing wear
Zinc	Tire wear (filler material), motor oil (stabilizing additive), grease
Iron	Auto body rust, steel highway structures (guardrails, etc.), moving engine parts
Copper	Metal plating, bearing and bushing wear, moving engine parts, brake lining wear, fungicides and insecticides applied by maintenance operations
Cadmium	Tire wear (filler material), insecticide application
Chromium	Metal plating, moving engine parts, brake lining wear
Nickel	Diesel fuel and gasoline (exhaust), lubricating oil, metal plating, bushing wear, brake lining wear, asphalt paving
Manganese	Moving engine parts
Bromide	Exhaust
Cyanide	Anticake compound (ferric ferrocyanide, Prussian Blue or sodium ferrocyanide, Yellow Prussiate of Soda) used to keep deicing salt granular
Sodium, Calcium	Deicing salts, grease
Chloride	Deicing salts
Sulphate	Roadway blends, fuel, deicing salts
Petroleum	Spills, leaks or blow-by of motor lubricants, antifreeze and hydraulic fluids, asphalt surface leachate
Polychlorinated Biphenyls	Spraying of highway right-of-ways, background atmospheric deposition, PCB catalyst in synthetic tires
Pesticides, Pathogenic bacteria (indicators)	Soil, litter, bird droppings and trucks hauling livestock and stockyard waste
Rubber	Tire wear
Asbestos	Clutch and brake lining wear

* Source: Kobriger, 1984

Table IV-9: Number, Probable Type, and Preliminary Size of Stream Crossings by Alternative

Alternative	Stream Crossing	Type and Length of Crossing	Size of Structure	Linear Feet of Stream Impact
◆ SOUTHERN STUDY AREA				
1S - No-Build	Purnell Branch	Box Culvert	3 cell-23 feet	0
	Poorhouse Branch	Reinforced Concrete Pipe	3 cell-60 inches	0
	Five Mile Branch	Box Culvert	6 feet x 8 feet	0
	Massey Branch	Reinforced Concrete Pipe	2 cell-48 inches	0
	Porter Creek	Reinforced Concrete Pipe	2 cell-52 inches	0
	Goody Hill Branch	Box Culvert	6 feet x 14 feet	0
	Catbird Creek	Corregated Metal Pipe	36 inches	0
	Poplartown Branch	Box Culvert	5 feet x 9 feet	0
2S - TSM	Purnell Branch	Box Culvert	3 cell-23 feet	0
	Poorhouse Branch	Reinforced Concrete Pipe	3 cell-60 inches	0
	Five Mile Branch	Box Culvert	6 feet x 8 feet	0
	Massey Branch	Reinforced Concrete Pipe	2 cell-48 inches	0
	Porter Creek	Reinforced Concrete Pipe	2 cell-52 inches	0
	Goody Hill Branch	Box Culvert	6 feet x 14 feet	0
	Catbird Creek	Corregated Metal Pipe	36 inches	0
	Poplartown Branch	Box Culvert	5 feet x 9 feet	0
2S - 20' Median	Purnell Branch	Box Culvert	3 cell-23 feet	60
	Poorhouse Branch	Reinforced Concrete Pipe	3 cell-60 inches	90
	Five Mile Branch	Box Culvert	6 feet x 8 feet	60
	Massey Branch	Reinforced Concrete Pipe	2 cell-48 inches	40
	Porter Creek	Reinforced Concrete Pipe	2 cell-52 inches	55
	Goody Hill Branch	Box Culvert	6 feet x 14 feet	75
	Catbird Creek	Corregated Metal Pipe	36 inches	50
	Poplartown Branch	Box Culvert	5 feet x 9 feet	50
				480
3S - 20' Median	Purnell Branch	Box Culvert	3 cell-23 feet	170
	Poorhouse Branch	Reinforced Concrete Pipe	3 cell-60 inches	80
	Five Mile Branch	Box Culvert	6 feet x 8 feet	80
	Massey Branch	Reinforced Concrete Pipe	2 cell-48 inches	80
	Porter Creek	Reinforced Concrete Pipe	2 cell-52 inches	100
	Goody Hill Branch	Box Culvert	6 feet x 14 feet	115
	Catbird Creek	Corregated Metal Pipe	36 inches	80
	Poplartown Branch	Box Culvert	5 feet x 9 feet	85
				790
3S - 34' Median	Purnell Branch	Box Culvert Extension	3 cell-23 feet	180
	Poorhouse Branch	Reinforced Concrete Pipe Ext.	3 cell-60 inches	90
	Five Mile Branch	Box Culvert Extension	6 feet x 8 feet	90
	Massey Branch	Reinforced Concrete Pipe Ext.	2 cell-48 inches	90
	Porter Creek	Reinforced Concrete Pipe Ext.	2 cell-52 inches	110
	Goody Hill Branch	Box Culvert Extension	6 feet x 14 feet	125
	Catbird Creek	Corregated Metal Pipe	36 inches	90
	Poplartown Branch	Box Culvert	5 feet x 9 feet	95
				870
SOUTHERN PREFERRED ALTERNATIVE	Purnell Branch	Box Culvert Extension	3 cell-23 feet	180
	Poorhouse Branch	Reinforced Concrete Pipe Ext.	3 cell-60 inches	90
	Five Mile Branch	Box Culvert Extension	6 feet x 8 feet	90
	Massey Branch	Reinforced Concrete Pipe Ext.	2 cell-48 inches	110
	Porter Creek	Reinforced Concrete Pipe Ext.	2 cell-52 inches	110
	Goody Hill Branch	Box Culvert Extension	6 feet x 14 feet	125
	Catbird Creek	Corregated Metal Pipe	36 inches	90
	Poplartown Branch	Box Culvert	5 feet x 9 feet	95
				870

Table IV-9: Number, Probable Type, and Preliminary Size of Stream Crossings by Alternative (continued)

Alternative	Stream Crossing	Type and Length of Crossing	Size of Structure	Linear Feet of Stream Impact
◆ NORTHERN STUDY AREA				
1N - No-Build	Crippen Branch Church Branch Middle Branch Birch Branch Carey Branch	Corregated Metal Pipe Box Culvert Box Culvert Box Culvert Box Culvert	2 cell-36 inches 8 ½ feet x 15 feet 7 ½ feet x 9 feet 7 feet x 16 feet 6 feet x 11 feet	0 0 0 0 0
2N - TSM	Crippen Branch Church Branch Middle Branch Birch Branch Carey Branch	Corregated Metal Pipe Box Culvert Box Culvert Box Culvert Box Culvert	2 cell-36 inches 8 ½ feet x 15 feet 7 ½ feet x 9 feet 7 feet x 16 feet 6 feet x 11 feet	0 0 0 0 0
3N - 20' Median (50 MPH)	Crippen Branch Church Branch Middle Branch Birch Branch Carey Branch	Corregated Metal Pipe Box Culvert Box Culvert Box Culvert Box Culvert	2 cell-36 inches 8 ½ feet x 15 feet 7 ½ feet x 9 feet 7 feet x 16 feet 6 feet x 11 feet	85 120 350 140 80 775
3N - 34' Median (50 MPH)	Crippen Branch Church Branch Middle Branch Birch Branch Carey Branch	Corregated Metal Pipe Box Culvert Box Culvert Box Culvert Box Culvert	2 cell-36 inches 8 ½ feet x 15 feet 7 ½ feet x 9 feet 7 feet x 16 feet 6 feet x 11 feet	95 130 380 150 90 845
3N - 20' Median (60 MPH)	Crippen Branch Church Branch Middle Branch Birch Branch Carey Branch	Corregated Metal Pipe Box Culvert Extension Box Culvert Extension Box Culvert Extension Box Culvert Extension Box Culvert Extension	2 cell-36 inches 8 ½ feet x 15 feet 7 ½ feet x 9 feet 7 feet x 16 feet 6 feet x 11 feet	105 140 415 160 115 935
3N - 34' Median (60 MPH)	Crippen Branch Church Branch Middle Branch Birch Branch Carey Branch	Corregated Metal Pipe Box Culvert Extension Box Culvert Extension Box Culvert Extension Box Culvert Extension Box Culvert Extension	2 cell-36 inches 8 ½ feet x 15 feet 7 ½ feet x 9 feet 7 feet x 16 feet 6 feet x 11 feet	115 160 430 170 130 1005
4N Modified - 20' Median	Church Branch Middle Branch Birch Branch Carey Branch	New Box Culvert [1] New Box Culvert [1] Box Culvert Extension Box Culvert Extension	8 ½ feet x 15 feet 7 ½ feet x 9 feet 7 feet x 16 feet 6 feet x 11 feet	270 500 160 115 1045
4N Modified - 34' Median	Church Branch Middle Branch Birch Branch Carey Branch	New Box Culvert [1] New Box Culvert [1] Box Culvert Extension Box Culvert Extension	8 ½ feet x 15 feet 7 ½ feet x 9 feet 7 feet x 16 feet 6 feet x 11 feet	285 520 170 130 1,105

Table IV-9: Number, Probable Type, and Preliminary Size of Stream Crossings by Alternative (continued)

Alternative	Stream Crossing	Type and Length of Crossing	Size of Structure	Linear Feet of Stream Impact
3N/4N Modified - 20' Median	Church Branch	New Box Culvert	8 ½ feet x 15 feet	270
	Middle Branch	New Box Culvert [1]	7 ½ feet x 9 feet	500
	Birch Branch	Box Culvert Extension	7 feet x 16 feet	160
	Carey Branch	Box Culvert Extension	6 feet x 11 feet	115
				1045
3N/4N Modified - 34' Median	Church Branch	New Box Culvert [1]	8 ½ feet x 15 feet	285
	Middle Branch	New Box Culvert [1]	7 ½ feet x 9 feet	520
	Birch Branch	Box Culvert Extension	7 feet x 16 feet	170
	Carey Branch	Box Culvert Extension	6 feet x 11 feet	130
				1,105
NORTHERN PREFERRED ALTERNATIVE	Church Branch	Box Culvert Extension	8 ½ feet x 15 feet	210
	Middle Branch	New Box Culvert [1]	7 ½ feet x 9 feet	520
	Birch Branch	Box Culvert Extension	7 feet x 16 feet	170
	Carey Branch	Box Culvert Extension	6 feet x 11 feet	130
				1,030

[1] The new box culvert sizes shown are based on the type and size of the existing US 113 crossing. Larger culverts and/or bridges will be considered during final design to minimize impacts and facilitate animal passage.

Abrupt changes in channel width which can result in increase scouring and erosion in areas where the channel has been narrowed and may also result in a broader shallower stream channel in areas where the stream is widened will be considered. This will avoid disruption of fish migration due to a decrease in stream depth and channel formation.

Broader, shallower streams promote warming of the stream and a decrease in dissolved oxygen which can limit fish populations or result in changes in fish populations. They can also disrupt invertebrate populations and affect how pollutants such as metals are processed through the aquatic ecosystem.

During final design, culverts will be designed to maintain the geomorphic stability of the stream channels. Consideration will also be given to "daylighting" portions of the culverts to maintain stream production and encourage animal usage, and maintaining the active floodplain of the streams crossed.

New stream crossings at Church Branch and Middle Branch would be required with the relocation alternatives (Alternatives 4N Modified and 3N/4N Modified). In an effort to reduce wetland and stream impacts and forest fragmentation, the **Northern Preferred Alternative** has been realigned to use, to the extent possible, the existing US 113 crossing at Church Branch. Only one new stream crossing, at Middle Branch is required for the **Northern Preferred Alternative**. The type, size, and location (TS&L) of the new crossing will be determined during final design when detailed hydrologic data is available. During final design, consideration will be given to maintaining geomorphic stability of the stream channels and the maintenance the active floodplain of the streams crossed. Full or partial bridging options will be given full consideration. Coordination with resource agencies will continue throughout the design phase of this project.

The enlargement of existing stream culverts to facilitate animal passage will also be considered during final design when detailed hydrologic data is available.

The benefits of the provision of animal passage through these culverts must be weighed carefully against the potential for increased downstream flooding due to the larger culvert openings. Wetland and other environmental impacts may also be increased by enlarging culverts because the raised roadway profile will require more fill.

The restoration of streams within the study area to compensate for stream loss will be considered during final design. Until detailed hydrologic data is available it is not possible to identify appropriate restoration methods.

The Pocomoke River, a Maryland scenic river, is located at least 2,500 feet to the west of US 113. Because the river flows roughly parallel to the roadway, US 113 does not cross it. No impacts to the scenic resource are expected. The Pocomoke River is not protected by federal wild and scenic river designation (Haubert, 1997).

Adverse impacts to water quality during construction of the roadway or borrow pits will be minimized through strict adherence to the SHA erosion and sediment control procedures. All borrow material will be obtained from clean upland sites. All areas of exposed soil will be vegetatively or structurally stabilized as soon as practical. An SHA approved stormwater management plan will also be required for this project. The stormwater management plan will include both quantity and quality management for stormwater runoff prior to discharge into receiving waters.

Stormwater management facilities can cause several negative environmental impacts including: increasing downstream water temperatures, reducing downstream dissolved oxygen level during dry weather discharge, sacrifice of upstream channels, provide a barrier to the downstream movement of bedload, provide a barrier to fish movement, and the disturbance of wetlands (Schuler and Galli, 1991). These negative impacts will be minimized by the careful placement of these facilities outside stream channels and wetlands.

Other measures to minimize construction related impacts include:

- Initiating temporary stream closures where necessary.
- Minimizing equipment operation within the stream channels.
- Constructing temporary in-stream measures (Coffer dams, stream crossings) with clean materials.
- Locating equipment fueling and service staging areas away from aquatic resources.
- Constructing culvert extensions or new structures at stream crossings in such a manner as to promote continued easy fish migration and/or avoid any additional impact within stream channels.

All Waters of the United States including Jurisdictional Wetlands are regulated under Section 404 of the Clean Water Act (CWA). These areas also regulated by the State of Maryland through its wetlands and waterways statutes. Project activities impacting jurisdictional waters and wetlands will require authorization from the Corps of Engineers and the Maryland Department of the Environment.

H. Floodplains

The No-Build and TSM Alternatives will not cause additional impacts to any 100-year floodplains.

Each of the Build Alternatives, including the **Preferred Alternatives** will traverse the 100 year floodplains associated with major stream systems in the study areas which include Purnell Branch, Poorhouse Branch, Five Mile Branch, Massey Branch, Porter Branch, Goody Hill Branch, and Poplartown Branch in the southern study area and Crippen Branch, Church Branch, Middle Branch, Birch Branch and Carey Branch on the northern study area. Table IV-10 shows the area of impact to these 100-year floodplains by each alternative.

Table IV-10: Impacts to the 100-Year Floodplain

Alternative	Proposed Floodplain Impact (acres)
◆ SOUTHERN STUDY AREA	
1S - No-Build	No Impact
2S - TSM	No Impact
2S - 20' Median	9.5
3S - 20' Median	7.1
3S - 34' Median	8.4
SOUTHERN PREFERRED ALTERNATIVE	8.4
◆ NORTHERN STUDY AREA	
1N - No-Build	No Impact
2N - TSM	No Impact
3N - 20' Median / 50 MPH	5.2
3N - 34' Median / 50 MPH	5.7
3N - 20' Median / 60 MPH	8.0
3N - 34' Median / 60 MPH	8.5
4N Modified - 20' Median	2.7
4N Modified - 34' Median	3.0
3N/4N Modified - 20' Median	2.9
3N/4N Modified - 34' Median	3.1
NORTHERN PREFERRED ALTERNATIVE	2.6

These estimates are based on preliminary structure sizes. Final determination of sizes will be made during the design phase of the project.

In accordance with the requirements of 23 CFR 650 Executive Order 11988, each encroachment was evaluated to determine its significance. A significant encroachment would involve one of the following:

- a significant potential for interruption or termination of a transportation facility which is needed for emergency vehicles or provides a community's only evacuation routes,
- a significant risk, or
- a significant adverse impact on natural and beneficial floodplain values.

The use of standard hydraulic design techniques for all waterway openings which limit upstream flood level increases and approximate existing downstream flow rates will be utilized where feasible.

Use of state-of-the-art sediment and erosion control techniques and stormwater management controls will ensure that none of the encroachments would result in risks or impacts to the beneficial floodplain values or provide direct or indirect support to further development within the floodplain. Preliminary analyses indicate that no significant floodplain impacts are expected to occur as a result of any proposed Build Alternatives including the **Preferred Alternatives.**

All of the proposed culverts, culvert extensions or other structures at stream crossings will be sized so that upstream and downstream flood elevations will remain unchanged if possible. Sections of roadway which may traverse a floodplain shall be located above the 100-year flood level for protection from flood damage. At the final design phase of the project, the plans will be reviewed by federal, state and local agencies to ensure that the design complies with state and local floodplains regulations. Proposed floodplain encroachments will be in accordance with the provisions of Executive Order 11988.

I. Wetlands

Impacts to Waters of the United States including jurisdictional wetlands within the study area are unavoidable for any of the Build Alternatives including the **Preferred Alternatives.** The placement of fill within some wetlands and the construction of stream crossings on others will cause the loss of wetland acreage which, in turn, may also impair one or more of the wetland functions detailed in Chapter III. Wetland values and functions may be further impaired by any impacts to surface water quality caused by the construction or operation of US 113 (Surface Water Resources, Section IV-G). Alternative alignments, slope limits, right-of-way, and wetlands locations are shown in Appendix A. The acreage of encroachment for each wetland within the dualization alternatives are included in Table IV-11. Total acreage of encroachment for each wetland class are included in Table IV-12.

Table IV-11: Impacts To Wetlands Within The Study Area By Each Build Alternative [1]

Southern Study Area							
Wetland Number [2]	Wetland Classification [3]	Stream	Total Wetland Area [4] (Acres)	Impacted Area (acres) [5]			
				DRAFT EIS Alternatives			PREFERRED ALTERATIVE
				2S - 20' Median	3S - 20' Median	3S - 34' Median	
W-1	PEM	Hardship Branch	100	<0.1	0.2	0.3	0.13
W-2	PFO	Patty's Branch	>500	1.1	1.1	1.3	0.32
W-3	PFO	Patty's Branch	200	<0.1	<0.1	<0.1	0.02
W-4	PFO	Patty's Branch	2.0	--	--	--	---
W-5	PEM/PSS	Patty's Branch	11.0	--	0.4	0.5	0.20
W-5A	PFO/PEM	Patty's Branch	2.0	--	0.5	0.6	0.25
W-6	PFO	Patty's Branch	>500	--	0.8	0.9	0.61
W-7	PFO	Patty's Branch	>500	0.6	--	--	---
W-8	PFO	Purnell Branch	>500	0.8 [6]	1.4	1.6	0.32
W-9	PSS/R2	Poorhouse Branch	200	<0.1	0.1	0.1	0.02
W-10	PFO	Five Mile Branch	>500	<0.1	--	--	---
W-11	PFO/R2	Massey Branch	100	--	0.1	0.1	0.01
W-12	PFO	Massey Branch	>500	1.7	3.6	4.0	1.25
W-13	PFO	Porter Creek	100	0.3	0.6	0.7	0.39
W-14	PFO	Bassett Creek	100	--	--	--	---
W-15	PFO	Bassett Creek	5.0	<0.1	0.6	0.7	0.10
W-16	PFO	Bassett Creek	200	0.2	0.5	0.6	0.26
W-17	PFO	Bassett Creek	0.8	<0.1	0.4	0.5	0.16
W-18	PFO	Catbird Creek	100	0.7	1.2	1.3	0.80
W-19	PFO	Poplartown Branch	1.0	--	--	--	---
W-20	PFO	Poplartown Branch	50	--	--	--	---
W-21	PFO/R2	Poplartown Branch	200	--	--	--	---
W-22	PFO	Poplartown Branch	200	0.2	0.3	0.4	0.22
TOTAL WETLAND IMPACTS: DRAFT EIS (5/97)				5.8	11.8	13.6	---
TOTAL WETLAND IMPACTS: FINAL EIS				2.0 [7,8]	4.7 [7]	5.5 [7]	5.06 SAY 5 to 5 ½ acres

Note: Apparent errors due to rounding.

1. Stream (Waters of the U.S.) impacts are discussed in Section IV-G and in Table IV-2.
2. Farmed wetlands to be verified during final design.
3. Legend: PFO - Palustrine Forested Wetland, PSS - Palustrine Scrub/Shrub Wetland
   PEM - Palustrine Emergent Wetland, R2 - Perennial Stream
4. Total wetland area outside of the study area is estimated from Soil Survey and NWI information.
5. NOTE - Impacts in the Draft EIS were presented based on right-of-way line to right-of-way line impacts; impacts for the **Southern Preferred Alternative** are presented for limits of disturbance.
6. The Draft EIS for alternatives 2S-20' Median assumed a passing lane in the vicinity of Wetland 8. Federal resource agencies requested elimination of the passing lane and the associated impacts on the wetland.
7. The Southern Preferred Alternative was refined to minimize wetland impacts, resulting in a 60% decrease in wetland impacts. This factor has been applied to each Draft EIS alternative for comparison purposes.
8. In addition to Note 7. above, the passing lane shown for Alt. 2S-20' Median in wetland W-8 has been removed.

Table IV-11: Impacts To Wetlands Within The Study Area By Each Build Alternative [1] (continued)

Table IV-11: Impacts To Wetlands Within The Study Area By Each Build Alternative [1] Continued
Northern Study Area

Wetland Number [2]	Wetland Classification [3]	Stream	Total Wetland Area [4] (Acres)	Impacted Area [5]								
				DRAFT EIS Alternatives								PREFERRED ALTERNATIVE
				3N - 20' Median 50 MPH	3N -34' Median 50 MPH	3N-20' Median 60 MPH	3N -34' Median 60 MPH	4N Modified-20' Median	4N Modified - 34' Median	3N/4N Modified-20' Median	3N/4N Modified-34' Median	
W-23	PFO	Church Branch	3.0	0.1	0.1	0.4	0.4	1.9	1.9	1.9	1.9	1.45
W-24	PFO	Crippen Branch	1.0	<0.1	<0.1	<0.1	<0.1	--	--	--	--	--
W-25	PFO	Crippen Branch	100	0.3	0.3	0.4	0.4	--	--	--	--	--
W-26	PFO/PSS	Church Branch	3.0	--	--	--	--	0.6	0.8	0.7	0.8	0.82
W-27	PFO	Church Branch	200	0.1	0.1	0.1	0.1	1.6	1.8	1.6	1.8	1.15
W-28	PFO	Church Branch	200	0.6	0.7	1.3	1.5	2.5	2.6	2.5	2.6	0.90
W-29	PFO/PSS	Church Branch	1.8	--	--	--	--	0.9	1.0	0.9	1.0	0.00
W-30	PFO	Middle Branch	>500	0.4	0.5	1.6	1.8	0.9	1.0	0.9	1.0	0.49
W-31	PFO	Birch Branch	>500	0.7	0.8	0.8	1.0	0.8	1.0	0.8	1.0	0.50
W-32	PFO/PSS	Birch Branch	>500	--	--	--	--	--	--	--	--	--
W-33	PFO	Birch Branch	100	--	--	--	--	--	--	--	--	--
W-34	PFO	Birch Branch	100	--	--	--	--	--	--	--	--	--
W-35	PFO	Perkins Branch	1.0	--	--	--	--	--	--	--	--	--
W-36	PEM	Perkins Branch	5.0	0.5	0.6	0.7	0.8	0.7	0.8	0.7	0.8	0.37
W-37	PFO	Carey Branch	200	0.1	0.2	0.2	0.4	10.8	12.0	0.2	0.4	0.02
W-38	PEM	Carey Branch	0.7	0.7	0.7	0.7	0.7	--	--	0.7	0.7	0.64
W-39	PFO	Carey Branch	200	--	--	--	--	1.3	1.5	--	--	--
W-40	PFO	Carey Branch	200	0.2	0.2	0.4	0.5	0.4	0.5	0.4	0.5	0.23
TOTAL WETLAND IMPACTS: DRAFT EIS (5/97)				3.6	4.3	6.6	7.5	22.4	24.8	11.2	12.4	---
TOTAL WETLAND IMPACTS: FINAL EIS				2.2 [6]	2.6 [6]	4.0 [6]	4.5 [6]	13.4 [6]	14.9 [6]	6.7 [6]	7.5 [6]	6.57 SAY 7 to 7½ acres

Note: Apparent errors due to rounding.

1. Stream (Waters of the U.S.) impacts are discussed in Section IV-G and in Table IV-2.
2. Farmed wetlands to be verified during final design.
3. Legend: PFO - Palustrine Forested Wetland; PSS - Palustrine Scrub/Shrub Wetland; PEM - Palustrine Emergent Wetland; R2 - Perennial Stream
4. Total wetland area outside of the study area is estimated from Soil Survey and NWI information.
5. NOTE - Impacts in the Draft EIS were presented based on right-of-way line to right-of-way line impacts, impacts for the **Northern Preferred Alternative** are presented for limits of disturbance. Apparent errors due to rounding.
6. The Northern Preferred Alternative was refined to minimize wetland impacts, resulting in a 40% decrease in wetland impacts. This factor has been applied to each Draft EIS alternative for comparison purposes.

Table IV-12: Impacts To Wetlands By Alternative By Wetland Classification

Alternative	Wetland Classification			
	Palustrine Forested	Palustrine Scrub/Shrub	Palustrine Emergent	Farmed Wetlands [1]
◆ SOUTHERN STUDY AREA				
1S - No-Build	0.0	0.0	0.0	0.0
2S - TSM	0.0	0.0	0.0	0.0
2S - 20' Median	5.8	0.0	<0.1	0.1
3S - 20' Median	11.3	0.2	0.3	0.1
3S - 34' Median	13.0	0.3	0.3	0.2
SOUTHERN PREFERRED ALTERNATIVE	4.7	0.2	0.1	0.0
◆ NORTHERN STUDY AREA				
1N - No-Build	0.0	0.0	0.0	0.0
2N - TSM	0.0	0.0	0.0	0.0
3N - 20' Median / 50 MPH	2.3	0.0	1.3	<0.1
3N - 34' Median / 50 MPH	2.8	0.0	1.4	<0.1
3N - 20' Median / 60 MPH	5.1	0.0	1.5	0.3
3N - 34' Median / 60 MPH	6.0	0.0	1.6	0.4
4N Modified - 20' Median	21.1	0.2	1.1	1.2
4N Modified - 34' Median	23.3	0.2	1.3	1.4
3N/4N Modified - 20' Median	9.2	0.2	1.8	1.1
3N/4N Modified - 34' Median	10.2	0.2	2.0	1.2
NORTHERN PREFERRED ALTERNATIVE	5.0	0.5	1.0	0.6

[1] Approximate impact to farmed wetlands to be verified and surveyed during final design. Apparent errors due to rounding.

In addition to direct impacts to wetlands caused by earthwork and highway structures, post-construction impacts to wetland values and functions may also be realized. These may include such impacts as: the loss of wetland flora, fauna and habitat due to sediment and pollutant deposition or hydrologic changes; the interruption of animal reproductive cycles by highway related noise; and the interruption of migration into and out of wetland areas by highway traffic or structural barriers (Erickson, et al., 1980).

Existing functions for each wetland within the right-of-way for the alternatives were determined using New England Corps of Engineers Descriptive method. The definition and assessment criteria that were used during the field review of wetland functions is provided in Section III.H.3. The results of the wetland function assessment are summarized in Table III-16.

In general, most of the existing functions will continue to be provided by remaining portions of the wetlands although the quantity or magnitude of these functions would be reduced proportionally with the area lost. For some wetlands, the introduction of new sediment/toxicant sources; the introduction or loss of inlets, outlets or constrictions; the change in the input area; etc, will impact the wetland's effectiveness and/or opportunity to perform some or all functions. The wetland functions most impacted or limited by the Build Alternatives include: sediment/toxicant retention, flood flow alteration, wildlife habitat and nutrient removal/transformation.

Section 404(b)(1) Guidelines

The Section 404(b)(1) guidelines are the substantive criteria used to evaluate discharges of dredged or fill material under Section 404 of the Clean Water Act. The purpose of Section 404(b)(1) guidelines is to restore and maintain the chemical, physical, and biological integrity of Waters of the United States through the control of discharges of dredged or fill material. From a national perspective, the degradation or destruction of special aquatic sites, such as filling operations in wetlands, is considered to be among the most severe environmental impacts covered by the guidelines. The guiding principle should be that degradation or destruction of special aquatic sites may represent an irreversible loss of valuable resources. (40 CFR §230.1)

This Final Environmental Impact Statement, in compliance with Section 404 of the Clean Water Act addresses the requirements of the 404(b)(1) guidelines Subparts B through F. The provisions of Subparts B through F and the manner in which they are addressed in this document are detailed below:

Subpart B: Compliance with the Guidelines

Subpart B addresses the analysis necessary for compliance with the guidelines and establishes four conditions which must be satisfied to determine that the proposed action complies with the 404(b)(1) guidelines. Subpart B further sets forth factual determinations to be considered when determining if the proposed action satisfies the conditions of compliance.

230.10 Restrictions on Discharge - The discharge of dredged or fill material in the aquatic ecosystem including wetlands, is not permitted if there is a practicable alternative that would have less adverse impact. Commonly referred to as the "Alternatives Analysis," these provisions of the guidelines require that alternative actions and locations be considered to avoid impacts to aquatic resources. The analysis must demonstrate that there is no practicable alternative to the proposed discharge of dredged or fill material which would have less adverse impact to the aquatic ecosystem. These alternatives are not considered practicable if they have other substantive adverse environmental consequences. The provisions also require the determination of the project's water dependency and compliance with NEPA and the Coastal Zone Management Program.

230.10(a)(1) Alternatives Analysis - As detailed in Chapter II (Alternatives Considered) of this Final EIS, a range of alternatives were considered for this project including: No-Build, TSM, and several Dualization alternatives. Section II-D reviews each of the alternatives studied in detail in the Draft EIS and explains why each alternative was not selected as the Preferred Alternative. Section II-E provides a detailed discussion of the Preferred Alternatives and their reasons for selection. The findings of this analysis demonstrate that there are no practicable alternatives which completely avoid aquatic impacts and still meet the purpose and need for the project.

230.10(a)(2) Avoidance Alternatives - Due to the aerial extent and linear nature of the wetlands in the project area only the No Build and TSM alternatives completely avoid direct impacts to aquatic resources. However, as determined in Section II-D of this Final EIS, and discussed above (230.10(a)(1) Alternatives Analysis) these alternatives do not meet the purpose and need for this project. Therefore, there are no practicable alternatives which completely avoid aquatic impacts.

Where possible, the Build alternatives were located to avoid and minimize impacts to individual aquatic resources including wetlands during preliminary design. Avoidance of stream systems that are generally perpendicular to the alternative alignments was not possible while still meeting the project's purpose and need. Unavoidable impacts to aquatic resources including wetlands were minimized by circumventing the resources to the extent possible and maximizing slopes, thereby reducing fill. Culverts or bridges will also be used to maintain existing stream channels and hydrologic connections.

Beyond preliminary design, numerous strategies were developed to further avoid and minimize individual wetland impacts. These strategies considered the function and value of the impacted wetland and the safety and economic ramifications of adopting the avoidance and minimization effort. The general strategies used to further reduce wetland impacts are as follows:

- Structural measures - Structural measures evaluated consisted of an epoxy coated steel sheet pile retaining walls, mechanically stabilized slopes, and bridge spans. Based on the minor reductions in impacts and the high cost of these measures, the use of structural measures were not considered economically feasible except at the highly sensitive Wetland W-8. Additional options may be considered during final design, once detailed hydrologic and hydraulic data are available to evaluate the merits and costs of these structures.

- Reduction in median width - For safety and operations, the full width median was maintained in the vicinity of all intersections. Where wetland areas were located more than 1,500 feet away from an intersection, reduced median widths were considered. An attempt was made to taper the median to 10 feet to reduce direct wetland impacts. On curves where sight distance was a safety concern, the median could only be reduced to 16 feet.

- Alignment shifts and modifications to the alternative alignments were considered to reduce wetland impacts.

- Construction operation restrictions - Due to the high value and function of all the wetlands in the study area, operation of heavy equipment will not extend beyond the limit of disturbance in wetlands.

Specific strategies at individual wetlands impacted by the build alternatives are detailed below. Further avoidance or minimization of impacts to these individual wetlands would cause additional displacements, alignment difficulties or cause additional impacts to other wetlands and may compromise the safety of the roadway. The following provides the analysis of avoidance alternatives, in accordance with the Section 404(b)(1) guidelines and Executive Order 11990 for the build alternatives.

- **Southern Study Area Alternative Presented in the Draft EIS** (see Draft EIS, Appendix A, Figures 1 through 7 and 8 through 14)
  - Alt. 2S - 20' Median
  - Alt. 3S - 20' Median
  - Alt. 3S - 34' Median

Wetland 1 is located on both sides of existing US 113, north of Castle Hill Road. This wetland is not directly impacted by the 2S - 20' Median Alternative with the application of minimization measures. Shifting the dualization to the east would reduce the wetland impact to W-1, but would require approximately 1,500 feet of additional road reconstruction. Reduced median width is not feasible due to the proximity of the US 113/Castle Hill Road intersection. To minimize the proposed impacts, 2:1 outside slopes with guardrail have been used to reduce the southbound roadway footprint. This combination of minimization measures reduces the wetland impacts without compromising the safety and integrity of the roadway or increasing impacts to other resources.

Wetland 2 is located on both sides of existing US 113, south of Snow Hill Road. Direct impacts by the 2S - 20' Median Alternative can not be avoided because of the need for a northbound passing lane in this area. Shifting the dualization to the east would cause additional direct impacts to W-2. To minimize the proposed direct impacts, a 10-foot median and 2:1 outside slopes with guardrail have been used to reduce the southbound roadway footprint. Construction operations will also be limited to the limit of disturbance. This combination of minimization measures reduces the direct wetland impacts without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetland 3 is located on both sides of existing US 113, just south of Snow Hill Road. This wetland is not directly impacted by the 2S - 20' Median Alternative with the application of minimization measures. Shifting the construction to the east would directly impact approximately the same acreage of wetland of W-3 and increase the direct impact to W-2. Proximity to Snow Hill Road requires the use of a full median width. Proposed direct impacts have been minimized through the use of 2:1 outside slopes with guardrail to reduce the southbound roadway footprint and the limiting of construction operations to the limit of disturbance. This combination of minimization measures reduces the direct wetland impacts without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetland 4 is located to the east of US 113, south of Brick Kiln Road. This wetland is not directly impacted by any of the southern study area alternatives.

Wetland 5 is located to the west of US 113, north of Washington Street. This wetland is not directly impacted by the 2S - 20' Median Alternative. Shifting the dualization to the east would require approximately 2,000 feet of additional road reconstruction and cause a direct impact to a farmed wetland and also the higher functioning W-7 not directly impacted by the alternative considered. Proximity to Brick Kiln Road/Washington Street requires the use of the full median width. To minimize proposed direct impacts, 2:1 outside slopes with guardrail have been used to reduce the roadway footprint. This combination of minimization measures reduces the direct wetland impacts without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetland 5A is located to the west of US 113, south of Public Landing Road. This wetland is not directly impacted by the 2S - 20' Median Alternative. Shifting the dualization to the east would require approximately 2,400 feet of additional roadway construction and cause a direct impact to a farmed wetland and the higher functioning W-7. Proximity to Public Landing Road requires the use of the full median width. To minimize the proposed direct impacts to Wetland 5A, 2:1 outside slopes with guardrail have been used to reduce the southbound roadway footprint. This combination of minimization measures reduces the direct wetland impacts without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetland 6 is located to the west of US 113, north of Public Landing Road. This wetland is not directly impacted by the 2S - 20' Median Alternative. Shifting the dualization to the east would require approximately 2,000 feet of additional roadway construction and cause a direct impact to a farmed wetland and the W-7. Proximity to Public Landing Road requires the use of the full median width. Direct impacts to Wetland 6 are minimized through the use of 2:1 outside slopes with guardrail to reduce the southbound roadway footprint and by limiting construction operations to the limit of disturbance. This combination of minimization measures reduces the direct wetland impacts without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetland 7 is located to the east of existing US 113, north of Public Landing Road. This wetland is not directly impacted by any of the southern study area alternatives.

Wetland 8 is located along Purnell Branch on both sides of existing US 113, south of Market Street. This wetland is not directly impacted by the 2S - 20' Median Alternative. Shifting the dualization to the east would result in greater direct impacts to the wetlands. Because of the high value of this cypress wetland, the resource was of critical concern and special minimization measures were developed. Because the wetland is located along a curve on US 113 and sight distance was a concern, a 16-foot median was employed to minimize direct impacts (10-foot median could not be used at this location due to site distance limitations). The combination of minimization measures reduces the direct wetland impacts without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetland 9 is located along Poorhouse Branch on both sides of existing US 113, north of Cedartown Road. Direct impacts to this wetland could not be avoided with the 2S - 20' Median Alternative because of the need for a southbound passing lane in this area. Shifting the dualization to the east would increase direct wetland impacts. Due to the close proximity of Cedartown Road, the full median width must be used. The use of 2:1 outside slopes with guardrail and the limiting of construction operations to the limit of disturbance will minimize direct wetland impacts. This combination of minimization measures reduces the direct wetland impacts without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetland 10 is located along Five Mile Branch to the east of existing US 113, North of Central Site Lane. This wetland is not directly impacted by the 2S - 20' Median Alternative with the application of minimization measures. This wetland is not directly impacted by the southern study area dualization alternatives.

Wetland 11 is located on both sides of existing US 113, south of Langmaid Road. This wetland is not directly impacted by the 2S - 20' Median Alternative. Shifting the dualization to the west would not decrease direct wetland impacts and would cause a direct impact to the Newark Sewage Treatment Plant. The full median width is required because of the close proximity to Langmaid Road. Direct impacts to Wetland 11 are minimized through the use of 2:1 outside slopes with guardrail along the northbound roadway and by limiting construction operations to the limit of disturbance. This combination of minimization measures reduces the direct wetland impacts without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetland 12 is located along Massey Branch on both sides of existing US 113, between Langmaid and Newark Roads. Direct impacts to this wetland could not be avoided with the 2S - 20' Median Alternative because of the need for a northbound passing lane in this area. Shifting the dualization to the west would decrease the direct wetland impacts, but would require approximately 3,500 feet of additional roadway construction. To minimize the proposed direct impacts, a 10-foot median, 2:1 outside slopes with guardrail along the northbound roadway have been proposed to reduce the roadway footprint. Construction operations will also be limited to the limit of disturbance to further reduce direct impacts. This combination of minimization measures reduces the direct wetland impacts without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetland 13 is located along Porter Creek on both sides of existing US 113, north of Newark Road. Direct impacts to this wetland could not be avoided with the 2S - 20' Median Alternative because of the need for a northbound passing lane in this area. Shifting the dualization to the west could reduce the direct wetland impact, but would require approximately 3,000 feet of additional roadway construction and direct impact the W-13A. Reduced median width is not feasible at W-13 due to proximity to the Newark Road/Gunning Club Lane intersection. To minimize the proposed direct impacts to W-13, 2:1 outside slopes with guardrail have been proposed to reduce the roadway footprint. This combination of minimization measures reduces the direct wetland impacts without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetland 14 is located to the east of existing US 113, between Newark and Goody Hill Roads. This wetland is not affected by any of the southern study area alternatives.

Wetlands 15 and 17 are located to the west of existing US 113, with **Wetland 16** located on both sides of US 113 along Goody Hill Branch, near Goody Hill Road. Direct impacts to these wetlands could not be completely avoided with the 2S - 20' Median Alternative because of need for a southbound passing lane in this area. Shifting the dualization to the east would avoid W-15 (a wetland of special state concern) and W-17, and directly impact approximately the same acreage from W-16, but the shift would require approximately 2,000 feet of roadway construction and directly impact a farmed wetland and increase direct impacts to W-18. Reducing the median at wetlands W-15, W-16, and W-17 to 16-feet, will decrease direct impacts at each wetland, but will require the construction of 2,400' of frontage road for access to US 113. Further reduction of the median width is not possible due to the presence of a curve on US 113. Direct impacts to each wetland are further minimized through the use of 2:1 outside slopes with guardrail to reduce the southbound roadway footprint and by limiting construction operations to the limit of disturbance. This combination of minimization measures reduces the direct wetland impacts without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetland 18 is located along Catbird Creek on both sides of existing US 113, south of Bays End Lane. Shifting the construction of the southern study area alternatives to the east would increase the direct impacts to W-18. Proximity to Bays End Lane requires the use the full median width. Direct impacts to W-18 have been minimized through the use of 2:1 outside slopes with guardrail to reduce the southbound roadway footprint and by limiting construction operations to the limit of disturbance. This combination of minimization measures reduces the direct wetland impacts without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetlands 19 and 20 are located to the east of existing US 113, between Bays End Lane and Mason Road. These wetlands are not affected by any of the southern study area alternatives.

Wetland 21 is located along Poplartown Branch to the east of existing US 113, south of Harrison Road, and is not directly impacted by any of the southern study area alternatives.

Wetland 22 is located along Poplartown Branch to the west side existing US 113, south of Harrison Road. Shifting the construction of any of the southern study area alternatives to the east would directly impact the W-21 and require approximately 2,500 feet of additional roadway construction. Reduced

median width is not feasible due to proximity to Harrison Road. Direct impacts to W-22 have been minimized through the use of 2:1 outside slopes with guardrail to reduce the southbound roadway footprint. Direct impacts are further minimized by limiting construction operations to the limit of disturbance. This combination of minimization measures reduces the direct wetland impacts without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

- **Northern Study Area Alternatives Presented in the Draft EIS** (see Draft EIS, Appendix A, Figures 15 through 17)
  - Alt. 3N - 20' Median/50 MPH Design Speed
  - Alt. 3N - 20' Median/60 MPH Design Speed
  - Alt. 3N - 34' Median/50 MPH Design Speed
  - Alt. 3N - 34' Median/60 MPH Design Speed
  - Alt. 4N Modified - 20' Median
  - Alt. 4N Modified - 34' Median
  - Alt. 3N/4N Modified - 20' Median
  - Alt. 3N/4N Modified - 34' Median

Wetland 23 is located to the west of existing US 113, north of Deer Park Road. Direct impacts to this wetland by the 3N Alternatives could not be avoided without causing increased direct impacts to W-24 and W-25 and additional residential displacements. The 4N Modified and 3N/4N Modified Alternatives can not avoid this wetland because of the proximity of the Maryland and Delaware Railroad and the existing US 113 tie-in/take-off points. Direct impacts are minimized by using 2:1 outside slopes with guardrail to reduce the roadway footprint and by limiting construction operations to the limits of disturbance. This combination of minimization measures reduces the direct wetland impacts without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetlands 24 and 25 are located to the east of existing US 113 of the Three Penny Lane intersection and are not directly impacted by the 3N/4N Modified Alternatives. Shifting the 3N alternatives to the west would reduce direct impacts to W-24 and W-25 but, increase direct impacts to W-23, increase the number of residential displacements, and require approximately 1,000 feet of additional roadway construction.

Wetland 26 is located to the west of existing US 113, north of Deer Park Road. The 3N Alternatives will not directly impact this wetland. The 4N Modified and 3N/4N Modified Alternatives can not avoid this wetland because of the proximity of the Maryland and Delaware Railroad, the existing US 113 tie-in/take-off points and the graded US 113/MD 90 interchange. Direct impacts to W-26 have been minimized using 2:1 outside slopes with guardrail to reduce the roadway footprint and by limiting construction operations to the limits of disturbance. This combination of minimization measures reduces the direct wetland impacts without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetland 27 is located 2,400 feet to the west of existing US 113 between Carey Road and MD 90. The 3N Alternatives will not directly impact this wetland. This wetland could not be avoided by the 4N Modified and 3N/4N Modified Alternatives because of its size and being located so close to the

existing graded MD 90 Interchange. Reducing the median width is not possible because of the proximity of the interchange ramp movements (left turns). The use of 2:1 outside slopes with guardrail to reduce the roadway footprint and limiting construction operations to the limits of disturbance will minimize direct wetland impacts. This combination of minimization measures reduces the direct wetland impacts without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetlands 28 is in the stream valley of Church Branch and located on both sides of existing US 113, north of Racetrack Road. This wetland could not be avoided by any of the northern study area alternatives because of its length. The median could not be reduced due to the close proximity to the Racetrack Road intersection. Direct impacts to W-28 have been minimized through the use of 2:1 outside slopes with guardrail to reduce the roadway footprint and by limiting construction operations to the limits of disturbance. This combination of minimization measures reduces the direct wetland impacts without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetland 29 is located 500 feet east of existing US 113, north of Church Branch. The 3N Alternatives will not directly impact this wetland. The median width of the 4N Modified and 3N/4N Modified Alternatives could not be reduced due to the proximity of the "old" US 113 intersection. The use of 2:1 outside slopes with guardrail to reduce the roadway footprint and the limiting of construction operations to the limits of disturbance will minimize direct wetland impacts. This combination of minimization measures reduces the direct wetland impacts without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetland 30 is in the stream valley of Middle Branch and located on both sides of existing US 113, north of Racetrack Road. This wetland could not be avoided by any of the northern study area alternatives because of its length. For the 3N Alternatives, the median could not be reduced due to the close proximity to the Pitts Road intersection. Direct impacts by the 4N Modified and 3N/4N Modified Alternatives have been minimized through the use of a 10-foot wide median, 2:1 outside slopes with guardrail to reduce the roadway footprint and by limiting construction operations to the limits of disturbance. This combination of minimization measures reduces the direct wetland impacts without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetland 31 is in the stream valley of Birch Branch and located on both sides of existing US 113, north of Shingle Landing Road. This wetland could not be avoided by any of the northern study area alternatives because of its length. For the 3N Alternatives, the median could not be reduced due to the close proximity to the Pitts Road intersection. Direct impacts by the 4N Modified and 3N/4N Modified Alternatives have been minimized through the use of a 16-foot median and 2:1 outside slopes with guardrail to reduce northbound roadway footprint and by limiting construction operations to the limit of disturbance. Further reduction of the median is not feasible because of the close proximity of intersections and curves. This combination of minimization measures reduces the direct wetland impacts without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetland 32 is located to the east of existing US 113, between Shingle Landing and Bishopville Roads. This wetland is not directly impacted by any of the northern study area alternatives.

Wetland 33 is located to the west of existing US 113, between Shingle Landing and Bishopville Roads. This wetland is not directly impacted by any of the northern study area alternatives.

Wetland 34 is located to the west of existing US 113, between Shingle Landing and Bishopville Roads. This wetland is not directly impacted by any of the northern study area alternatives.

Wetland 35 is located to the east of existing US 113, between Shingle Landing and Bishopville Roads. This wetland is not directly impacted by any of the northern study area alternatives.

Wetland 36 is located to the east of existing US 113, south of Bishopville Road. This wetland is directly impacted by all of the northern study area alternatives. Shifting the dualization to the west would directly impact the W-33 and require the taking of the C&P Telephone building along with approximately 600 feet of additional roadway construction. Reduced median width is not feasible at W-36 due to proximity of the US 113/Bishopville Road intersection. Proposed direct impacts are minimized with the use of 2:1 outside slopes with guardrail to reduce the northbound roadway footprint and through limiting construction operations to the limit of disturbance. This combination of minimization measures reduces the direct wetland impacts without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetland 37 is located to the west of existing US 113, between Bishopville and Whaleyville Roads. The wetland could not be avoided with any of the northern study area alternatives due to its size and proximity to US 113. Shifting the 3N and 3N/4N modified Alternatives to the east would cause two additional residential and two additional business displacements. Reduced median width is not feasible at W-37 due to the proximity of the Maryland and Delaware Railroad crossing, the MD 610 intersection, and sight distance problems. To minimize the proposed direct impacts, 2:1 outside slopes with guardrail have been used to reduce the roadway footprint. This combination of minimization measures reduces the direct wetland impacts without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetland 38 is located to the east of existing US 113, north of the Maryland and Delaware Railroad crossing. This wetland is not directly impacted by the 4N Modified Alternatives. This wetland is completely impacted by the 3N and 3N/4N Modified Alternatives and could not be avoided because of its proximity to US 113. Shifting the 3N or 3N/4N Modified alignments to the west or east would increase the direct impacts to W-37 or require seven additional residential and business displacements, along with additional roadway construction. Reducing the median width, using 2:1 outside slopes, and limiting construction operations do not avoid or minimize direct impacts at this wetland.

Wetland 39 is located 300 feet to the west of existing US 113, north of Whaleyville Road. This wetland is not directly impacted by the 3N and 3N/4N Modified Alternatives. The wetland could not be avoided with 4N Modified Alternatives due to its size and proximity to US 113. Reduced median width is not feasible at W-37 due to the proximity of the MD 610 intersection. To minimize the proposed direct impacts, 2:1 outside slopes with guardrail have been used to reduce the roadway

footprint. This combination of minimization measures reduces the direct wetland impacts without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetland 40 is located along Carey Branch on both sides of existing US 113 and south of Morris Road. This wetland could not be avoided by any of the northern study area alternatives due to its proximity to the existing US 113 tie-in/take-off points. Shifting the alignment to the east would increase the direct impacts to W-40, along with additional residential/business displacements and roadway construction. This shift would also directly impact the Transpeninsular Line Marker historical property. Tie-in with the existing dualized alignment in Delaware requires the use of the full median width. To minimize the proposed direct impacts, 2:1 outside slopes with guardrail have been used to reduce the southbound roadway footprint and construction operations are limited to the limits of disturbance. This combination of minimization measures reduces the direct wetland impacts without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

During the preparation of this Final EIS, additional modifications have been made to the alternative alignments, further reducing wetland and other environmental impacts. These modifications have resulted in the preferred alternatives for the southern and northern study areas.

◆ **Southern Preferred Alternatives** (see Figures 1 through 7 in Appendix A)

Wetland 1 is located on both sides of existing US 113, north of Castle Hill Road; shifting the dualization to the east would reduce the direct wetland impact to W-1, but would require approximately 1,500 feet of additional road reconstruction. Reduced median width is not feasible due to the proximity of the US 113/Castle Hill Road intersection. To minimize the proposed direct impacts, 2:1 outside slopes with guardrail have been used to reduce the southbound roadway footprint. This combination of minimization measures reduces the direct wetland impacts to the extent possible without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetland 2 is located on both sides of existing US 113, south of Snow Hill Road; shifting the dualization to the east would cause additional direct impacts to W-2. To minimize the proposed direct impacts, a 10-foot median and 2:1 outside slopes with guardrail have been used to reduce the southbound roadway footprint. Construction operations will also be limited to the limit of disturbance. This combination of minimization measures reduces the direct wetland impacts to the extent possible without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetland 3 is located on both sides of existing US 113, just south of Snow Hill Road; shifting the dualization to the east would directly impact approximately the same acreage of wetland of W-3 and increase the direct impact to W-2. Proximity to Snow Hill Road requires the use of a 34-foot median. Proposed direct impacts have been minimized through the use of 2:1 outside slopes with guardrail to reduce the southbound roadway footprint and the limiting of construction operations to the limit of disturbance. This combination of minimization measures reduces the direct wetland impacts to the extent possible without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetland 4 is located to the east of US 113, south of Brick Kiln Road, and is not directly impacted by the **Preferred Alternative.**

Wetland 5 is located to the west of US 113, north of Washington Street; shifting the dualization to the east would require approximately 2,000 feet of additional road reconstruction and cause a direct impact to a farmed wetland and also the higher functioning W-7. Proximity to Brick Kiln Road/Washington Street requires the use of a 34-foot median. To minimize proposed direct impacts, 2:1 outside slopes with guardrail have been used to reduce the roadway footprint. This combination of minimization measures reduces the direct wetland impacts to the extent possible without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetland 5A is located to the west of US 113, south of Public Landing Road. Shifting the dualization to the east would require approximately 2,400 feet of additional roadway construction and cause a direct impact to a farmed wetland and the higher functioning W-7. Proximity to Public Landing Road requires the use of a 34-foot median. To minimize the proposed direct impacts to Wetland 5A, 2:1 outside slopes with guardrail have been used to reduce the southbound roadway footprint. This combination of minimization measures reduces the direct wetland impacts to the extent possible without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetland 6 is located to the west of US 113, north of Public Landing Road. Shifting the alignment to the east would require approximately 2,000 feet of additional roadway construction and cause a direct impact to a farmed wetland and the W-7. Proximity to Public Landing Road requires the use of a 34-foot median. Direct impacts to Wetland 6 are minimized through the use of 2:1 outside slopes with guardrail to reduce the southbound roadway footprint and by limiting construction operations to the limit of disturbance. This combination of minimization measures reduces the direct wetland impacts to the extent possible without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetland 7 is located to the east of existing US 113, north of Public Landing Road. This wetland is not directly impacted by the **Preferred Alternatives.**

Wetland 8 is located along Purnell Branch on both sides of existing US 113, south of Market Street. Shifting the dualization to the east would result in greater direct impacts to the wetlands. Because of the high value of this cypress wetland, the resource was of critical concern and special minimization measures were developed. Because the wetland is located along a curve on US 113 and sight distance was a concern, a 16-foot median was employed to minimize direct impacts (10-foot median could not be used at this location due to site distance limitations). In addition, the use of 815 linear feet of epoxy coated sheet pile wall with guardrail on the west side of the southbound roadway will limit encroachment on this wetland. Another option included realigning the roadway to center the proposed dualization on the existing fill and placing sheet pile walls on both sides to reduce direct impacts by another 0.26 acres. This option however, would cost an additional $2.2 million, therefore making it not practicable. The preferred combination of minimization measures reduces the wetland direct impacts to the extent possible without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetland 9 is located along Poorhouse Branch on both sides of existing US 113, north of Cedartown Road. Shifting the dualization to the east would increase direct wetland impacts. Due to the close proximity of Cedertown Road, a 34-foot median must be used. The use of 2:1 outside slopes with guardrail and the limiting of construction operations to the limit of disturbance will minimize direct wetland impacts. This combination of minimization measures reduces the direct wetland impacts to the extent possible without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetland 10 is located along Five Mile Branch to the east of existing US 113, North of Central Site Lane. Shifting the dualization to the east would increase direct wetland impacts. Due to the close proximity of Central Site Lane and Five Mile Branch Road, a 34-foot median must be used. The use of 2:1 outside slopes with guardrail along the southbound roadway and the limiting of construction operations to the limit of disturbance will minimize direct wetland impacts. This combination of minimization measures reduces the direct wetland impacts to the extent possible without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetland 11 is located on both sides of existing US 113, south of Langmaid Road. Shifting the dualization to the west would not decrease direct wetland impacts and would cause a direct impact to the Newark Sewage Treatment Plant. A 34-foot median is required because of the close proximity to Langmaid Road. Direct impacts to Wetland 11 are minimized through the use of 2:1 outside slopes with guardrail along the northbound roadway and by limiting construction operations to the limit of disturbance. This combination of minimization measures reduces the direct wetland impacts to the extent possible without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetland 12 is located along Massey Branch on both sides of existing US 113, between Langmaid and Newark Roads. This wetland could not be avoided because of its size and location along US 113. Shifting the dualization to the west would decrease the direct wetland impacts, but would require approximately 3,500 feet of additional roadway construction. To minimize the proposed direct impacts, a 10-foot median, 2:1 outside slopes with guardrail along the northbound roadway have been proposed to reduce the roadway footprint. Construction operations will also be limited to the limit of disturbance to further reduce direct impacts. This combination of minimization measures reduces the direct wetland impacts to the extent possible without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetland 13 is located along Porter Creek on both sides of existing US 113, north of Newark Road. Shifting the dualization to the west could reduce the direct wetland impact, but would require approximately 3,000 feet of additional roadway construction and directly impact the W-13A. Reduced median width is not feasible at W-13 due to proximity to the Newark Road/Gunning Club Lane intersection. To minimize the proposed direct impacts to W-13, 2:1 outside slopes with guardrail have been proposed to reduce the roadway footprint. This combination of minimization measures reduces the direct wetland impacts to the extent possible without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetlands 13A and 14 are located to the west and east respectively of existing US 113, between Newark and Goody Hill Roads. These wetlands are not affected by the **Preferred Alternatives**.

Wetlands 15 and 17 are located to the west, with **Wetland 16** located along Goody Hill Branch, near Goody Hill Road. Shifting the alignment to the east would avoid W-15 (a wetland of special state concern) and W-17, and directly impact approximately the same acreage from W-16, but the shift would require approximately 2,000 feet of roadway construction and directly impact a farmed wetland and increase direct impacts to W-18. The **Preferred Alternatives** will reduce the median at wetlands W-15, W-16, and W-17 from 34-feet to 16-feet, thereby decreasing direct impacts at each wetland, but will require the construction of 2,400' of frontage road for access to US 113. Further reduction of the median width is not possible due to the presence of a curve on US 113. Direct impacts to each wetland are further minimized through the use of 2:1 outside slopes with guardrail to reduce the southbound roadway footprint and by limiting construction operations to the limit of disturbance. This combination of minimization measures reduces the direct wetland impacts to the extent possible without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetland 18 is located along Catbird Creek on both sides of existing US 113, south of Bays End Lane. This wetland could not be avoided. Shifting the dualization would increase the direct impacts to W-18. Proximity to Bays End Lane requires the use a 34-foot median. Direct impacts to W-18 have been minimized through the use of 2:1 outside slopes with guardrail to reduce the southbound roadway footprint and by limiting construction operations to the limit of disturbance. This combination of minimization measures reduces the direct wetland impacts to the extent possible without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetlands 19 and 20 are located to the east of existing US 113, between Bays End Lane and Mason Road. These wetlands are not affected by the dualization.

Wetland 21 is located along Poplartown Branch to the east of existing US 113, south of Harrison Road, and is not directly impacted by the dualization.

Wetland 22 is located along Poplartown Branch to the west side existing US 113, south of Harrison Road. Shifting the dualization to the east would directly impact the W-21 and require approximately 2,500 feet of additional roadway construction. Reduced median width is not feasible due to proximity to Harrison Road. Direct impacts to W-22 have been minimized through the use of 2:1 outside slopes with guardrail to reduce the southbound roadway footprint. Direct impacts are further minimized by limiting construction operations to the limit of disturbance. This combination of minimization measures reduces the direct wetland impacts to the extent possible without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

◆ **Northern Preferred Alternative** (see Figures 8, 9 and 10 in Appendix A)

Wetlands 23 and 26, are located to the west of existing US 113, north of Deer Park Road. The **Preferred Alternatives** will realign the northbound-roadway, reducing the existing 110-foot median along the currently dual portion of US 113 to the proposed 34' wide median prior to Wetland W-23 (in order to minimize impacts at this wetland, approximately 1,800 LF of the existing northbound US

113 roadway would be removed). Additionally, the spur intersection with Three Penney Lane will be shifted south. Further reductions in median width are not feasible due to the close proximity of intersections. Direct impacts to W-23 and W-26 have been minimized using the alignment changes along with 2:1 outside slopes with guardrail to reduce the roadway footprint and by limiting construction operations to the limits of disturbance. This combination of minimization measures reduces the direct wetland impacts to the extent possible without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetlands 24 and 25 are located to the east of existing US 113 of the Three Penny Lane intersection and are not directly impacted by the **Preferred Alternatives.**

Wetland 27 is located 2,400 feet to the west of existing US 113 between Carey Road and MD 90. This wetland could not be avoided because of its size and being located so close to the existing graded MD 90 Interchange. Reducing the median width is not possible because of the proximity of the interchange ramp movements (left turns). The use of 2:1 outside slopes with guardrail to reduce the roadway footprint and limiting construction operations to the limits of disturbance will minimize direct wetland impacts. This combination of minimization measures reduces the direct wetland impacts to the extent possible without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetlands 28 is in the stream valley of Church Branch and located on both sides of existing US 113, north of Racetrack Road. This wetland could not be avoided because of its length. Additionally, the median could not be reduced below 34-feet due to the location on a 4-degree curve and its close proximity to the Racetrack Road and old US 113 intersections. The **Preferred Alternatives** shifts the proposed alignment to the west, to the area of the existing US 113 crossing, thus reducing direct impacts. Direct impacts to W-28 have been minimized through the use of 2:1 outside slopes with guardrail to reduce the roadway footprint and by limiting construction operations to the limits of disturbance. This combination of minimization measures reduces the direct wetland impacts to the extent possible without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetland 29 is located 500 feet east of existing US 113, north of Church Branch. The Preferred Alternative will shift the alignment to the west decreasing the direct impact to W-29. The median width could not be reduced due to the proximity of the "old" US 113 intersection. The use of 2:1 outside slopes with guardrail to reduce the roadway footprint and the limiting of construction operations to the limits of disturbance will minimize direct wetland impacts. This combination of minimization measures reduces the direct wetland impacts to the extent possible without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetland 30 is in the stream valley of Middle Branch and located on both sides of existing US 113, north of Racetrack Road. These wetlands could not be avoided by shifting the dualization or realigning the alignment. Direct impacts to W-30 have been minimized through the use of a 10-foot wide median, 2:1 outside slopes with guardrail to reduce the roadway footprint and by limiting construction

operations to the limits of disturbance. This combination of minimization measures reduces the direct wetland impacts to the extent possible without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetland 31 is in the stream valley of Birch Branch and located on both sides of existing US 113, north of Shingle Landing Road. These direct wetlands impacts could not be avoided but were reduced by shifting the alignment to use the existing US 113 crossing. Direct impacts to W-31 have been minimized through the use of a 16-foot median and 2:1 outside slopes with guardrail to reduce northbound roadway footprint and by limiting construction operations to the limit of disturbance. Further reduction of the median is not feasible because of the close proximity of intersections and curves. This combination of minimization measures reduces the direct wetland impacts to the extent possible without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetlands 32 and 35 are located to the east, with **Wetlands 33 and 34,** located to the west of existing US 113, between Shingle Landing and Bishopville Roads. These wetlands are not directly impacted by the **Preferred Alternatives.**

Wetland 36 is located to the east of existing US 113, south of Bishopville Road. Shifting the dualization to the west would directly impact the W-33 and require the taking of the C&P Telephone building along with approximately 600 feet of additional roadway construction. Reduced median width is not feasible at W-36 due to proximity of the US 113/Bishopville Road intersection. Proposed direct impacts are minimized with the use of 2:1 outside slopes with guardrail to reduce the northbound roadway footprint and through limiting construction operations to the limit of disturbance. This combination of minimization measures reduces the direct wetland impacts to the extent possible without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetland 37 is located to the west of existing US 113, between Bishopville and Whaleyville Roads. The wetland could not be avoided due to its size and proximity to US 113. Shifting the roadway to the east would cause two additional residential and two additional business displacements. Reduced median width is not feasible at W-37 due to proximity to the Maryland and Delaware Railroad crossing and sight distance problems. To minimize the proposed direct impacts, 2:1 outside slopes with guardrail have been used to reduce the roadway footprint. This combination of minimization measures reduces the direct wetland impacts to the extent possible without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

Wetland 38 is located to the east of existing US 113, north of the Maryland and Delaware Railroad crossing. This wetland is completely impacted by the **Preferred Alternatives** and could not be avoided because of its proximity to US 113. Shifting the alignment to the west or east would increase the direct impacts to W-37 or require seven additional residential and business displacements, along with additional roadway construction. Reducing the median width, using 2:1 outside slopes, and limiting construction operations do not avoid or minimize direct impacts at this wetland.

Wetland 39 is located 300 feet to the west of existing US 113, north of Whaleyville Road and is not directly impacted by the dualization.

Wetland 40 is located along Carey Branch on both sides of existing US 113 and south of Morris Road. This wetland could not be avoided. Shifting the alignment to the east would increase the direct impacts to W-40, along with additional residential/business displacements and roadway construction. This shift would also directly impact the Transpeninsular Line Marker historical property. Tie-in with the existing dualized alignment in Delaware requires the use of a 34-foot median. To minimize the proposed direct impacts, 2:1 outside slopes with guardrail have been used to reduce the southbound roadway footprint and construction operations are limited to the limits of disturbance. This combination of minimization measures reduces the direct wetland impacts to the extent possible without compromising the safety and integrity of the roadway or increasing direct impacts to other resources.

- **Only Practicable Alternative Finding**

Because of the distribution and extent of the wetlands and the linear nature of this project, there is no practicable alternative to completely avoid construction in wetlands and still satisfy the project purpose and need and avoiding other substantial adverse environmental consequences. Based on the information available as presented in this section and in Section II of this Final EIS, all practicable measures to minimize harm to wetlands have been incorporated into the **Preferred Alternatives** according to the requirements of the Section 404(b)(1) guidelines and Executive Order 11990.

As greater detail becomes available during the final design, the feasibility of further wetland avoidance and minimization measures will be evaluated including the use of innovative engineering technologies such as the use of geotextiles and geogrid materials to reduce fill slope requirements. Additional concerns regarding dewatering for the construction of culverts and bridges and the hydraulic impacts of new roadside ditches on existing wetlands will be evaluated during final design as additional detailed hydrologic and hydraulic data becomes available. Priority will be given to maintaining the existing acreage and functions of wetlands within the corridor. Where unavoidable impacts remain, mitigation measures will be employed.

230.10(a)(3) Water Dependency - This project is proposed to improve traffic safety in the US 113 corridor. The project is not water dependent because the highway does not need to be located within an aquatic site to fulfill the project purpose of improved safety. As demonstrated in the alternatives analysis and avoidance alternatives however, complete avoidance of special aquatic sites is not possible.

230.10(a)(4) NEPA Compliance - This Final EIS serves as the required environmental documentation in compliance with NEPA requirements. This document contains a range of alternatives for the evaluation of environmental impacts in compliance with NEPA and the Section 404(b)(1) guidelines.

30.10(a)(5) Coastal Zone Management Program Consistency - The range of alternatives evaluated in this Final EIS are consistent with the requirements of the Coastal Zone Management Program. Continued consistency with this program will be maintained through ongoing coordination with and review by the National Marine Fisheries Service and Maryland Department of the Environment.

230.10(b)(1) Water Quality Standards - The Maryland Department of the Environment will be reviewing the proposed discharges for compliance with the state's water quality standards. It is anticipated that the required Section 401 Water Quality Certifications and National Pollutant Discharge Elimination System (NPDES) permits will be issued for this project. These certifications and permits will contain special conditions to help ensure that the discharges will not violate the state's water quality standards.

230.10(b)(2) Toxic Pollutants - The proposed project will not violate any applicable toxic effluent standard or prohibition under Section 307 of the Clean Water Act. If the proposed discharges disturbs any hazardous materials identified during Phase I Hazardous Waste Investigations and any subsequent studies, they will be appropriately contained and/or disposed of in accordance with Maryland Department of the Environment regulations.

230.10(b)(3) Endangered Species - The proposed discharges will not impact any species listed as threatened or endangered under the Endangered Species Act. The proposed discharge will not jeopardize the continued existence or destroy or adversely modify critical habitat of federally listed species.

The state rare seaside alder (*Alnus maritina)* and the blackbanded sunfish (*Enneaconthus chactadon)*, a "species in need of conservation" have been identified in the project corridor. Mitigation for potential impacts to these species is discussed in Section IV.J.3 of this Final EIS.

230.10(b)(4) Marine Sanctuaries - The proposed discharges will not violate any requirement imposed to protect any marine sanctuary designated under Title III of the Marine Protection, Research, and Sanctuaries Act of 1972.

230.10(c) Findings of Significant Degradation - As discussed in Sections IV.F, IV.G and IV.I of this Final EIS, the proposed discharges of fill material are not expected to substantially contribute to the degradation of Waters of the United States.

230.10(d) Minimization of Potential Adverse Impacts - The proposed discharges and other associated work incorporate appropriate and practicable steps to minimize potential adverse impacts to the aquatic ecosystem. These steps include impact minimization, application of best management practices (BMP's), and compensatory mitigation for unavoidable wetland losses.

230.11 Factual determinations - The potential short-term and long-term effects of the proposed discharge on the physical, chemical and biological components of the aquatic environment must be determined in light of the considerations of Subparts C through F of the Section 404(b)(1) guidelines. These factual determinations are used by the US Army Corps of Engineers to make a finding of compliance or non-compliance with the restrictions on discharge (Section 230.10).

230.11(a) Physical Substrate Determinations - The substrate at the proposed discharge sites is composed of various mixtures of sands, silts and clays with rock, stones and pebbles intermixed in varying amounts within the substrate. The discharges will be composed of clean borrow, excavated material from the surrounding area, or clean stone which will be placed as controlled fill within Waters of the United States over, or in place of, existing substrate. The placement of the discharge will elevate the bottom contours creating a controlled, compacted, dry surface suited for the highway grade or temporary construction access. Once the permanent discharge is placed and stabilized, no movement of the fill is anticipated.

230.11(b) Water Circulation, Fluctuation and Salinity Determinations - The proposed discharges of fill material are located in nontidal areas and will not involve any tidal exchange. The discharges will consist of natural material found within the area or clean stone and should not alter the existing water chemistry, salinity, clarity, color, odor, taste, dissolved gas levels, temperature, nutrients, or cause eutrophication. The discharges may in some cases have effects on the flow patterns within those wetlands located immediately down gradient. With this exception, the discharges will not substantially change the current patterns, circulation and normal water fluctuation.

230.11(c) Suspended Particulate/Turbidity Determinations - The proposed discharges may cause an initial increase in water turbidity down gradient from the fill site. This will be controlled through the use of sediment and erosion control structures and devices. The discharges of clean stone may also increase water turbidity by disturbing bottom sediments and can be mitigated for by instream work restrictions (e.g., low flow periods). Both of these impacts will be temporary in nature. Possible time of year discharge restrictions (where applicable) and the use of BMPs will mitigate adverse effects.

230.11(d) Contaminant Determinations - The discharges will involve natural materials and clean stone and will not require bioassay or bioaccumulation testing. The stone will be sized to avoid dislocation or movement by current and heavy flows. Earthen discharges will be controlled through BMPs and other measures to minimize the potential for contaminant releases outside of the discharge areas.

230.11(e) Aquatic Ecosystem and Organism Determinations - Aquatic organisms will be displaced or eliminated from the discharge areas by the placement of the fill material. Minor, temporary effects on aquatic organisms may result from suspended particulates during the discharges. The confined discharges will elevate bottom contours and create dry substrate that will not be recolonized by aquatic organisms. Temporary discharges will be removed and the areas will be returned to pre-discharge contours and conditions. The loss of aquatic habitat resulting from the permanent discharges will be compensated for by compensatory wetland mitigation and the establishment of natural bottoms in culverts. The removal of existing blockages to movements of aquatic species will be investigated at the existing crossings.

230.11(f) Proposed Disposal Site Determinations - The placement of fill in special aquatic sites where the movement of water could cause the mixing of suspended particulate matter and water will be limited to the smallest practicable zone through the use of appropriate control measures and will be further inhibited by the use of clean stone to reduce the erosion of fill material.

230.11(g and h) Determination of Cumulative and Secondary Effects on the Aquatic Ecosystem - Cumulatively, the proposed discharges should not result in a major impairment of the water resources or interfere with the productivity and water quality of the aquatic ecosystem outside of the discharge areas. Secondary effects will occur on Waters of the United States immediately down gradient of the proposed discharges, but are not expected to result in a major impairment of the water resources or interfere with the productivity and water quality of the aquatic ecosystem outside of the discharge areas. As discussed in Section IV.Q.4 of this Final EIS, additional cumulative impacts to aquatic resources may be expected due to development and economic growth occurring within the highway corridor.

Subpart C: Potential Impacts on Physical and Chemical Characteristics of the Aquatic Ecosystem

Subpart C addresses the potential for impacts to the physical and chemical characteristics of the impacted wetlands. The separate portions of Subpart C have each been addressed in other sections of this document and are detailed below.

230.20 Substrate - The placement of fill material will alter substrate elevation or contours may cause changes in the water circulation, depth, current pattern, water fluctuation and water temperature. Additionally, benthic organisms may be adversely impacted by smothering immobile forms or forcing mobile forms to migrate.

230.21 Suspended Particulates/Turbidity - The placement of fill material may increase the levels of suspended particulates, which may reduce light penetration and lower the rate of photosynthesis and primary productivity of an aquatic area. In addition, the biological and chemical contents of the suspended material may become biologically available to organisms or result in oxygen depletion.

230.22 Water - The placement of fill material, which may change the chemistry and physical characteristics, may alter clarity, color, odor and taste; thereby affecting the water bodies' stability for aquatic organisms, human consumption, recreation and aesthetics. Clean borrow, excavated material from the surrounding area and clean stone will be used and are not expected to change the chemical and physical characteristics of the water.

230.23 Current Patterns and Water Circulation - The placement of fill material may change the dimensions of a water body, resulting in alteration of suspended particle deposition; shoreline and substrate erosion; location, structure and dynamics of aquatic communities; rate and extent of water column components' mixing; and water stratification. Changes to current patterns and water circulation are expected to be minimal outside of the discharge zones.

230.24 Normal Water Fluctuations - The placement of fill will permanently de-water the areas within the discharge zone. The discharge's effect on the hydrologic regimes will be mitigated so that there will be no effect on the flow patterns within those water bodies located immediately down gradient of the discharge. Therefore, the discharge would not substantially change hydologic regimes or normal water fluctuation within or between other water bodies. Normal water fluctuations are expected to remain outside of the fill areas.

Subpart D: Potential Impacts on the Biological Characteristics of the Aquatic Ecosystem

Subpart D addresses the potential for impacts to the biological characteristics of the impacted wetlands. The separate portions of subpart D have each been addressed below.

230.30 Threatened and Endangered Species - As discussed in Section IV.J.3 of this Final EIS, there are no federally listed threatened or endangered species known to occur in the project area. Mitigation for potential impacts to state listed species is discussed in Section IV.J.3 of this Final EIS.

230.31 Fish, Crustaceans, Mollusks and Other Aquatic Organisms in the Food Web - The placement of fill material could release contaminants or suspended particles resulting in an adverse effect on the balance of populations of adults, juveniles, larvae or eggs, which may modify the overall productivity and nutrient export capability of the ecosystem. The use of clean borrow, natural excavated material from the surrounding area, and clean stone is expected to minimize this impact.

230.32 Other Wildlife - The placement of fill material can change water levels, water flow and circulation, salinity, chemical content and substrate characteristics and elevation, which may result in the loss or change of breeding and nesting areas, escape cover, travel corridors, and preferred food sources for resident and transient species. Additionally, plant and animal species diversity may decrease, disrupting the normal functions of the ecosystems and reducing overall biological productivity. Permanent impacts to wetland resources will be offset by compensatory mitigation. Impacts to aquatic resources will be minimized by encouraging the deposition of natural sediments in culvert bottoms, thereby creating benthic habitat.

Subpart E: Potential impacts on Special Aquatic Sites

Subpart E addresses the potential for impacts to special aquatic sites within the rights-of-way of the alternatives. These sites comprise wetlands and riffle and pool complexes as detailed below. No other special aquatic sites are found in the project area.

230.41 Wetlands - The placement of fill material may damage or destroy habitat and adversely affect the biological productivity by smothering, dewatering, permanently flooding or altering substrate elevation or periodicity of water movement. Additionally, destruction or reduction in wetland vegetation, nutrient exchange, water quality, floodwater storage, buffering ability, and fish and wildlife habitat may occur. Permanent impacts to wetland resources will be offset by compensatory mitigation.

230.45 Riffle and Pool Complexes - The placement of fill material can eliminate riffle and pool areas by displacement, hydrologic modification of complexes may reduce aeration/filtration capabilities and stream habitat diversity, alter stream hydrology, destroy habitats, create anaerobic conditions, and increase floodwater velocities. Impacts to riffle and pool complexes will be minimized by encouraging the deposition of natural sediments in culvert bottoms, thereby creating benthic habitat.

Subpart F: Potential Effects on Human Use Characteristics

Subpart F addresses the potential for impacts to the human use characteristics of the impacted wetlands. The separate portions of Subpart F have each been addressed below.

230.50 Municipal and Private Water Supplies - The placement of fill or discharges can affect the quantity and quality of water supplies with respect to color, taste, odor, chemical content, and suspended particulate concentration which reduces the fitness of the water for consumption. Water supplies are not expected to be impacted by the proposed discharges.

230.51 Recreational and Commercial Fisheries - No commercial fisheries are found in the study area. The placement of fill material may cause chemical contamination, interfere with reproductive success, reduce populations and affect habitat for populations of consumable aquatic organisms. Recreational fisheries are not expected to be impacted outside of the discharge zones.

230.52 Water-Related Recreation - The disposal of fill material may adversely modify turbidity, suspended particulates, temperature, dissolved oxygen, dissolved materials, toxic materials, pathogenic organisms, quality of habitat and the aesthetic qualities of sight, taste, odor and color. Some of these modifications are expected to be short-term.

230.53 Aesthetics - The placement of fill material can affect the beauty of natural aquatic ecosystems by degrading water quality, creating distracting disposal sites, encouraging unplanned and incompatible human access and by destroying vital elements that contribute to the compositional harmony or unity, visual distinctiveness, or diversity of an area. When on new location, the project will create a visual intrusion and be a noise source which may decrease the monetary and/or intrinsic values of the aquatic resources.

230.54 Parks, National and Historic Monuments, National Seashores, Wilderness Areas, Research Sites and Similar Preserves - The placement of fill material into such areas may modify the aesthetic, educational, historical, recreational and/or scientific qualities, thereby reducing or eliminating their uses. None of these features are found within the project area, therefore, no impact will occur.

- Other Wetland Impacts

Construction activity in wetlands and waterways will adhere to the time of year restrictions specified as part of the Section 404 permit and Section 401 Water Quality Certification. Specific time of year restrictions will be developed by the Corps and MDE during the permitting process, in consultation with the National Marine Fisheries Service, U.S. Fish and Wildlife Service, and Maryland Department of Natural Resources.

In order to minimize impacts to existing wetlands, strict enforcement of the erosion and sediment control measures minimize construction-related impacts. These measures include:

- use of surface mattings.
- temporary and permanent seeding.
- use of channel linings and slope rock protection.
- use of energy dissipators.
- use of silt barrier fencing.
- use of turbidity curtains

The increase of impervious surface area associated with the highway construction will produce higher peak runoff discharges and velocities. Many wetland species have specific water depth requirements, and the potential for exceedance of those requirements is great. The biotic potential of some wetland species may be jeopardized by increased peak discharges and velocities.

Increased velocities may also lead to erosion and sediment transport and the eventual formation of significant channels and/or aggradation which could limit the areas of inundation, thus shrinking wetland areas. Discharges and velocities will need to be controlled through the use of detention facilities that simulate pre-development conditions. This can be achieved through the use of detention basins and flow regulators. These water quantity measures will protect wetland areas from post development impacts. Best management practices will be used to ensure water quality.

All borrow material will be obtained from clean upland sites. All areas of exposed soil will be vegetatively or structurally stabilized as soon as practical. An SHA approved stormwater management

plan will also be required for this project. The stormwater management plan will include both quantity and quality management for stormwater runoff prior to discharge into receiving waters.

Stormwater management facilities can cause several negative environmental impacts including: increasing downstream water temperatures, reducing downstream dissolved oxygen level during dry weather discharge, sacrifice of upstream channels, provide a barrier to the downstream movement of bedload, provide a barrier to fish movement, and the disturbance of wetlands (Schuler and Galli, 1991). These negative impacts will be minimized by the careful placement of these facilities outside stream channels and wetlands.

Stormwater management facilities have the potential to alter base flow within streams particularly if stormdrains divert water from natural discharge areas. Stormwater management facilities for this project are not expected to affect stream baseflow for the following reasons: 1) runoff from the road will be normally conveyed to SWM facilities by open, grassed swales, which will allow for infiltration of runoff and recharge of groundwater, 2) SWM facilities will be sited to collect runoff within natural drainage areas and will outfall to natural discharge streams, and 3) the purpose of SWM facilities is to reduce the impact on baseflow by reducing peak runoff and encouraging infiltration. Final design of stormwater management facilities will be planned to minimize hydrological alterations to receiving streams.

Mitigation

Mitigation planning for unavoidable wetland impacts has followed the sequencing guidelines of the Maryland Compensatory Mitigation Guidance (1994). The sequencing guidelines specify that after avoidance and minimization alternatives have been examined, the characteristics of the impacted wetlands (functions and values) must be considered to determine the goals of the mitigation plan. The site selection process was initiated with a search for areas that are suitable for "in-kind" replacement of wetlands, adjacent to proposed impact areas or within the same sub-watershed in which the impacts occur.

Initially, 25 sites were identified for review by the resource agencies based on location within the watershed, amount of excavation required, adjacent land use, connection to existing habitats, and opportunity to replace functions and values of the impacted wetlands. Of these 25 sites, 19 were considered candidate mitigation sites by the resources agencies and were recommended for additional site evaluations (see meeting minutes in Chapter VI). Landowners of the 19 sites were then contacted to determine their interest in participating in the wetland mitigation plan, which resulted in the identification of 8 sites as potential wetland mitigation sites for the **Preferred Alternatives.** These 8 sites provide sufficient area within each subwatershed to mitigate for wetlands impacted by the **Preferred Alternatives** as shown in Table IV-12A. The location of each wetland mitigation site is shown in Figures IV-2A through -2D.

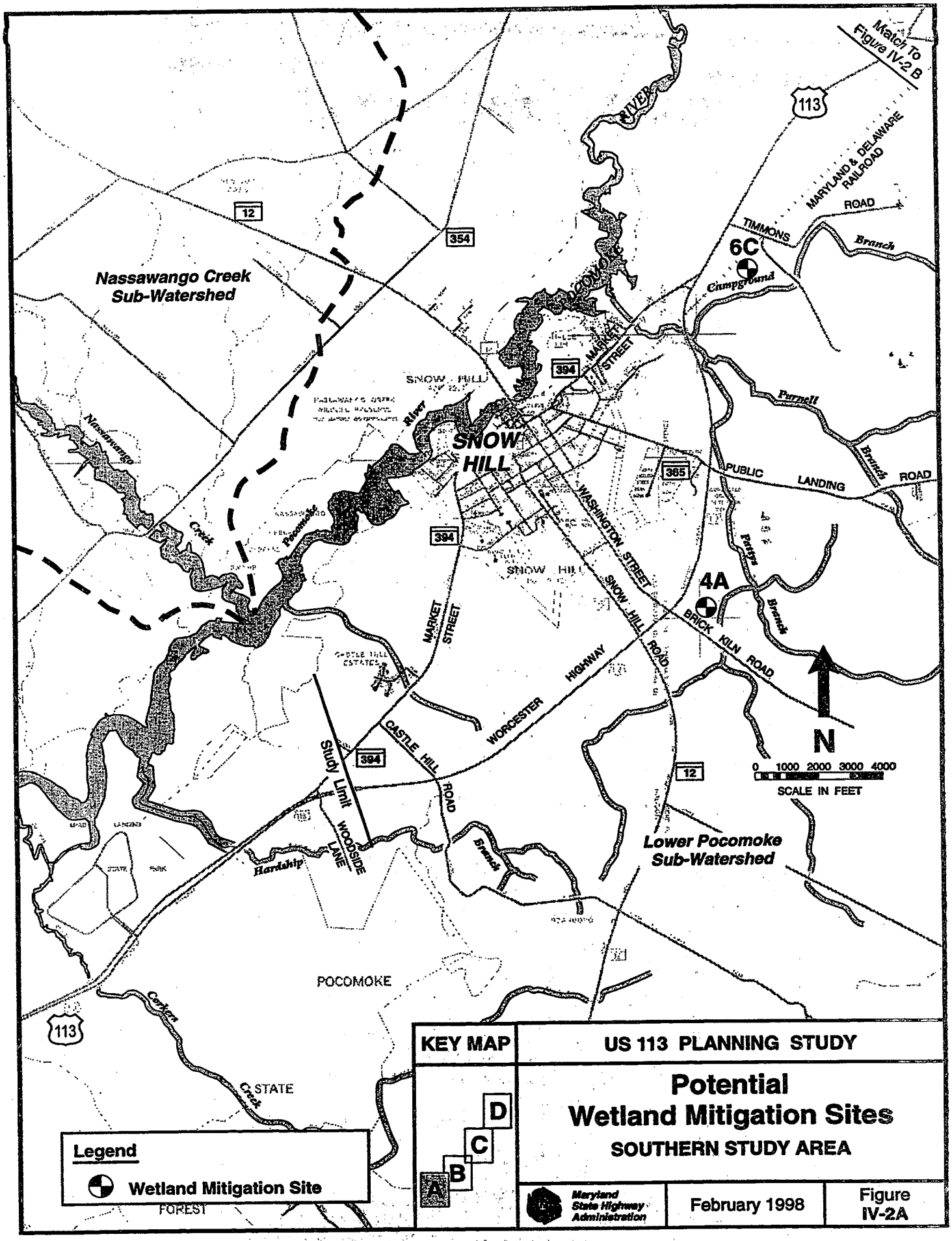
Table IV-12A: Wetland Impacts by the Preferred Alternatives and Available Mitigation Area by Watershed (acres)

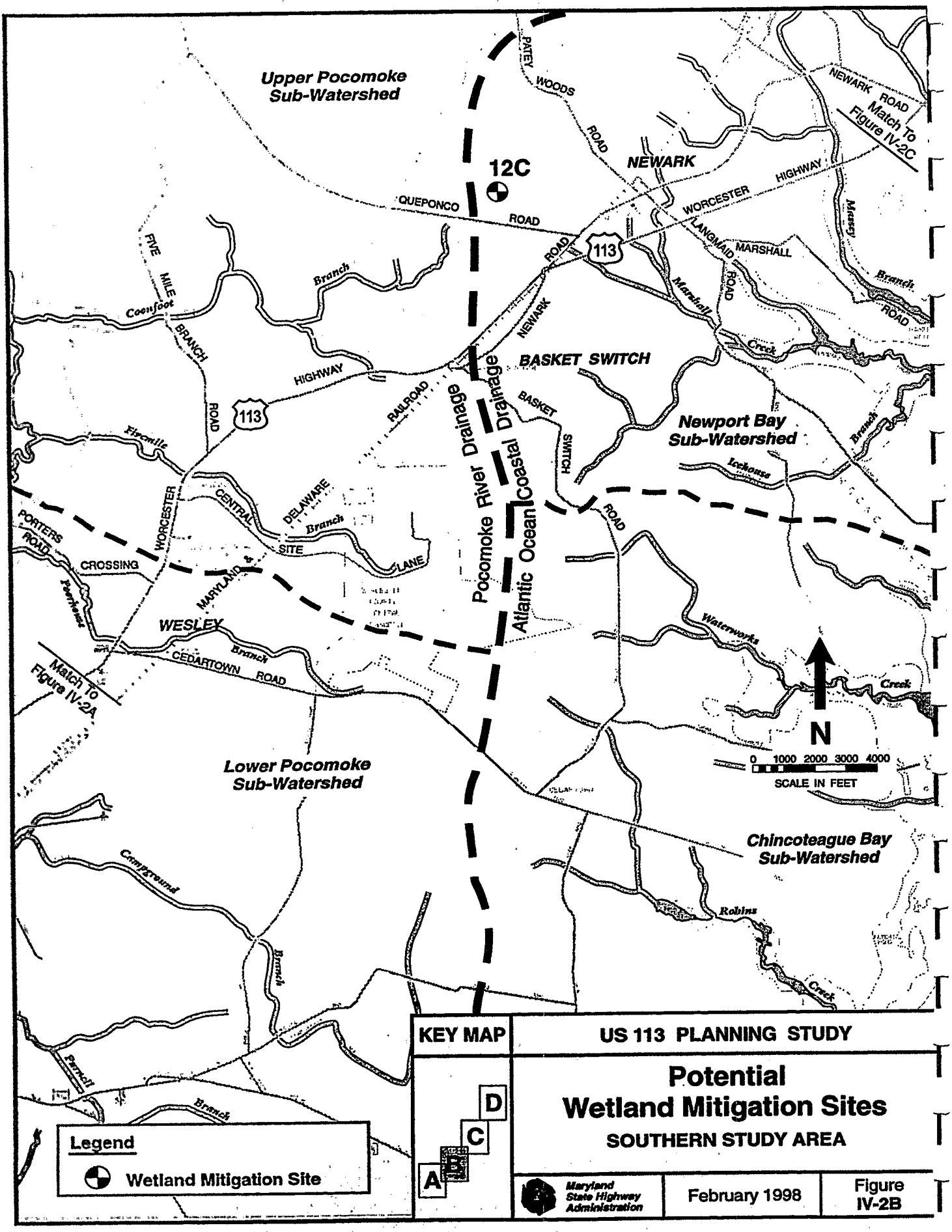
Watershed	Forested*	Emergent	Total Impacts	Available Mitigation Area
Lower Pocomoke	1.7	0.1	1.8	5
Upper Pocomoke	0	0	0	80
Newport Bay	3.2	0	3.2	12
Isle of Wight Bay	5.6	1.0	6.6	30
Totals	10.5	1.1	11.6	125±

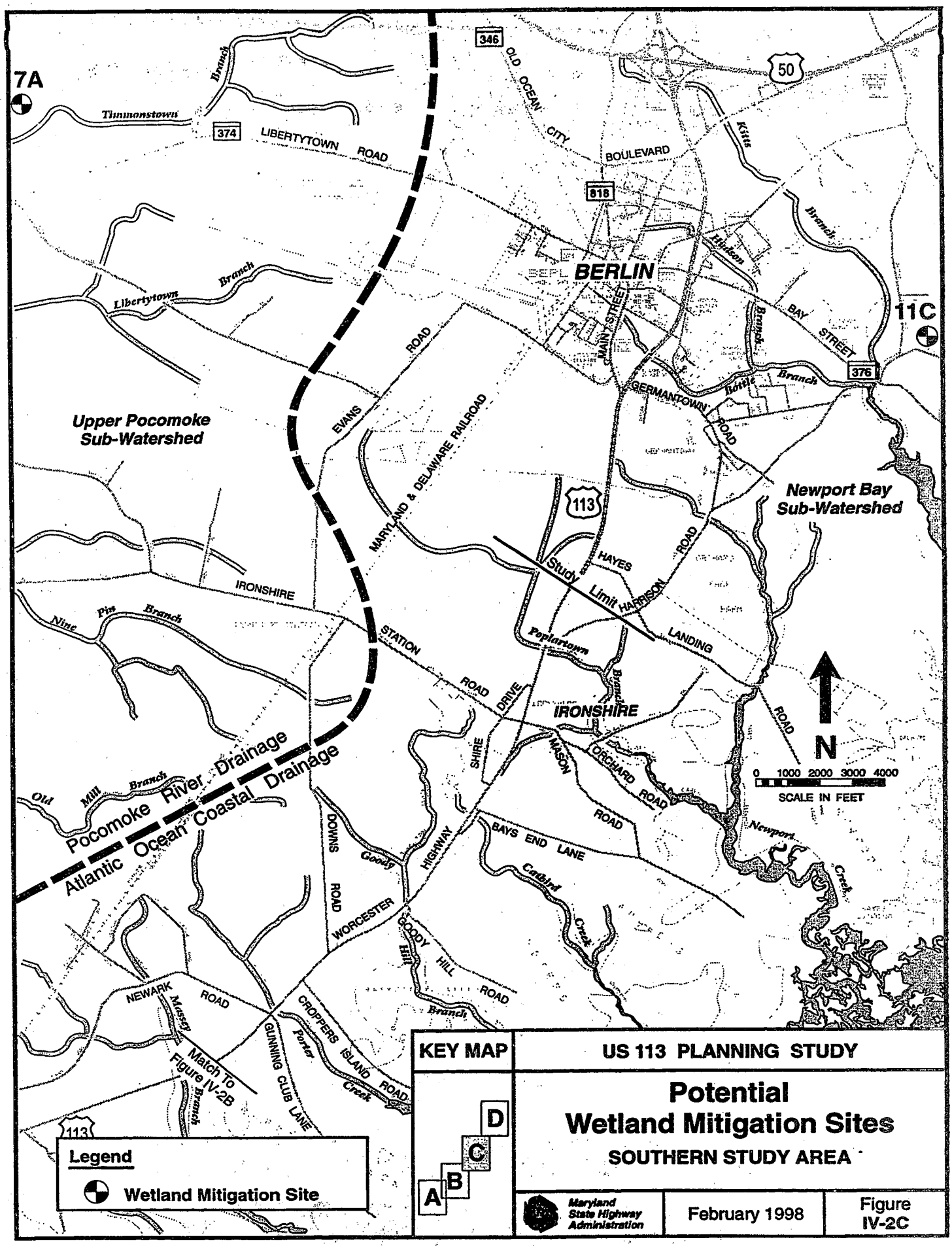
* Scrub/shrub wetlands included

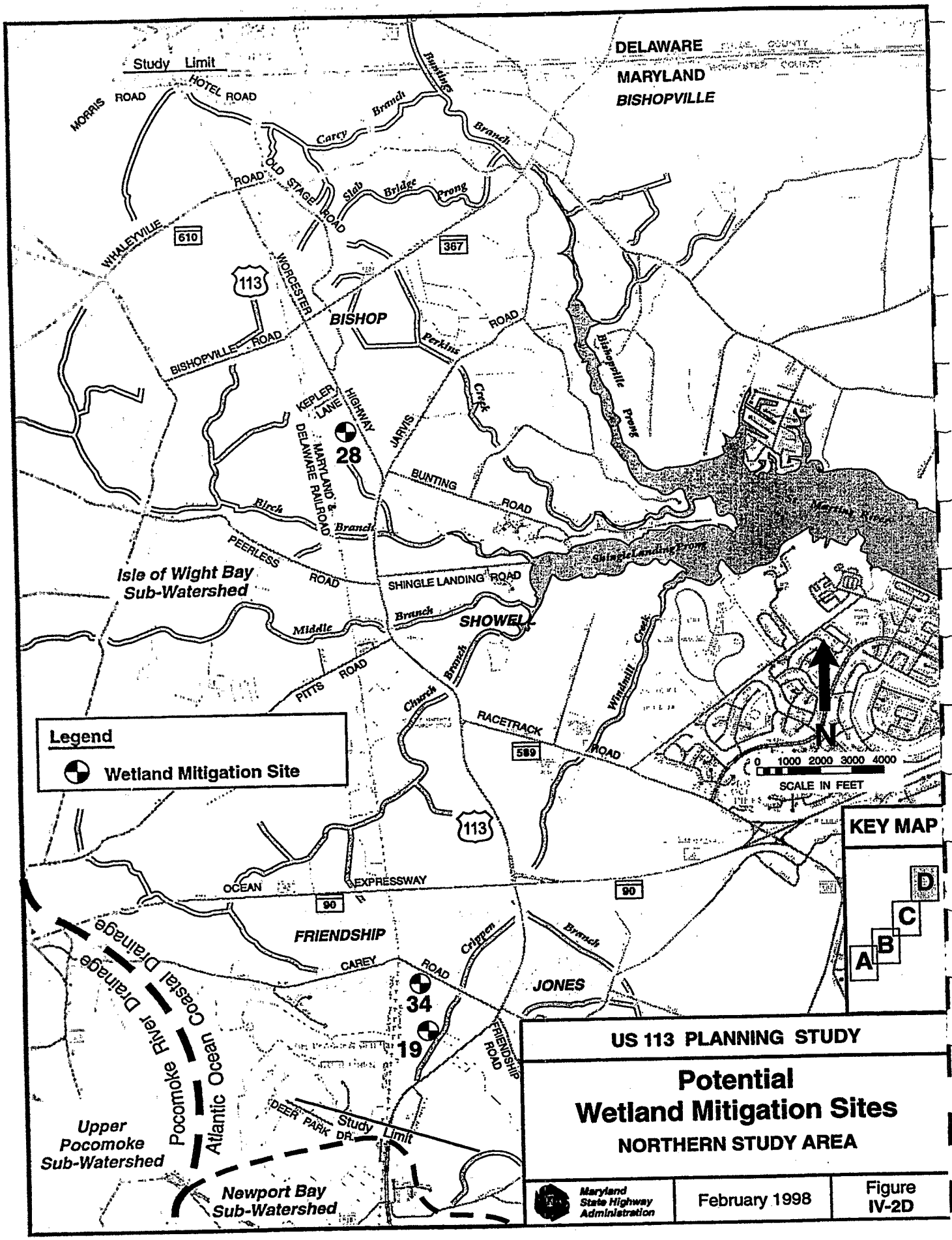
On-site investigations will be conducted within each potential mitigation area to further evaluate hydrologic and subsurface characteristics, and to select preferred sites for final design. An environmental inventory including a Section 106 review (National Historic Preservation Act) will be conducted for mitigation sites outside the original area of potential effects (APE) of the project. The environmental inventory will also include coordination with the USDA Natural Resources and Conservation Service (NRCS) to determine the presence of prior converted cropland and/or farmed wetlands. A description of each potential wetland mitigation area is provided below which summarizes the source of hydrology, proposed earthwork to obtain wetland hydrology, soil types, landscape position, and land use.

Site 4A is located in the Lower Pocomoke subwatershed along the east side of Brick Kiln Road, approximately 1,000 feet south of U.S. 113. The 10-acre site is currently cultivated and is surrounded by forested wetlands on three sides. Two drainage ditches convey water to an unnamed tributary of


Match To Figure IV-2 B
Nassawango Creek Sub-Watershed
SNOW HILL
Pocomoke River
Nassawango Creek
MARKET STREET
WASHINGTON STREET
SNOW HILL ROAD
WORCESTER HIGHWAY
CASTLE HILL ROAD
WOODSIDE LANE
Study Limit
BRICK KILN ROAD
PUBLIC LANDING ROAD
TIMMONS ROAD
MARYLAND & DELAWARE RAILROAD
Purnell Branch
Pattys Branch
Hardship Branch
Carter Creek
POCOMOKE
STATE FOREST
6C
Campground
4A
Lower Pocomoke Sub-Watershed
N
0 1000 2000 3000 4000
SCALE IN FEET
12
354
394
365
113
Legend
Wetland Mitigation Site
KEY MAP
A
B
C
D
US 113 PLANNING STUDY
Potential Wetland Mitigation Sites
SOUTHERN STUDY AREA
Maryland State Highway Administration
February 1998
Figure IV-2A


Upper Pocomoke Sub-Watershed
12C
NEWARK
PATEY WOODS ROAD
NEWARK ROAD
Match To Figure IV-2C
QUEPONCO ROAD
WORCESTER HIGHWAY
LANGMAID MARSHALL ROAD
113
Massey Branch
Marshall Creek
FIVE MILE BRANCH ROAD
Coonfoot Branch
HIGHWAY
RAILROAD
BASKET SWITCH
BASKET SWITCH ROAD
Pocomoke River Drainage
Atlantic Ocean Coastal Drainage
Newport Bay Sub-Watershed
Lockouse Branch
Firemile
WORCESTER
CENTRAL
DELAWARE
Branch
SITE
LANE
PORTERS ROAD
CROSSING
Poorhouse
MARYLAND
WESLEY
CEDARTOWN ROAD
Branch
Waterworks Creek
Match To Figure IV-2A
N
0 1000 2000 3000 4000
SCALE IN FEET
Lower Pocomoke Sub-Watershed
Chincoteague Bay Sub-Watershed
Campground Branch
Robins Creek
Parnell Branch
Legend
Wetland Mitigation Site
KEY MAP
A
B
C
D
US 113 PLANNING STUDY
Potential Wetland Mitigation Sites
SOUTHERN STUDY AREA
Maryland State Highway Administration
February 1998
Figure IV-2B


7A
11C
Timmonstown
Branch
374
LIBERTYTOWN ROAD
346
OLD OCEAN CITY BOULEVARD
50
818
Kitts
Branch
Ellinson
BERLIN
MAIN STREET
BAY STREET
Branch
Bottle Branch
376
GERMANTOWN ROAD
Libertytown
Branch
EVANS ROAD
MARYLAND & DELAWARE RAILROAD
Upper Pocomoke Sub-Watershed
Newport Bay Sub-Watershed
113
HAYES ROAD
Study Limit
HARRISON LANDING
IRONSHIRE
Nine Pin Branch
STATION ROAD
Poplartown
Branch
IRONSHIRE
DRIVE
SHIRE
MASON
ORCHARD ROAD
ROAD
N
0 1000 2000 3000 4000
SCALE IN FEET
Pocomoke River Drainage
Atlantic Ocean Coastal Drainage
Old Mill Branch
DOWNS ROAD
Goody
HIGHWAY
BAYS END LANE
Catbird Creek
Newport Creek
WORCESTER
GOODY HILL ROAD
Hill Branch
NEWARK ROAD
Massey Branch
CROPPERS ISLAND ROAD
Porter Creek
GUNNING CLUB LANE
Match To Figure IV-2B
113
Legend
Wetland Mitigation Site
KEY MAP
A
B
C
D
US 113 PLANNING STUDY
Potential
Wetland Mitigation Sites
SOUTHERN STUDY AREA
Maryland State Highway Administration
February 1998
Figure IV-2C



US 113 PLANNING STUDY

Potential Wetland Mitigation Sites

NORTHERN STUDY AREA

Maryland State Highway Administration | February 1998 | Figure IV-2D

Patty's Branch that is located along the eastern boundary of the site. Patty's Branch is located approximately 1,000 feet downstream of the site. Surrounding land use is woodland, forested wetlands, and agriculture. Soils on the site are mapped as Fallsington, Woodstown, and Sassafras, which include poorly drained to well drained soils. Wetlands would be created on the site by filling drainage ditches and excavating a minor amount of soil to create a diversity of habitat types. Wetland hydrology would be supported by flooding and groundwater. This site would expand existing wetland habitat and offers the opportunity to replace wetland functions associated with wildlife habitat, groundwater recharge/discharge, nutrient transformation, sediment retention, and floodflow alteration.

Site 6C is located in the Lower Pocomoke subwatershed, approximately 700 feet east of U.S. 113 at station 1235 near the intersection with Rt. 394. The site is adjacent to the floodplain of Campground Branch, which supports a community of bald cypress. Current use of the site is a hay field, and adjacent land use is forested wetlands and agriculture. This site includes 3 to 5 acres of the cypress swamp and adjacent buffer that would be preserved as part of the mitigation plan, pending future agreements with the landowner.

Site 7A is located in the Upper Pocomoke subwatershed along Timmonstown Road, approximately 1 mile west of Rt 374. The site is adjacent to Franklin Swamp, which forms a contiguous wetland corridor with the Pocomoke River. Several ditches drain the site for agricultural use. Adjacent land use includes forested wetlands, agriculture, and rural residential. The site includes approximately 80 acres and is mapped as Othello silt loam, a poorly drained soil. Wetland creation is proposed on the site by filling several drainage ditches to restore wetland hydrology, with minor excavation to provide a diversity of habitat. This site would expand existing wetland habitat and offers the opportunity to replace wetland functions associated with wildlife habitat, groundwater recharge/ discharge, nutrient transformation, and floodflow alteration. In addition, existing maps of the area indicate that a natural waterway may have been diverted along the eastern boundary of the site for agricultural purposes. If future site investigations confirm that this was a natural channel, the site also offers the opportunity to provide essential fish habitat and stream restoration.

Site 11C is located in the Newport Bay subwatershed along Sinepuxent Road, approximately one-half mile east of Rt. 376. The site is adjacent to a forested wetland that drains to Kitts Branch and Trappe Creek. Approximately 5 acres may be available for wetland creation, pending future agreements with the landowner. Forested wetlands would be created by filling two drainage ditches and/or excavating less than two feet of soil, and planting the site with species that are native to adjacent wetlands. Open water may be included in the mitigation design at the request of the landowner; however, open water areas will not be used to offset mitigation requirements for impacts to vegetated wetlands. Fifteen acres of adjacent forested wetlands may also be included in the mitigation plan as preservation of existing wetlands. Ongoing consultation with the resource agencies and landowner will be conducted to determine if wetland preservation is feasible at this location. This site would expand existing wetland habitat and offers the opportunity to replace wetland functions associated with wildlife habitat, groundwater recharge/discharge, nutrient transformation, sediment retention, and floodflow alteration.

Site 12C is located in the Newport Bay subwatershed along Queponco Road, approximately one-half mile west of U.S. 113. The 10-acre site is surrounded by woodland on three sides and is bisected by three ditches that drain to Marshall Creek. Ditches from an adjacent poultry operation drain into the site, which offers excellent opportunity for nutrient removal. Addition wetland functions that would be replaced at the site include wildlife habitat, groundwater recharge/discharge, and sediment/toxicant reduction. Forested wetlands could be created by filling the three ditches that drain the site; however, hydrological studies will be needed to ensure that modifying the ditch network does not adversely affect adjacent farmland. The ditches may also be rerouted, or the site could be graded to achieve

wetland hydrology. The owner of this site also harvested timber from approximately 10 acres of adjacent land that would be preserved as part of the mitigation plan.

Site 19 is located along Crippen Branch in the Isle of Wight Bay subwatershed, approximately 600 feet east of the proposed right-of-way between Carey Road and Three Penny Lane. The 10 to 20 acre site and surrounding agricultural land was extensively ditched in the mid-1980's, at which time Crippen Branch was channelized and maintained as a public drainage ditch. Wetland hydrology would be restored by filling several lateral ditches provided that future hydrological studies determine that surrounding agricultural land would not be affected. Alternatively, a minor amount of grading would be done to inhibit drainage from the site, which would also provide an opportunity to replace floodplain functions along Crippen Branch. This site would expand existing wetland habitat and offers the opportunity to replace wetland functions associated with wildlife habitat, groundwater recharge/discharge, nutrient transformation, sediment retention, and floodflow alteration.

Site 28 is located in the Isle of Wight Bay subwatershed, adjacent to the proposed right-of-way at the realignment of Jarvis Road. Surrounding land use includes agriculture and forested wetlands. Approximately 5 to 10 acres of the site would be suitable for wetland creation by filling drainage ditches and/or minor excavation. The site drains to Birch Branch, which is located approximately 1500 feet west of the parcel. Wetland hydrology would be supported by groundwater and surface runoff. This site would expand existing woodland habitat and offers the opportunity to replace wetland functions associated with wildlife habitat, groundwater recharge/discharge, nutrient transformation, and sediment retention.

Site 34 is located along an unnamed tributary to Church Branch in the Isle of Wight Bay subwatershed, and is adjacent to the proposed right-of-way on the south side of Carey Road. Surrounding land use includes agriculture and woodland. Approximately 5 acres of the site would be suitable for wetland creation by filling drainage ditches and/or minor excavation. Wetland hydrology would be supported by groundwater and surface runoff. This site would expand existing woodland habitat and offers the opportunity to replace wetland functions associated with wildlife habitat, groundwater recharge/discharge, nutrient transformation, and sediment retention.

A wetland mitigation plan for the **Preferred Alternatives** is being developed in consultation with the US Army Corps of Engineers, US Environmental Protection Agency, US Fish and Wildlife Service, and Maryland Department of the Environment. The mitigation plan includes creation of new wetlands and preservation of existing wetlands and adjacent upland habitat. The goal of the mitigation plan is to replace the principle functions and values of impacted wetlands by integrating aquatic and terrestrial habitat using an ecosystem approach. The resource agencies recommend the following replacement ratios when new wetlands are created as mitigation for unavoidable impacts:

Forested Wetlands	2:1 (i.e., 2 acres created for each acre impacted)
Scrub/Shrub Wetlands	2:1
Emergent Wetlands	1½:1

These ratios are only a guideline for wetland mitigation and may be adjusted based on the final selected mitigation site(s) ability to replace the principal functions of the impacted wetlands as outlined in the functional analysis. For example, the cypress dominated wetlands associated with Wetland-8 are of critical concern because the loss of this habitat can not easily be replaced. Consequently, additional mitigation will be required to off-set unavoidable impacts to Wetland-8. The resource agencies have suggested that a perpetual conservation easement on remaining portions of the cypress swamp may be considered as an integral part of the mitigation plan for impacts to Wetland-8.

Landowners of Wetland 8 will be contacted to discuss possible arrangements for preserving the wetland through purchase or perpetual conservation easements. When preservation of existing wetlands is feasible, resource agency guidelines recommend a mitigation ratio of 10:1 after the minimum 1:1 replacement is accomplished to satisfy the goal of no net loss of wetlands.

The goals and objectives of the wetland mitigation plan are provided in Table 12B. Proposed mitigation ratios may be adjusted during future coordination with federal and state regulatory agencies prior to permit issuance. In addition to the specified compensation ratios and acreage, the mitigation process followed by SHA will incorporate the following goals:

- Continue to minimize wetland impacts during final design
- Replace principle wetland functions and values within same subwatershed as the wetland impact
- Implement wetland mitigation before impacts are completed to allow early evaluation of mitigation success in replacing functions and values
- Preserve existing wetlands and buffers when proposed mitigation site does not provide all functions
- Negotiate with Public Drainage Associations to increase or preserve buffers around public drainage ditches to improve water quality in subwatershed
- Coordinate with the Coastal Bays Management Program to identify additional mitigation opportunities for stream and wetland impacts

A Technical Report for Wetland Mitigation has been prepared to address specific details of the wetland mitigation plan. The Technical Report includes an assessment of each mitigation site to replace specific functions and values of the impacted wetlands. Final site assessments will include monitoring of groundwater elevations and an interagency review to determine which sites offer the best potential for replacing the functions and values. The questions and considerations presented in the New England Functional Assessment Method will be used to assist in the evaluation of each mitigation site. Many of the questions used to determine wetland functions and values pertain to non-wetland related features such as landscape position, location in the watershed, adjacent land-use, potential sediment sources, and potential nutrient sources. Therefore, the answer to such questions would indicate the potential for the mitigation site to perform the related function if wetland hydrology were created.

In addition to vegetated wetlands, unavoidable impacts to streams will occur during construction of the Preferred Alternative. Many of the natural streams in the project area have been ditched or otherwise modified for agricultural purposes, and restoration of natural channel characteristics or stream buffer plantings may be possible to compensate for unavoidable impacts. Ongoing coordination with local resource agency personnel will be conducted to identify opportunities for stream restoration as part of the wetland mitigation plan. In addition, federal, state, and local resource agencies will be consulted to identify opportunities for removal of blockages to aquatic species on streams being impacted by the **Preferred Alternatives.**

Table 12B– Goals and Objectives for Wetland Mitigation

Wetland	Type	Subwatershed [1]	Wetland Impact (acres)	Proposed [5] Ratio	Proposed Acres
1	PEM	Lower Pocomoke	0.13	1.5:1	0.20
2	PFO	Lower Pocomoke	0.32	2:1	0.64
3	PFO	Lower Pocomoke	0.02	2:1	0.04
5	PEM/SS	Lower Pocomoke	0.20	2:1	0.40
A	PEM/PFO	Lower Pocomoke	0.25	2:1	0.50
6	PFO	Lower Pocomoke	0.61	2:1	1.22
8	PFO	Lower Pocomoke	0.32	2:1	0.64 [3]
9	PFO	Lower Pocomoke	0.02	2:1	0.04
11	PFO	Newport Bay	0.01	2:1	0.02
12	PFO	Newport Bay	1.25	2:1	2.50
13	PFO	Newport Bay	0.39	2:1	0.78
15 [2]	PFO	Newport Bay	0.14	3:1	0.42
16	PFO/PSS	Newport Bay	0.26	2:1	0.52
17	PFO	Newport Bay	0.16	2:1	0.32
18	PFO	Newport Bay	0.80	2:1	1.60
22	PFO	Newport Bay	0.22	2:1	0.44
23	PFO	Isle of Wight Bay [4]	1.45	2:1	2.90
26	PFO/PSS	Isle of Wight Bay [4]	0.82	2:1	1.64
27	PFO	Isle of Wight Bay [4]	1.15	2:1	2.30
28	PFO	Isle of Wight Bay [4]	0.90	3:1	2.70
30	PFO	Isle of Wight Bay [4]	0.49	3:1	1.47
31	PFO	Isle of Wight Bay [4]	0.50	3:1	1.50
36	PEM	Isle of Wight Bay [4]	0.37	1.5:1	0.56
37	PFO	Isle of Wight Bay [4]	0.02	2:1	0.04
38	PEM	Isle of Wight Bay [4]	0.64	1.5:1	0.96
40	PFO	Isle of Wight Bay [4]	0.23	3:1	0.69
		TOTALS	**12 +**		**25+**

1. The following sites are proposed to compensate for impacts within each subwatershed:
   Lower Pocomoke - Sites 4A and 7A
   Newport Bay - Sites 11C and 12C
   Isle of Wight Bay - Sites 19, 28, and 34
2. Wetland 15 is a wetland of Special State Concern due to the presence of seaside alder (state status rare). Prior to construction in Wetland 15, individual plants may be transplanted to mitigation site 11C.
3. Mitigation for impacts to Wetland 8 (cypress swamp) includes preservation of 3.2 acres of the cypress swamp and adjacent buffer at Site 6C.
4. Additional mitigation in the Newport Bay subwatershed includes preservation of approximately 15 acres of forested wetlands and adjacent woodland at Site 11C.
5. Proposed mitigation ratios may be adjusted during future negotiations with the resource agencies based on the ability of the final selected mitigation sites to replace the principle functions and values of the impacted wetlands.

J. Vegetation and Wildlife

1. Vegetation

The No-Build (Alternatives 1S and 1N) and TSM (Alternatives 2S and 2N) alternatives are not expected to cause additional impacts to natural vegetation in the study area.

Alternative 2S-20' Median, the dualize alternatives and the **Preferred Alternatives** will require the clearing and grubbing of existing vegetation and the conversion of land for transportation purposes. This will result in the loss of agricultural, forest land, meadow land and residential and commercial frontage.

Some impacts to natural vegetation, crop fields and miscellaneous lawns and ornamental plants are expected to result from each of the 3S and 3N alternatives even as the proposed dualization of US 113 closely parallels the existing roadway.

The 4N Modified alternatives avoid impacts to many residential and commercial properties as the alignments diverges from the existing roadway and impacts primarily agricultural fields, forested and wetland areas.

The 3N/4N Modified alternatives, including the **Northern Preferred Alternative** would impact less forest, wetland, and meadow acreage and would impact more landscaped and turfed acreage than the 4N Modified alternatives.

A summary of the impacts on vegetation by each alternative alignment is shown in Table VI-13.

Three specimen trees, one Southern Red Oak and two Tulip Poplars, are located in the study area. They are clustered together, located just north of Harrison Road. A specimen tree is identified as any tree with a DBH (diameter at breast height) of 30 inches, or greater. These trees will be impacted by the Alternative 2S-20' Median, and by the 3S alternatives, including the **Southern Preferred Alternative**. Impact to the Southern Red oak may be avoided during final design through the inclusion of guardrail.

Impacts to forested areas will require reforestation in accordance with the revised Reforestation Law. The replacement of forested area lost due to the construction of the **Preferred Alternatives** will be accomplished at a 1:1 ratio within SHA right-of-way or on nearby state lands. The mitigation of wetland impacts is addressed in Section IV-I of this document. Other mitigation options such as landscaping, for the impacts to vegetation by the dualization alternatives including the **Preferred Alternatives** will be further defined and finalized in later stages of this project.

Table IV-13: Impacts to Vegetation

Alternative	Agriculture Land (acres)	Upland Forest (acres)	Upland Meadow (acres)	Wetland (acres)	Landscaped and Turfed Areas (acres)	Total (acres)
◆ SOUTHERN STUDY AREA						
1S - No-Build	0	0	0	0	0	0
2S - TSM	0	0	0	0	0	0
2S - 20' Median	20	39	8	5.8	56	129
3S - 20' Median	104	47	10	11.8	67	240
3S - 34' Median	115	52	11	13.6	74	266
SOUTHERN PREFERRED ALTERNATIVE	115	52	11	5.1	74	257
◆ NORTHERN STUDY AREA						
1N - No-Build	0	0	0	0	0	0
2N - TSM	0	0	0	0	0	0
3N - 20' Median / 50 MPH	35	14	15	3.6	46	114
3N - 34' Median / 50 MPH	39	13	14	4.3	42	112
3N - 20' Median / 60 MPH	39	15	17	6.6	51	129
3N - 34' Median / 60 MPH	44	17	19	7.5	57	145
4N Modified - 20' Median	102	53	15	22.4	15	207
4N Modified - 34' Median	102	59	17	24.8	17	220
3N/4N Modified-20' Median	103	48	17	11.2	17	196
3N/4N Modified-34' Median	103	53	19	12.4	19	206
NORTHERN PREFERRED ALTERNATIVE	100	56	19	6.6	19	201

2. Wildlife

Impacts to wildlife habitat and wildlife were assessed qualitatively based on the loss of areas of natural vegetation which is used as habitat. Based on the vegetative types various wildlife species would be impacted by the roadway alternatives.

Wildlife habitat may be impacted in several ways as a result of this project. The construction of the proposed roadway will cause the physical destruction of habitats but may also cause the fragmentation and/or degradation of habitats as well (Southerland, 1993). Each of the dualization alternatives, including the **Preferred Alternatives**, would require the destruction of some habitat along the existing roadway. This destruction of natural environments will result in the loss of habitat and the wildlife found there. This loss of wildlife is explained in the concept of capability ratings, where each unit of habitat has a proportional wildlife carrying capacity (Schemnitz, 1980). The relocation alternatives (the 4N Modified, 3N/4N Modified alternatives, and **Preferred Alternatives**) also will cause habitat fragmentation. The breaking up of large, contiguous tracts of habitat into smaller blocks may have negative impacts on area-sensitive species such as many forest interior dwelling species. The construction of the roadway may also act as a barrier to wildlife movement to and from these habitat fragments. The degradation of habitats may occur due to the disturbance of resident species by light and noise along the road, contamination with pollutants, and the introduction of exotic species. The relocation alternatives have the potential to further degrade and fragment the habitat along the proposed new roadway (Southerland, 1993).

The construction of the US 113 build alternatives has the potential to break up large, contiguous tracts of forested habitat into smaller blocks which could have potential negative impacts on area sensitive species such as many forest interior dwelling species. In the southern study area, the 2S-20' Median and 3S alternatives and the **Southern Preferred Alternative** minimize potential negative impacts to forest interior dwelling species by following the existing US 113 alignment, eliminating forest fragmentation. Also, these southern alternatives including the **Southern Preferred Alternative** will not reduce the size of any large, existing forested tracts to below the 100 acre threshold required by many forest interior dwelling species (Maryland Department of Natural Resources, 1986).

In the northern study area, the 3N alternatives also minimize potential negative impacts to forest interior dwelling species by following the existing US 113 alignment, eliminating forest fragmentation and will not reduce the size of any large, existing forested tracts to below the 100 acre threshold (Maryland Department of Natural Resources, 1986). The relocation alternatives in the northern study area have the potential to cause some fragmentation of large forested tracts. Some of these potential impacts were addressed during the planning of this project with the elimination and modification of several of the preliminary alternatives due in part, because of the habitat fragmentation they caused (see Section II.C.4 of the Final EIS). The current relocation alternatives (4N Modified and 3N/4N Modified alternatives and the **Northern Preferred Alternative**) minimize forest fragmentation to the extent possibly by impacting forest tracts near their existing edge and maintaining large, contiguous expanses where possible. The **Northern Preferred Alternative** would have the least potential impacts on forest interior dwelling species of the relocation alternative currently considered. The proposed alignment of the **Northern Preferred Alternative** avoids further fragmentation of a forested area associated with Church Branch which is impacted by both the 4N Modified and 3N/4N Modified alternatives. Also, both the **Northern Preferred Alternative** and 3N/4N Modified alternative avoid further fragmentation of two forested areas in the vicinity of MD 610 (Whaleyville Road) which is impacted by the 4N Modified alternative.

The construction of the roadway improvements may also act as a barrier to wildlife movement to and from wildlife habitat areas remaining. The degradation of habitats may also occur due to the disturbance of resident species by light and noise along the road, contamination of roadside areas with pollutants, and the introduction of exotic species (Southerland, 1993).

The No-Build Alternative will not cause any additional impacts to wildlife or wildlife habitat within either the southern or northern study areas. Because the TSM (Alternatives 2S and 2N) and 2S-20' Median, 3S and 3N alternatives, and the **Southern Preferred Alternative** closely parallel the existing roadway, the degradation and fragmentations of wildlife habitat will be minimized. The widening will require the removal of natural vegetation from the proposed right-of-way and a proportional loss of wildlife habitat and the wildlife using that habitat.

The 4N Modified alternatives would have required the provision of right-of-way area sufficient enough to include the divided roadway, shoulders and safety grading (minimum of 200 feet). This alternative as well as portions of the 3N/4N Modified alternatives and the **Northern Preferred Alternative** on new location, primarily impact agricultural fields and forested areas resulting in fragmentation of wildlife habitat within the corridor in addition to the physical removal of natural vegetation. By maintaining more of the existing roadway alignment, the **Preferred Alternatives** reduces habitat fragmentation.

The dualization of US 113 will increase the possibilities of migratory animal mortality. Research (Michael, 1975; Burke and Sherburne, 1983) found that the construction of a new roadway had little effect on the distribution or density of animals within the remaining habitats. The new right-of-way vegetation (such as grasses) may however attract some species to areas which had formerly been forested such as American robin and woodchuck. Also, the edge created between two habitat types known as the ecotone, will be beneficial to other species such as the white-tail deer and black rat snake (Leedy and Adams, 1997). These effects will be minimal however because of the large, existing areas of open agricultural land and the existing ecotones throughout the study areas.

Wildlife species found in the areas of new alignment may be exposed to new noise elements. Noise levels may have a negative impact on breeding birds who depend on vocal communication for attracting mates (Memphis State University, 1971; Dooling, 1982). It is expected that additional pollutants carried into adjacent water resources by surface runoff could result in some water quality degradation, thereby affecting biota within the receiving water resources, however, as shown in Section IV-G these effects are expected to be minimal. Minor additional air pollution is not expected to have an adverse affect on wildlife as it will be readily dispersed by wind.

The associated loss of wildlife caused by alternatives may be mitigated by the enhancement of the wildlife habitat through reforestation including vegetation with high wildlife food value (mast producing trees, seed or berry producing shrubs, etc.), and plants which will provide cover for wildlife.

The enlargement of existing stream culverts and proposed culverts or bridges to facilitate animal passage will also be considered during final design when detailed hydrologic data is available.

The benefits of the provision of animal passage through these culverts must be weighed carefully against the potential for increased downstream flooding due to the larger culvert openings. Wetland and other environmental impacts may also be increased by enlarging culverts because the raised roadway profile will require more fill.

To protect aquatic resources including anadromus fish species such as yellow perch, white perch, alewife, and blueback herring, no instream construction will be permitted between February 15 and June 15. Construction activity in wetlands and waterways will adhere to the time of year restrictions specified as part of the Section 404 permit and Section 401 Water Quality Certification. Specific time of year restrictions will be developed by the Corps and MDE during the permitting process, in consultation with the National Marine Fisheries Service, U.S. Fish and Wildlife Service, and Maryland Department of Natural Resources.

3. Rare, Threatened and Endangered Species

There are no federally listed rare, threatened, or endangered (RTE) species known to occur within the study area, therefore no impacts will occur. Of the five state listed RTE species recorded in the project area, two of these, the state rare seaside alder (*Alnus maritima*), in the southern study area, and the blackbanded sunfish (*Enneaconthus chactadon*), in the northern study area, which is in need of conservation, are potentially impacted by the dualization alternatives, including the **Preferred Alternatives**. The presence of several seaside alders within the southern study area was verified during field surveys in July 1996. Although the presence of the blackbanded sunfish was not confirmed during this study, it has been identified during previous surveys of Carey Branch in the northern study area.

The No-Build and TSM alternatives are not expected to cause any impacts to rare, threatened, or endangered species or their habitats within the northern or southern study area.

The potential for impacts to the seaside alder by Alternative 2S-20' Median and the 3S alternatives will be reduced through minimizing encroachment on the wetland habitats where it is found (Davidson, 1996). Prior to disturbance by the **Southern Preferred Alternative**, the seaside alders that occur within the proposed impact area could be transplanted to other suitable habitat. Consideration will be given for including seaside alder groves in wetland creation/ restoration areas if possible.

Impacts to the blackbanded sunfish by the 3N, 4N Modified, and 3N/4N Modified alternatives including the **Northern Preferred Alternative** will be minimized by strictly adhering to the required stream closure for in-stream work from February 15 to June 15 (Dintman, 1995). To protect aquatic resources no instream construction is allowed to take place during the closure period. Impacts will be further minimized by strict sediment and erosion control measures which will prevent sediment contamination of Carey Branch.

K. Air Quality

The air quality analysis indicates that carbon monoxide impacts resulting from the implementation of the No-Build, TSM, or the Build Alternative including the **Preferred Alternatives**, would not result in a violation of the S/NAAQS 1-hour CO concentration of 35 ppm or the 8-hour CO concentration of 9 ppm, at any air quality receptor location, in either analysis year. Table IV-14 shows the predicted No-Build/TSM and Build 1-hour and 8-hour CO concentrations for the southern study area for 200 and 2020 (NOTE: the Build Alternative includes the **Preferred Alternatives**). Table IV-15 shows the

predicted No-Build/TSM and Build CO concentrations for the northern study area for the same analysis years.

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. The State Highway Administration has addressed this possibility by establishing "Standard Specifications for Construction and Materials" which specifies procedures to be followed by contractors involved in site work.

The Maryland Air Management Administration was consulted to determine the adequacy of the "Specifications" in terms of satisfying the requirements of the "Regulations Governing the Control of Air Pollution in the State of Maryland". The Maryland Air Management 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.

In conclusion, the **Preferred Alternatives** will not result in violations of the 1-hour or 8-hour S/NAAQS in 2000 or 2020.

Table IV-14: CO Concentrations- Southern Study Area

Receptor	2000				2020			
	No-Build		Build *		No-Build		Build *	
	1-Hr.	8-Hr.	1-Hr.	8-Hr.	1-Hr.	8-Hr.	1-Hr.	8-Hr.
1-1	2.6	0.9	2.7	0.9	2.6	0.9	2.7	0.9
1-2	2.7	0.9	2.8	1.0	2.8	0.9	2.8	1.0
1-3	2.7	0.9	2.7	0.9	2.7	0.9	2.7	0.9
2-1	2.7	0.9	2.8	0.9	2.7	1.0	2.8	0.9
2-2	2.9	1.0	2.8	1.0	2.9	1.0	2.8	1.0
2-3	2.9	1.0	2.9	1.1	2.9	1.0	2.9	1.1
2-4	3.2	1.1	3.0	1.1	3.1	1.1	3.0	1.1
2-5	3.1	1.1	3.1	1.1	3.0	1.1	3.1	1.1
2-6	3.5	1.3	3.3	1.3	3.5	1.3	3.3	1.2
3-1	3.0	1.1	3.1	1.1	3.0	1.1	3.1	1.1
3-2	3.3	1.2	3.2	1.2	3.3	1.2	3.2	1.2
3-3	2.9	1.0	3.0	1.1	2.9	1.0	2.9	1.0
3-4	3.4	1.2	3.0	1.2	3.4	1.2	3.0	1.1
3-5	3.0	1.1	3.1	1.1	3.0	1.1	3.1	1.1
3-6	2.9	1.0	3.0	1.1	2.9	1.0	3.0	1.1
3-7	3.1	1.1	3.1	1.1	3.1	1.1	3.1	1.1
3-8	2.8	1.0	2.8	1.0	2.8	1.0	2.8	1.0
3-9	2.9	1.0	2.9	1.1	2.9	1.0	2.9	1.1
4-1	3.0	1.1	3.2	1.1	3.0	1.1	3.2	1.1
4-2	3.0	1.1	2.9	1.1	3.0	1.1	2.9	1.1
4-3	2.8	1.0	2.7	0.9	2.8	1.0	2.7	0.9
4-4	2.9	1.1	3.1	1.1	2.9	1.1	3.1	1.1
4-5	3.1	1.1	2.9	1.1	3.1	1.1	2.9	1.1
4-6	3.4	1.3	3.2	1.1	3.4	1.3	3.2	1.1
4-7	2.9	1.0	3.0	1.1	2.9	1.1	3.0	1.1
4-8	3.0	1.1	2.9	1.0	3.0	1.1	2.9	1.0
4-9	3.2	1.1	3.1	1.1	3.2	1.1	3.1	1.1
4-10	2.8	1.0	2.8	1.0	2.8	1.0	2.8	1.0
4-11	2.9	1.0	3.0	1.1	2.9	1.0	3.0	1.1
4-12	2.9	1.0	2.9	1.1	2.9	1.0	2.9	1.1

Notes: 1-hour average CO concentrations include a 2.6 ppm background concentration.
Worse Case (a.m. or p.m.) shown.
8-hour average CO concentrations include a 0.9 ppm background concentration.
The S/NAAQS for the 1-hour average is 35.0 ppm.
The S/NAAQS for the 8-hour average is 9.0 ppm
* Includes the **Preferred Alternatives**

TABLE IV-15: CO Concentrations - Northern Study Area

Receptor	2000				2020			
	No-Build		Build *		No-Build		Build *	
	1-Hr.	8-Hr.	1-Hr.	8-Hr.	1-Hr.	8-Hr.	1-Hr.	8-Hr.
6-1	3.0	1.0	2.9	1.1	3.0	1.0	2.9	1.1
6-2	3.1	1.1	2.6	0.9	3.1	1.1	2.7	0.9
6-3	3.7	1.3	2.6	0.9	3.7	1.4	2.6	0.9
6-4	2.9	1.0	2.6	0.9	3.0	1.0	2.6	0.9
6-5	3.1	1.1	2.6	0.9	3.1	1.1	2.6	0.9
6-6	2.6	0.9	2.9	1.0	2.6	0.9	2.9	1.0
6-7	2.7	1.0	2.6	0.9	2.7	1.0	2.6	0.9
6-8	3.3	1.2	2.6	0.9	3.3	1.2	2.6	0.9
6-9	3.3	1.2	2.6	0.9	3.4	1.3	2.7	0.9
6-10	2.9	1.0	2.7	0.9	3.0	1.0	2.7	0.9
6-11	3.0	1.0	2.8	1.0	3.0	1.1	2.8	1.0
6-12	2.9	1.0	2.7	0.9	2.9	1.0	2.7	0.9
6-13	2.9	1.0	2.6	0.9	2.9	1.0	2.7	0.9
6-14	3.0	1.1	2.7	0.9	3.0	1.1	2.8	0.9
6-15	3.1	1.1	2.9	1.0	3.2	1.1	2.9	1.0
6-16	5.4	2.0	3.9	1.4	5.9	2.3	4.2	1.6
6-17	3.1	1.1	2.6	0.9	3.1	1.1	2.7	0.9
6-18	2.8	1.0	2.6	0.9	2.9	1.0	2.6	0.9
6-19	3.1	1.1	2.6	0.9	3.2	1.1	2.6	1.2
7-1	3.5	1.3	3.2	1.2	3.6	1.3	3.3	1.2
7-2	2.8	1.0	2.8	1.0	2.8	1.0	2.8	1.0
7-3	2.8	0.9	2.8	0.9	2.8	1.0	2.8	1.0
7-4	3.0	1.1	3.1	1.8	3.0	1.1	3.1	1.2
7-5	3.2	1.2	3.7	1.5	3.3	1.2	3.7	1.5
7-6	2.9	1.0	2.9	1.1	2.9	1.0	2.9	1.1
7-7	2.8	1.0	2.9	1.1	2.8	1.0	2.9	1.1
7-8	3.0	1.0	3.1	1.1	3.0	1.1	3.1	1.2
7-9	3.3	1.2	3.1	1.2	3.4	1.2	3.1	1.2
7-10	3.4	1.2	3.1	1.2	3.4	1.3	3.2	1.2
7-11	5.7	2.4	4.9	2.0	5.6	2.5	5.0	2.1
7-12	3.4	1.2	3.6	1.4	3.6	1.3	3.7	1.4
7-13	3.4	1.2	3.2	1.2	3.4	1.2	3.3	1.2
7-14	3.7	1.3	3.4	1.3	3.8	1.4	3.5	1.3
7-15	3.0	1.1	3.2	1.1	3.0	1.1	3.1	1.1
7-16	3.1	1.1	2.9	1.1	3.1	1.1	3.0	1.1

Notes: 1-hour average CO concentrations include a 2.6 ppm background concentration.
Worse Case (a.m. or p.m.) shown.
8-hour average CO concentrations include a 0.9 ppm background concentration.
The S/NAAQS for the 1-hour average is 35.0 ppm.
The S/NAAQS for the 8-hour average is 9.0 ppm
* Includes the **Preferred Alternatives**

L. Noise Quality

1. Criteria for Determining Noise Impact

The existing noise environment of the areas residential receptors involved in this study reflects a base of steady "background" noise, which is the sum of many distant noise sources. Super-imposed on this background noise is the noise from traffic on US 113.

To describe noise environments, and to assess impact on noise sensitive areas, a frequency weighing measure which simulates the human perceptions is customarily selected. A-weighted ratings of noise sources, which reflect the human ear's reduced sensitivity to low frequencies, have been found to correlate well with human perceptions of the annoying aspects of noise, particularly from traffic noise sources. Consequently A-weighted noise levels, described in decibels-A or dBA, are the values cited by Federal Highway Administration (FHWA) in its noise criteria.

One area of environmental acoustics that has received considerable attention is the development of methods to describe the impact of highway noise on the community. Attempts to correlate noise environments with community annoyance have led to the development of several single-number noise descriptions for the assessment of community reaction. To accurately reflect peoples' reactions to noise, a descriptor should describe the fluctuating noise levels completely by including intensity and frequency characteristics along with the variation of both over time. Furthermore, it should describe, in a single number, the known effects of noise on humans. A descriptor that satisfies these requirements is the Equivalent Noise Level, L_{eq}, which is the constant noise level that contains the same amount of acoustical energy as the actual fluctuating level of interest over the same period of time. The FHWA has designated the hourly Equivalent Noise level value, $L_{eq}(h)$, in its noise criteria.

Criteria adopted by the Maryland SHA for the determination of an impacted receptor have been implemented throughout the analysis for this project and are summarized as follows:

According to the procedures described in FHWA Title 23 of the Code of Federal Regulations Part 772, noise impacts occur when predicted noise levels for the design year (2020) approach or exceed the noise abatement criterion for a particular land use category, or when predicted noise levels are substantially higher than existing ambient noise levels. The Maryland State Highway Administration and FHWA defines "approach" as 66 dBA or above, and uses a 10 dBA increase to define a substantial increase. Under SHA's current noise policy, once an impact has been identified, the following factors are evaluated to determine whether mitigation is feasible and reasonable:

Feasibility

- Can noise levels be reduced by at least 3 decibels at impacted receptors? The noise reduction goal for receptors with the highest noise levels (first right-of-way receivers) is 7-10 decibels.

- Will the placement of a noise barrier restrict pedestrian or vehicular access or cause a safety problem, such as limiting sight distance or reduction of a vehicle recovery area?

- Will the construction of a noise barrier result in utility impacts?

- Will the construction of a noise barrier have an impact upon existing drainage?

- Will an impact occur to a Section 4(f) resource? Section 4(f) resources include publicly owned recreation areas and parks, wildlife areas, conservation areas and historic sites that are either on or eligible for the National Register of Historic Places.

- Are there other non-highway noise sources in the area that would reduce the effectiveness of a noise barrier?

Reasonableness

- Acceptability of proposed abatement. SHA requires that 75% of impacted and benefitted residents approve of the proposed abatement.

- Comparison of no-build to build noise levels. Noise abatement is considered reasonable if a 3 decibel or greater change in design year build noise levels over design year no-build levels will result from the proposed highway improvements. The effects of the highway improvements made after the original construction of the highway will also be considered.

- If noise levels equal or exceed 72 decibels at impacted receptors, SHA will consider noise abatement reasonable for any proposed improvements that will increase the noise levels.

- Is the cost of abatement reasonable? SHA defines reasonable cost as a maximum of $50,000 per residence. SHA feels it is reasonable to include in the cost calculation all impacted receivers that would receive a 3 decibel or greater reduction from a barrier. SHA will consider all receptors that <u>will not</u> experience noise levels equal to or greater than 66 decibels or an increase of 10 decibels over ambient levels as benefitted by a noise barrier if they receive a 5 decibel or greater reduction from a noise barrier.

The most recent five years of bidding experience will be used to calculate the square foot factor used to estimate noise barrier cost. Currently, SHA is using a cost of $178.03 per square meter ($16.54 per square foot). This cost figure is based upon current costs of panels, footings, and installation.

- Will the noise barriers have a significant negative visual impact at impacted receptors?

- Are there any special circumstances, i.e., historical/cultural significance at the receptors that should be evaluated?

2. Predicted Noise Levels

Analysis Procedures

This analyses was conducted in accordance with standard Federal Highway Administration guidelines and current State Highway Administration procedures and policies. The analysis began with the determination of existing noise levels along US 113 by measuring ambient noise levels at 65 receptor sites. Existing noise levels were recorded using a Metrosonic db-308 Sound Analyzer for a 15-minute period. An acoustic analysis was performed utilizing the STAMINA 2.0 traffic noise prediction model. The computer model incorporates the following:

- Traffic characteristics (volume, speed, percentage of heavy and medium trucks)
- Topography (distance, elevation, vegetation, barriers)
- Roadway characteristics (distance and elevation)
- Sensitive receptors (distance and elevation)

The STAMINA 2.0 computer model was established based upon proposed roadway improvements and projected future traffic conditions which included prediction points along the existing roadway, and the aforementioned field receptors. The predicted increase in noise levels was computed by subtracting the predicted noise levels from the existing noise levels. Additionally, a future No-Build scenario was modeled. The No-Build model is based upon the existing roadway conditions and projected future traffic conditions. This allows comparison of the future noise levels between the No-Build and build alternatives. The SHA criteria for determining an impacted receiver can be applied.

Traffic Data

Traffic data were recorded in 15 minute samples during monitoring at several ambient receptor sites and then converted to hourly volumes. The traffic samples were utilized in calibrating the STAMINA 2.0 models. Samples were recorded for autos, medium trucks and heavy trucks and their associated speeds noted. Medium trucks are defined as two axle trucks and heavy trucks as three or more axles. Future traffic volumes for the No-Build and

Build conditions, including truck percentages and directional split, were predicted by the SHA Travel Forecasting Section.

Under some conditions, future traffic volumes were predicted which are worse than Level of Service (LOS) 'C'. Volumes were analyzed using the 1985 Highway Capacity Manual procedures. Maximum noise levels due to roadway traffic occur when a roadway operates at LOS 'C'. Therefore, for these areas, the roadway volume which produces LOS 'C' was defined and utilized in the noise model. For conditions where the roadway operates at a level better than LOS 'C', the predicted actual traffic volumes were used in the noise model.

Predicted Results

Table IV-16 presents the predicted noise levels for the design year No-Build alternative.

The noise sensitive receptors analyzed for the study area are adjacent to US 113, or lie adjacent to the sections of Northern Preferred Alternative on new alignment. Existing US 113 is a two-lane undivided highway which has not been modified from its original condition within the study area.

Therefore, the baseline condition assessed for the study area is the No-Build noise level. Noise levels predicted for design year 2020 under the No-Build and TSM alternatives were used as the basis for determining the impact of each of the dualize alternatives. The detailed analysis of noise quality in the study areas is available in the Noise Quality Study Report published as a technical memorandum to the Draft EIS.

Thirty of the receptor locations analyzed are in the southern study area. Two of the 30 sites have ambient noise levels in excess of 67 dBA, four sites would approach or exceed 67 dBA for the No-Build condition in the design year (2020) and five sites would be impacted by noise levels which approach or exceed 67 dBA for the 3S alternatives, including the Southern Preferred Alternative.

Thirty-four of the receptor locations analyzed are in the northern study area. Eleven of the 34 sites have ambient noise levels which approach or exceed 67 dBA and 12 sites would approach or exceed 67 dBA for the No-Build alternative in the Design Year (2020). Fifteen sites have projected (2020) noise levels which approach or exceed 67 dBA for Alternative 3N, six sites have projected noise levels which approach or exceed the design noise level criteria for Alternative 4N Modified-34' Median, ten sites would be considered impacted by the Combination Alternative, ten sites would be considered impacted by the Combination Alternative 3N/4N Modified-34' Median and eleven sites would be considered impacted by the Northern Preferred Alternative.

Tables IV-16 and IV-17 present a summary of the noise levels under No-Build conditions compared to noise levels under the dualize alternatives, including the Preferred Alternatives, and Tables IV-18 and IV-19 present a summary of noise levels for the dualize alternatives compared to the ambient noise level.

Table IV-16: Summary of Noise Levels No-Build Versus Dualization Alternatives, including the Southern Preferred Alternative - Southern Study Area

Receptor	Ambient Noise Level (dBA)	Future Year 2020 Noise Levels (dBA)		
		No-Build Alt. 1S	3S 34' Median Alternative including Southern Preferred Alternative	Difference (1S vs 3S-34' Median including Southern Preferred Alternative)
1-1	65	53	52	-1
1-2	56	52	53	+1
1-3	59	58	59	+1
2-1	58	58	59	+1
2-2	60	63	64	+1
2-3	58	60	64	+4
2-4	63	64	64	0
2-5	64	64	65	+1
2-6	**67**	**67**	**67**	0
3-1	63	61	65	+4
3-2	66	62	63	+1
3-3	65	**69**	**70**	+1
3-4	**71**	**67**	**67**	0
3-5	62	61	65	+4
3-6	58	63	65	+2
3-7	57	58	60	+2
3-8	61	58	61	+2
3-9	63	59	62	+3
4-1	58	57	60	+3
4-2	64	63	65	+2
4-3	64	55	56	+1
4-4	60	61	64	+3
4-5	61	61	61	0
4-6	58	60	61	+1
4-7	60	63	67	+4
4-8	63	63	64	+1
4-9	64	**66**	**66**	0
4-10	58	56	58	+2
4-11	63	61	65	+4
4-12	65	61	65	+4

Shaded area indicates a receptor meets SHA impact criteria.
Bold indicates a receptor approached or exceeds the FHWA design noise level.

Table IV-17: Summary of Noise Levels No-Build Versus Dualization Alternatives, Including Northern Preferred Alternative - Northern Study Area

Receptor	Ambient Noise Level (dBA)	[illegible]	[illegible]	[illegible]	Future Year 2020 Noise Level (dBA)	[illegible]	[illegible]	[illegible]	[illegible]
		No-Build Alt. 1	Alt. 3N	Difference (No-Build vs 3N)	Alt. 4N Mod.	Difference (No-Build vs 4N)	3N/4N Modified Alternative including Northern Preferred Alternative		Difference No-Build vs 3N/4N Modified, including Northern Preferred Alternative
6-1	63	61	64	+3	-	-	-		-
6-2	69	68	69	+1	-	-	-		-
6-3	69	70	71	+1	-	-	-		-
6-4	64	63	68	+5	-	-	-		-
6-5	63	69	71	+2	-	-	-		-
6-6	72	70	71	+1	-	-	-		-
6-7	60	53	56	+3	-	-	-		-
6-8	58	44	-	-	56	+12	56		+12
6-9	67	60	60	0	-	-	-		-
6-10	60	56	58	+2	-	-	-		-
6-11	52	59	59	0	-	-	-		-
6-12	67	62	62	0	-	-	-		-
6-13	54	54	56	+2	-	-	-		-
6-14	65	62	62	0	59	-3	59		-3
6-15	66	65	61	-4	[illegible]	+2	[illegible]		+2
6-16	65	70	65	-5	64	-6	64	69	-6 / -1 *

Shaded area indicates a receptor which meets SHA impact criteria.
Bold indicates a receptor which approached or exceeds the FHWA design noise level.
* 3N/4N Modified Alternative / **Northern Preferred Alternative**

Table IV-17: Summary of Noise Levels No-Build Versus Dualization Alternatives, Including Northern Preferred Alternative-Northern Study Area (continued)

Receptor	Ambient Noise Level (dB)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2020 Noise Levels (dBA) 3N/4N Modified Alternative	[illegible]	Difference Build vs. 3N/4N Modified Alternative	Difference Build vs. Northern Preferred Alternative
6-17	65	**66**	64	-2	54	-12	54 *	53 *	-12 *	-11 *
6-18	65	58	[illegible]	+8	50	-8	50 *	51 *	-8 *	-7 *
6-19	65	50	56	+6	48	-2	48 *	50 *	-2 *	-- *
7-1	**73**	**72**	65	-7	64	-8	64		-8	
7-2	55	54	57	+3	61	+7	61		+7	
7-3	59	50	54	+4	57	+7	57		+7	
7-4	60	61	[illegible]	+5	[illegible]	+6	[illegible]		+6	
7-5	**68**	**68**	[illegible]	+3	[illegible]	+4	[illegible]		+3	
7-6	56	54	59	+5	60	+6	59		+5	
7-7	53	50	55	+5	56	+6	55		+5	
7-9	61	62	65	+3	56	+4	65		+3	
7-10	**69**	**67**	[illegible]	+4	54	-13	[illegible]		+4	
7-11	**70**	**67**	[illegible]	+2	54	-13	[illegible]		+2	
7-12	**69**	64	[illegible]	+8	58	-6	[illegible]		+8	
7-13	**70**	**66**	[illegible]	+4	64	-2	[illegible]		+4	
7-14	**72**	**68**	[illegible]	+2	[illegible]	+3	[illegible]		+2	
7-15	62	60	[illegible]	+6	[illegible]	+7	[illegible]		+6	
7-16	65	62	[illegible]	+4	[illegible]	+5	[illegible]		+4	

Shaded area indicates a receptor meets SHA impact criteria.
Bold indicates a receptor approached or exceeds the FHWA design noise level.
* 3N/4N Modified Alternative / Northern Preferred Alternative

Table IV-18: Summary of Noise Levels Ambient Versus Dualization Alternatives, Including Southern Preferred Alternative - Southern Study Area

Receptor	Ambient Noise Level (dBA)	[illegible]	[illegible]	[illegible]
1-1	65	53	52	-13
1-2	56	52	53	-3
1-3	59	58	59	0
2-1	58	58	59	+1
2-2	60	63	64	+4
2-3	58	60	64	+6
2-4	63	64	64	+1
2-5	64	64	65	+1
2-6	67	**67**	[illegible]	0
3-1	63	61	65	+2
3-2	66	62	63	-3
3-3	65	**69**	[illegible]	+5
3-4	**71**	**67**	[illegible]	-4
3-5	62	61	65	+3
3-6	58	63	65	+7
3-7	57	58	60	+3
3-8	61	58	61	0
3-9	63	59	62	-1
4-1	58	57	60	+2
4-2	64	63	65	+1
4-3	64	55	56	-8
4-4	60	61	64	+4
4-5	61	61	61	0
4-6	58	60	61	+3
4-7	60	63	[illegible]	+7
4-8	63	63	64	+1
4-9	64	**66**	[illegible]	+2
4-10	58	56	58	0
4-11	63	61	65	+2
4-12	65	61	65	0

Shaded area indicates a receptor meets SHA impact criteria.
Bold indicates a receptor approached or exceeds the FHWA design noise level.

Table IV-19: Summary of Noise Levels Ambient Versus Dualization Alternatives, Including Northern Preferred Alternative - Northern Study Area

Receptor	Ambient Noise Level (dBA)	Future Year 2020 Noise Levels (dBA)								
		No-Build Alt. 1N	3N-34' Median	Difference (Ambient vs 3N-34' Median)	4N Mod.-34' Median	Difference (Ambient vs 4N Mod.-34' Median)	3N/4N Mod.-34' Median, Including **Northern Preferred Alternative**		Difference Ambient vs 3N/4N Mod.-34' Median, Including **Northern Preferred Alternative**	
6-1	63	61	64	+1	-	-	-		-	
6-2	**69**	**68**	69	0	-	-	-		-	
6-3	**69**	**70**	71	+2	-	-	-		-	
6-4	64	63	68	+4	-	-	-		-	
6-5	63	**69**	71	+8	-	-	-		-	
6-6	**72**	**70**	71	-1	-	-	-		-	
6-7	60	53	56	-4	-	-	-		-	
6-8	58	44	-	-	56	-2	56		-2	
6-9	**67**	60	60	-7	-	-	-		-	
6-10	60	56	58	-2	-	-	-		-	
6-11	52	59	59	+7	-	-	-		-	
6-12	**67**	62	62	-5	-	-	-		-	
6-13	54	54	56	+2	-	-	-		-	
6-14	65	62	62	-3	59	-6	59		-6	
6-15	**66**	65	61	-5	67	+1	67		+1	
6-16	65	**70**	65	0	64	0	64 *	69 *	-1 *	+4 *

Shaded area indicates a receptor which meets SHA impact criteria.
Bold indicates a receptor which approached or exceeds the FHWA design noise level.
* 3N/4N Modified Alternative / **Northern Preferred Alternative**

Table IV-19: Summary of Noise Levels Ambient Versus Dualization Alternatives, Including Northern Preferred Alternative-Northern Study Area (continued)

Receptor	Ambient Noise Level (dBA)	Future 2020 Noise Levels (dBA)									
		No Build Alt. 1N	3N/4N Mod.-34' Median	Difference (Ambient vs. 3N)	3N/4N Mod.-34' Median	Difference (Ambient vs. 4N)	3N/4N Mod.-34' Median, Including Northern Preferred Alternative *		Difference Ambient vs. 3N/4N Mod.-34' Median, Including Northern Preferred Alternative	
6-17	65	**66**	64	-1	54	-11	54 *	55 *	-11 *	-10 *
6-18	65	58	66	+1	50	-15	50 *	51 *	-15 *	-14 *
6-19	65	50	56	-9	48	-17	48 *	50 *	-17 *	-15 *
7-1	**73**	**72**	65	-8	64	-9	64		-9	
7-2	55	54	57	+3	61	+6	61		+6	
7-3	59	50	54	-5	57	-2	57		-2	
7-4	60	61	67	+6	67	+7	67		+7	
7-5	**68**	**68**	71	+3	72	+4	70		+3	
7-6	56	54	59	+3	60	+4	59		+3	
7-7	53	50	55	+2	56	+3	55		+2	
7-9	61	62	65	+4	56	-5	65		+4	
7-10	**69**	**67**	71	+2	54	-15	71		+2	
7-11	**70**	**67**	69	-1	54	-16	69		-1	
7-12	**69**	64	72	+3	58	-11	72		+3	
7-13	**70**	**66**	70	0	64	-6	70		0	
7-14	**72**	**68**	70	-2	71	-1	70		-2	
7-15	62	60	66	+4	67	+5	66		+4	
7-16	65	62	66	+1	67	+2	66		+1	

Shaded area indicates a receptor meets SHA impact criteria.
Bold indicates a receptor approached or exceeds the FHWA design noise level.
* 3N/4N Modified Alternative / **Northern Preferred Alternative**

Impact Assessment and Feasibility of Noise Control

- **Receptor 2-6** represents three homes on the east side of US 113 near the residence of 6224 Worcester Highway across from Potters Crossing Road. Projected (2020) noise levels of 67 dBA for Alternative 3S-34' Median and the **Southern Preferred Alternative** meet the design noise level criteria, however, the receptor does not meet the reasonableness criteria of 3 dBA for the Build versus No-Build condition to warrant consideration of noise abatement. In addition, construction of a barrier is not feasible because driveway openings are required to provide access to the residences, resulting in a potentially unsafe condition, as well as, a degradation in the barrier effectiveness. To achieve a noticeable reduction in noise levels, 5 dBA or more, a noise barrier system must be continuous. A break in the barrier system to allow access to the property would degrade the barrier's effectiveness (see Table IV-20A).

- **Receptor 3-3**, representing one home on the east side of US 113 south of Basket Switch Road, receives projected (2020) noise levels for Alternative 3S-34' Median and the **Southern Preferred Alternative** of 70 dBA which exceeds the design noise level of 67 dBA for the build alternative. The receptor site does not meet the reasonableness criteria, as the increase in Build noise level is less than 3 dBA over the No-Build condition to warrant consideration of noise abatement. Additionally, mitigation is not feasible because driveway openings are required to provide access to the residence. To achieve a noticeable reduction in noise levels, 5 dBA or more, a noise barrier system must be continuous. A break in the barrier system to allow access to the property would degrade the barrier's effectiveness, thereby eliminating the barrier as a feasible mitigating measure (see Table IV-20B).

- **Receptor 3-4** represents five homes on the west side of US 113 south of Basket Switch Road. Projected (2020) noise levels are 67 dBA for Alternative 3S-34' Median and the **Southern Preferred Alternative**, however, the receptor does not meet the reasonable criteria of 3 dBA for the Build versus No-Build condition to warrant consideration of noise abatement. In addition, construction of a barrier is not feasible because driveway openings are required to provide access to the residences, resulting in a potentially unsafe condition, as well as, a degradation in the barrier effectiveness. To achieve a noticeable reduction in noise levels, 5 dBA or more, a noise barrier system must be continuous. A break in the barrier system to allow access to the property would degrade the barrier's effectiveness (see Table IV-20C).

- **Receptor 4-7,** representing one home at 7809 Worcester Highway north of Goody Hill Road, is predicted (2020) to receive noise levels of 67 dBA for Alternative 3S-34' Median and the **Southern Preferred Alternative.** The noise sensitive area does meet the reasonableness criteria for a 3 dBA increase in Build versus No-Build, however, construction of a barrier is not feasible because a driveway opening is required to provide access to the residence, resulting in a potentially unsafe condition, as well as, a degradation in the barrier effectiveness. To achieve a noticeable reduction in noise levels, 5 dBA or more, a noise barrier system must be continuous. A break in the barrier system to allow access to the property would degrade the barrier's effectiveness (see Table IV-20D).

- **Receptor 4-9**, representing one home at 8029 Worcester Highway north of Bays End Lane, has projected (2020) noise levels for Alternative 3S-34' Median and the **Southern Preferred Alternative** of 66 dBA which approaches the design noise level of 67 dBA. however, the receptor does not meet the reasonableness criteria of 3 dBA for the Build versus No-Build condition to warrant consideration of noise abatement. In addition, construction of a barrier is not feasible because the driveway opening required to provide access to the residence results in an unsafe condition, as well as, a degradation in the barrier effectiveness. To achieve a noticeable reduction in noise levels, 5 dBA or more, a noise barrier system must be continuous. A break in the barrier system to allow access to the property would degrade the barrier's effectiveness (see Table IV-20E).

- **Receptors 6-2 and 6-3** represent eight residences on the west side of US 113 south of Friendship Road near 10421 and 10485 Worcester Highway. Projected (2020) noise levels for Alternative 3N-34' Median are 69 and 71 dBA which is in excess of the noise abatement criteria of 67 dBA. However, the receptor does not meet the reasonableness criteria of 3 dBA for the Build versus No-Build condition to warrant consideration of noise mitigation. In addition, construction of a barrier is not feasible because the driveway openings required to provide access to the residences results in a potentially unsafe condition, as well as, a degradation in the barrier effectiveness. To achieve a noticeable reduction in noise levels, 5 dBA or more, a noise barrier system must be continuous. A break in the barrier system to allow access to the property would degrade the barrier's effectiveness (see Table IV-20F).

- **Receptor 6-4**, representing four residences on the east side of US 113 south of Friendship Road near 10494 Worcester Highway, is predicted (2020) to receive noise levels for Alternative 3N-34' Median of 68 dBA which is in excess of the design noise level of 67 dBA. The noise sensitive area does meet the reasonableness criteria for a 3 dBA increase in Build versus No-Build, however, construction of a barrier is not feasible because driveway openings are required to provide access to the residences, resulting in a potentially unsafe condition, as well as, a degradation in the barrier effectiveness. To achieve a noticeable reduction in noise levels, 5 dBA or more, a noise barrier system must be continuous. A break in the barrier system to allow access to the property would degrade the barrier's effectiveness (see Table IV-20G).

- **Receptor 6-5** represents one residence on the west side of US 113 approximately 450 feet south of Carey Road. Projected (2020) noise levels for Alternative 3N-34' Median of 71 dBA are in excess of the 67 dBA design noise level, however, the receptor does not meet the reasonable criteria of 3 dBA for the Build versus No-Build condition to warrant consideration of noise mitigation. In addition, construction of a barrier is not feasible because a driveway opening is required to provide access to the residence, resulting in a potentially unsafe condition, as well as a degradation in the barrier effectiveness. To achieve a noticeable reduction in noise levels, 5 dBA or more, a noise barrier system must be continuous. A break in the barrier system to allow access to the property would degrade the barrier's effectiveness (see Table IV-20H).

- **Receptor 6-6** represents two residences and Vic's Country Store which is eligible for the National Register of Historic Places in this vicinity. Projected noise levels of 71 are in excess of the noise abatement criteria of 67 dBA for the Alternative 3N-34' Median build condition, however, the receptor does not meet the reasonable criteria of 3 dBA for the Build versus No-Build condition to warrant consideration of noise mitigation. Additionally, the location of existing driveways as well as the MD 452 and Jones Road intersections prevents a feasible method of mitigation at this location (see Table IV-20I).

- **Receptor 6-15** represents one residence on the west side of US 113 south of Racetrack Road at 11241 Worcester Highway. Projected noise levels for Alternative 4N Modified-34' Median, the 3N/4N Modified-34' Median Alternative and the **Northern Preferred Alternative** are 67 dBA which meets the design noise level, however, the receptor does not meet the reasonable criteria of 3 dBA for the Build versus No-Build condition to warrant consideration of noise mitigation. In addition, construction of a barrier is not feasible because a driveway opening is required to provide access to the residence (see Table IV-20J).

- **Receptor 6-16** represents the St. Martin's Church on the west side of U.S. 113 north of MD589. Projected (2020) noise levels for the **Northern Preferred Alternative** of 69 dBA exceeds the 67 dBA design noise level, however, the receptor does not meet the reasonable criteria of 3 dBA for the Build versus No-Build condition to warrant consideration of noise mitigation (see Table IV-20K).

- **Receptor 6-18** represents one residence on the west side of US 113 at 10129 Pitts Road. Projected (2020) noise levels for Alternative 3N-34' Median of 66 dBA approaches the design noise level of 67 dBA, and the Build condition increases noise levels over the No-Build condition by more than 3 dBA. However construction of a barrier is not feasible because of the intersection of Pitts Road with U.S. 113 and private access driveways would result in a potentially unsafe condition, as well as, a degradation in the barrier effectiveness. To achieve a noticeable reduction in noise levels, 5 dBA or more, a noise barrier system must be continuous. A break in the barrier system to allow access to the property would degrade the barrier's effectiveness (see Table IV-20L).

- **Receptor 7-4,** representing one residence on the west side of US 113 south of Jarvis Road at 10045 Worcester Highway, is predicted (2020) to receive noise levels of 66 dBA for Alternative 3N-34' Median and 67 dBA for Alternative 4N Modified-34' Median, the 3N/4N Modified-34' Median Alternative and the **Northern Preferred Alternative** which meets the design noise level criteria. The noise sensitive area does meet the reasonableness criteria for a 3 dBA increase in Build versus No-Build, however, construction of a barrier is not feasible because a driveway opening is required to provide access to the residence, resulting in an unsafe condition, as well as, a degradation in the barrier effectiveness. To achieve a noticeable reduction in noise levels, 5 dBA or more, a noise barrier system must be continuous. A break in the barrier system to allow access to the property would degrade the barrier's effectiveness (see Table IV-20M).

- **Receptor 7-5**, representing one residence on the west side of US 113 north of Jarvis Road at 12235 Worcester Highway, is predicted to receive noise levels of 71 dBA for Alternative 3N-34' Median and the 3N/4N Modified-34' Median Alternative, and 72 dBA for Alternative 4N Modified-34' Median and the **Northern Preferred Alternative** which is in excess of the design noise level of 67 dBA criteria. The noise sensitive area does meet the reasonableness criteria for a 3 dBA increase in Build versus No-Build, however, construction of a barrier is not feasible because a driveway opening is required to provide access to the residence, resulting in an unsafe condition, as well as, a degradation in the barrier effectiveness. To achieve a noticeable reduction in noise levels, 5 dBA or more, a noise barrier system must be continuous. A break in the barrier system to allow access to the property would degrade the barrier's effectiveness (see Table IV-20N).

- **Receptor 7-10**, representing one residence on the east side of US 113 north of Bishopville Road at 12914 Worcester Highway, is predicted to receive noise levels for Alternative 3N-34' Median, the 3N/4N Modified-34' Median Alternative and the **Northern Preferred Alternative** of 71 dBA which is in excess of the design noise level of 67 dBA for the build alternative. The noise sensitive area does meet the reasonableness criteria for a 3 dBA increase in Build versus No-Build, however, construction of a barrier is not feasible because a driveway opening is required to provide access to the residence, resulting in an unsafe condition, as well as, a degradation in the barrier effectiveness. To achieve a noticeable reduction in noise levels, 5 dBA or more, a noise barrier system must be continuous. A break in the barrier system to allow access to the property would degrade the barrier's effectiveness (see Table IV-20O).

- **Receptor 7-11** represents four residences on the east side of US 113 north of Whaleyville Road near 13102 Worcester Highway. Projected noise levels of 69 dBA are in excess of 67 dBA criteria for Alternative 3N-34' Median, the 3N/4N Modified-34' Median Alternative, and the **Northern Preferred Alternative**, however, the receptor does not meet the reasonableness criteria of 3 dBA for the Build versus No-Build condition to warrant consideration of noise mitigation. Additionally, construction of a barrier is not feasible because driveway openings are required to provide access to the residences (see Table IV-20P).

- **Receptor 7-12**, representing two residences on the west side of US 113, 400 feet north of Whaleyville Road, is predicted (2020) to receive noise levels for Alternative 3N-34' Median, the 3N/4N Modified-34' Median Alternative and the **Northern Preferred Alternative** of 72 dBA which is in excess of the design noise level of 67 dBA for the build alternative. The noise sensitive area does meet the reasonableness criteria for a 3 dBA increase in Build versus No-Build, however, a barrier is not feasible because of the location of driveways and the intersection of Whaleyville/ Hammonds Road with U.S. 113 (see Table IV-20Q).

- **Receptor 7-13**, representing one home, has projected (2020) noise levels for Alternative 3N-34' Median, the 3N/4N Modified-34' Median Alternative and the **Northern Preferred Alternative** of 70 dBA which is in excess of the design noise level criteria. The noise sensitive area does meet the reasonableness criteria for a 3 dBA increase in Build versus No-

Build, however, construction of a barrier is not feasible because driveway openings are required to provide access to the residence, resulting in a potentially unsafe condition, as well as, a degradation in the barrier effectiveness. To achieve a noticeable reduction in noise levels, 5 dBA or more, a noise barrier system must be continuous. A break in the barrier system to allow access to the property would degrade the barrier effectiveness (see Table IV-20R).

- **Receptor 7-14**, representing the Elk's Lodge, has projected (2020) noise levels in excess of the design noise level of 67 dBA for all alternatives, however, the receptor does not meet the reasonable criteria of 3 dBA for the Build versus No-Build condition to warrant consideration of noise mitigation. Additionally, mitigation measures are not feasible at this location because of the location of the entrance/exit to the lodge (see Table IV-20S).

- **Receptor 7-15** representing three residences on the west side of US 113 near 13419 Morris Road and **Receptor 7-16** representing the Tans Peninsula Line Marker which is eligible for the National Register for Historic Places has projected (2020) noise levels in excess of 67 dBA for all alternatives. The noise sensitive area does meet the reasonableness criteria for a 3 dBA increase in the Build versus No-Build, however, mitigation measures are not feasible at this location because of the openings for driveways and the intersection of Hotel Road/Morris Road (see Tables IV-20T and IV-20U).

Conclusion

The spacing of residential driveways and intersecting roadways prevents the construction of feasible noise mitigation for impacted receptor sites along any of the proposed Dualize Alternatives, including the **Preferred Alternatives**. To achieve a noticeable reduction in noise levels, 5 dBA or more, a noise barrier system must be continuous. A break in the barrier system for intersections and property access would degrade the barrier's effectiveness, thereby eliminating the barrier as a feasible mitigating device. However, between Shingle Landing Road/Peerless Road and the Delaware State Line, the **Preferred Alternatives** will consider frontage roads to serve existing development and limit access points to the new roadway. If, during final design, frontage roads are developed adjacent to impacted receptor sites, noise mitigation measures shall be analyzed to determine if it is feasible and reasonable to reduce traffic noise levels.

3. Construction Impacts

As with any major construction project, areas around the construction zone will experience varied periods and degrees of noise which differ from that generated by traffic. The noise produced by construction can vary greatly based upon the type of construction, the mix of equipment, and the construction procedures being employed. A project such as the dualization of U.S. 113 would probably require the following types of equipment to be utilized during construction:

Bulldozers and Earthmovers
Graders
Front End Loaders
Dump and other Diesel Trucks
Compressors
Jackhammers

The noise generated by these types of equipment will tend to increase the ambient noise levels in the vicinity of the work areas. However, a number of measure can be considered in order to minimize noise emanating from these activities. Such measures include but may not be limited to:

- Conduct all construction activities during normal working hours on weekdays, when noise intrusion would probably not occur during sleep or outdoor recreation periods.
- Any internal combustion engine used for any purpose on or related to the job should be equipped with a proper operating muffler.
- Maintenance of construction equipment should be regular and thorough to minimize noise emission because of inefficiently tuned engines, poorly lubricated moving parts, etc.
- When appropriate, locate continuously operated diesel-powered equipment, such as compressors or generators, in areas distant or shielded from noise sensitive area.

Table IV-20A:
Criteria for Determining Feasibility and Reasonableness of Noise Abatement
NOISE RECEPTOR 2-6

Feasibility Criteria	Yes	No
1. Noise Levels can be reduced by 7 dBA or more at impacted receptors.	-	-
2. Placement of barrier will restrict pedestrian or vehicular access.	X	
3. Construction of a barrier will cause a safety or maintenance problem.	X	
4 Noise Barrier can be constructed given topography, drainage, utilities, etc.	X	
5. Noise Barrier will adversely impact on Section 4(f) resource.		X
6. There are non-highway noise sources that would reduce barrier effectiveness.		X
Reasonableness Criteria	**Yes**	**No**
1. The majority of impacted residences will receive at least a 7 dBA noise reduction.	-	-
2. 75% or more of impacted and benefitted residents approve of proposed noise abatement.	-	-
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 effect of highway improvements on the design year noise levels at receptors that existed when prior improvements were made is equal to or greater than 3 dBA.		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 the noise abatement is equal to or less than $50,000 per residence, impacted and benefitted.	-	-
6. There is special circumstances, i.e., historical/cultural significance at this receptor.		X

Table IV-20B:
Criteria for Determining Feasibility and Reasonableness of Noise Abatement
NOISE RECEPTOR 3-3

Feasibility Criteria	Yes	No
1. Noise Levels can be reduced by 7 dBA or more at impacted receptors.	-	-
2. Placement of barrier will restrict pedestrian or vehicular access.	X	
3. Construction of a barrier will cause a safety or maintenance problem.	X	
4 Noise Barrier can be constructed given topography, drainage, utilities, etc.	X	
5. Noise Barrier will adversely impact on Section 4(f) resource.		X
6. There are non-highway noise sources that would reduce barrier effectiveness.		X
Reasonableness Criteria	**Yes**	**No**
1. The majority of impacted residences will receive at least a 7 dBA noise reduction.	-	-
2. 75% or more of impacted and benefitted residents approve of proposed noise abatement.	-	-
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 effect of highway improvements on the design year noise levels at receptors that existed when prior improvements were made is equal to or greater than 3 dBA.		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 the noise abatement is equal to or less than $50,000 per residence, impacted and benefitted.	-	-
6. There is special circumstances, i.e., historical/cultural significance at this receptor.		X

Table IV-20C:
Criteria for Determining Feasibility and Reasonableness of Noise Abatement
NOISE RECEPTOR 3-4

Feasibility Criteria	Yes	No
1. Noise Levels can be reduced by 7 dBA or more at impacted receptors.	-	-
2. Placement of barrier will restrict pedestrian or vehicular access.	X	
3. Construction of a barrier will cause a safety or maintenance problem.	X	
4 Noise Barrier can be constructed given topography, drainage, utilities, etc.	X	
5. Noise Barrier will adversely impact on Section 4(f) resource.		X
6. There are non-highway noise sources that would reduce barrier effectiveness.		X
Reasonableness Criteria	**Yes**	**No**
1. The majority of impacted residences will receive at least a 7 dBA noise reduction.	-	-
2. 75% or more of impacted and benefitted residents approve of proposed noise abatement.	-	-
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 effect of highway improvements on the design year noise levels at receptors that existed when prior improvements were made is equal to or greater than 3 dBA.		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 the noise abatement is equal to or less than $50,000 per residence, impacted and benefitted.	-	-
6. There is special circumstances, i.e., historical/cultural significance at this receptor.		X

Table IV-20D:
Criteria for Determining Feasibility and Reasonableness of Noise Abatement
NOISE RECEPTOR 4-7

Feasibility Criteria	Yes	No
1. Noise Levels can be reduced by 7 dBA or more at impacted receptors.	-	-
2. Placement of barrier will restrict pedestrian or vehicular access.	X	
3. Construction of a barrier will cause a safety or maintenance problem.	X	
4 Noise Barrier can be constructed given topography, drainage, utilities, etc.	X	
5. Noise Barrier will adversely impact on Section 4(f) resource.		X
6. There are non-highway noise sources that would reduce barrier effectiveness.		X
Reasonableness Criteria	**Yes**	**No**
1. The majority of impacted residences will receive at least a 7 dBA noise reduction.	-	-
2. 75% or more of impacted and benefitted residents approve of proposed noise abatement.	-	-
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 effect of highway improvements on the design year noise levels at receptors that existed when prior improvements were made is equal to or greater than 3 dBA.	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 the noise abatement is equal to or less than $50,000 per residence, impacted and benefitted.		X
6. There is special circumstances, i.e., historical/cultural significance at this receptor.		X

Table IV-20E:
Criteria for Determining Feasibility and Reasonableness of Noise Abatement
NOISE RECEPTOR 4-9

Feasibility Criteria	Yes	No
1. Noise Levels can be reduced by 7 dBA or more at impacted receptors.	-	-
2. Placement of barrier will restrict pedestrian or vehicular access.	X	
3. Construction of a barrier will cause a safety or maintenance problem.	X	
4 Noise Barrier can be constructed given topography, drainage, utilities, etc.	X	
5. Noise Barrier will adversely impact on Section 4(f) resource.		X
6. There are non-highway noise sources that would reduce barrier effectiveness.		X
Reasonableness Criteria	**Yes**	**No**
1. The majority of impacted residences will receive at least a 7 dBA noise reduction.	-	-
2. 75% or more of impacted and benefitted residents approve of proposed noise abatement.	-	-
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 effect of highway improvements on the design year noise levels at receptors that existed when prior improvements were made is equal to or greater than 3 dBA.		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 the noise abatement is equal to or less than $50,000 per residence, impacted and benefitted.	-	-
6. There is special circumstances, i.e., historical/cultural significance at this receptor.		X

Table IV-20F:
Criteria for Determining Feasibility and Reasonableness of Noise Abatement
NOISE RECEPTOR 6-2 / 6-3

Feasibility Criteria	Yes	No
1. Noise Levels can be reduced by 7 dBA or more at impacted receptors.	-	-
2. Placement of barrier will restrict pedestrian or vehicular access.	X	
3. Construction of a barrier will cause a safety or maintenance problem.	X	
4 Noise Barrier can be constructed given topography, drainage, utilities, etc.	X	
5. Noise Barrier will adversely impact on Section 4(f) resource.		X
6. There are non-highway noise sources that would reduce barrier effectiveness.		X
Reasonableness Criteria	**Yes**	**No**
1. The majority of impacted residences will receive at least a 7 dBA noise reduction.	-	-
2. 75% or more of impacted and benefitted residents approve of proposed noise abatement.	-	-
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 effect of highway improvements on the design year noise levels at receptors that existed when prior improvements were made is equal to or greater than 3 dBA.		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 the noise abatement is equal to or less than $50,000 per residence, impacted and benefitted.	-	-
6. There is special circumstances, i.e., historical/cultural significance at this receptor.		X

Table IV-20G:
Criteria for Determining Feasibility and Reasonableness
of Noise Abatement
NOISE RECEPTOR 6-4

Feasibility Criteria	Yes	No
1. Noise Levels can be reduced by 7 dBA or more at impacted receptors.	-	-
2. Placement of barrier will restrict pedestrian or vehicular access.	X	
3. Construction of a barrier will cause a safety or maintenance problem.	X	
4 Noise Barrier can be constructed given topography, drainage, utilities, etc.	X	
5. Noise Barrier will adversely impact on Section 4(f) resource.		X
6. There are non-highway noise sources that would reduce barrier effectiveness.		X
Reasonableness Criteria	**Yes**	**No**
1. The majority of impacted residences will receive at least a 7 dBA noise reduction.	-	-
2. 75% or more of impacted and benefitted residents approve of proposed noise abatement.	-	-
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 effect of highway improvements on the design year noise levels at receptors that existed when prior improvements were made is equal to or greater than 3 dBA.	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 the noise abatement is equal to or less than $50,000 per residence, impacted and benefitted.	-	-
6. There is special circumstances, i.e., historical/cultural significance at this receptor.		X

Table IV-20H:
Criteria for Determining Feasibility and Reasonableness
of Noise Abatement
NOISE RECEPTOR 6-5

Feasibility Criteria	Yes	No
1. Noise Levels can be reduced by 7 dBA or more at impacted receptors.	-	-
2. Placement of barrier will restrict pedestrian or vehicular access.	X	
3. Construction of a barrier will cause a safety or maintenance problem.	X	
4 Noise Barrier can be constructed given topography, drainage, utilities, etc.	X	
5. Noise Barrier will adversely impact on Section 4(f) resource.		X
6. There are non-highway noise sources that would reduce barrier effectiveness.		X
Reasonableness Criteria	**Yes**	**No**
1. The majority of impacted residences will receive at least a 7 dBA noise reduction.	-	-
2. 75% or more of impacted and benefitted residents approve of proposed noise abatement.	-	-
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 effect of highway improvements on the design year noise levels at receptors that existed when prior improvements were made is equal to or greater than 3 dBA.		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 the noise abatement is equal to or less than $50,000 per residence, impacted and benefitted.	-	-
6. There is special circumstances, i.e., historical/cultural significance at this receptor.		X

Table IV-20I:
Criteria for Determining Feasibility and Reasonableness of Noise Abatement
NOISE RECEPTOR 6-6

Feasibility Criteria	Yes	No
1. Noise Levels can be reduced by 7 dBA or more at impacted receptors.	-	-
2. Placement of barrier will restrict pedestrian or vehicular access.	X	
3. Construction of a barrier will cause a safety or maintenance problem.	X	
4 Noise Barrier can be constructed given topography, drainage, utilities, etc.	X	
5. Noise Barrier will adversely impact on Section 4(f) resource.		X
6. There are non-highway noise sources that would reduce barrier effectiveness.		X
Reasonableness Criteria	**Yes**	**No**
1. The majority of impacted residences will receive at least a 7 dBA noise reduction.	-	-
2. 75% or more of impacted and benefitted residents approve of proposed noise abatement.	-	-
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 effect of highway improvements on the design year noise levels at receptors that existed when prior improvements were made is equal to or greater than 3 dBA.		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 the noise abatement is equal to or less than $50,000 per residence, impacted and benefitted.	-	-
6. There is special circumstances, i.e., historical/cultural significance at this receptor.		X

Table IV- 21J:
Criteria for Determining Feasibility and Reasonableness of Noise Abatement
NOISE RECEPTOR 6-15

Feasibility Criteria	Yes	No
1. Noise Levels can be reduced by 7 dBA or more at impacted receptors.	-	-
2. Placement of barrier will restrict pedestrian or vehicular access.	X	
3. Construction of a barrier will cause a safety or maintenance problem.	X	
4 Noise Barrier can be constructed given topography, drainage, utilities, etc.	X	
5. Noise Barrier will adversely impact on Section 4(f) resource.		X
6. There are non-highway noise sources that would reduce barrier effectiveness.		X
Reasonableness Criteria	**Yes**	**No**
1. The majority of impacted residences will receive at least a 7 dBA noise reduction.	-	-
2. 75% or more of impacted and benefitted residents approve of proposed noise abatement.	-	-
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 effect of highway improvements on the design year noise levels at receptors that existed when prior improvements were made is equal to or greater than 3 dBA.		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 the noise abatement is equal to or less than $50,000 per residence, impacted and benefitted.	-	-
6. There is special circumstances, i.e., historical/cultural significance at this receptor.		X

Table IV- 21K:
Criteria for Determining Feasibility and Reasonableness of Noise Abatement
NOISE RECEPTOR 6-16

Feasibility Criteria	Yes	No
1. Noise Levels can be reduced by 7 dBA or more at impacted receptors.	-	-
2. Placement of barrier will restrict pedestrian or vehicular access.	X	
3. Construction of a barrier will cause a safety or maintenance problem.	X	
4 Noise Barrier can be constructed given topography, drainage, utilities, etc.	X	
5. Noise Barrier will adversely impact on Section 4(f) resource.		X
6. There are non-highway noise sources that would reduce barrier effectiveness.		X
Reasonableness Criteria	**Yes**	**No**
1. The majority of impacted residences will receive at least a 7 dBA noise reduction.	-	-
2. 75% or more of impacted and benefitted residents approve of proposed noise abatement.	-	-
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 effect of highway improvements on the design year noise levels at receptors that existed when prior improvements were made is equal to or greater than 3 dBA.		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 the noise abatement is equal to or less than $50,000 per residence, impacted and benefitted.	-	-
6. There is special circumstances, i.e., historical/cultural significance at this receptor.		X

Table IV-20L:
Criteria for Determining Feasibility and Reasonableness of Noise Abatement
NOISE RECEPTOR 6-18

Feasibility Criteria	Yes	No
1. Noise Levels can be reduced by 7 dBA or more at impacted receptors.	-	-
2. Placement of barrier will restrict pedestrian or vehicular access.	X	
3. Construction of a barrier will cause a safety or maintenance problem.	X	
4 Noise Barrier can be constructed given topography, drainage, utilities, etc.	X	
5. Noise Barrier will adversely impact on Section 4(f) resource.		X
6. There are non-highway noise sources that would reduce barrier effectiveness.		X
Reasonableness Criteria	**Yes**	**No**
1. The majority of impacted residences will receive at least a 7 dBA noise reduction.	-	-
2. 75% or more of impacted and benefitted residents approve of proposed noise abatement.	-	-
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 effect of highway improvements on the design year noise levels at receptors that existed when prior improvements were made is equal to or greater than 3 dBA.	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 the noise abatement is equal to or less than $50,000 per residence, impacted and benefitted.	-	-
6. There is special circumstances, i.e., historical/cultural significance at this receptor.		X

Table IV-20M:
Criteria for Determining Feasibility and Reasonableness of Noise Abatement
NOISE RECEPTOR 7-4

Feasibility Criteria	Yes	No
1. Noise Levels can be reduced by 7 dBA or more at impacted receptors.	-	-
2. Placement of barrier will restrict pedestrian or vehicular access.	X	
3. Construction of a barrier will cause a safety or maintenance problem.	X	
4 Noise Barrier can be constructed given topography, drainage, utilities, etc.	X	
5. Noise Barrier will adversely impact on Section 4(f) resource.		X
6. There are non-highway noise sources that would reduce barrier effectiveness.		X
Reasonableness Criteria	**Yes**	**No**
1. The majority of impacted residences will receive at least a 7 dBA noise reduction.	-	-
2. 75% or more of impacted and benefitted residents approve of proposed noise abatement.	-	-
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 effect of highway improvements on the design year noise levels at receptors that existed when prior improvements were made is equal to or greater than 3 dBA.	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 the noise abatement is equal to or less than $50,000 per residence, impacted and benefitted.	-	-
6. There is special circumstances, i.e., historical/cultural significance at this receptor.		X

Table IV-20N:
Criteria for Determining Feasibility and Reasonableness of Noise Abatement
NOISE RECEPTOR 7-5

Feasibility Criteria	Yes	No
1. Noise Levels can be reduced by 7 dBA or more at impacted receptors.	-	-
2. Placement of barrier will restrict pedestrian or vehicular access.	X	
3. Construction of a barrier will cause a safety or maintenance problem.	X	
4 Noise Barrier can be constructed given topography, drainage, utilities, etc.	X	
5. Noise Barrier will adversely impact on Section 4(f) resource.		X
6. There are non-highway noise sources that would reduce barrier effectiveness.		X
Reasonableness Criteria	**Yes**	**No**
1. The majority of impacted residences will receive at least a 7 dBA noise reduction.	-	-
2. 75% or more of impacted and benefitted residents approve of proposed noise abatement.	-	-
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 effect of highway improvements on the design year noise levels at receptors that existed when prior improvements were made is equal to or greater than 3 dBA.	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 the noise abatement is equal to or less than $50,000 per residence, impacted and benefitted.	-	-
6. There is special circumstances, i.e., historical/cultural significance at this receptor.		X

Table IV-20O:
Criteria for Determining Feasibility and Reasonableness of Noise Abatement
NOISE RECEPTOR 7-10

Feasibility Criteria	Yes	No
1. Noise Levels can be reduced by 7 dBA or more at impacted receptors.	-	-
2. Placement of barrier will restrict pedestrian or vehicular access.	X	
3. Construction of a barrier will cause a safety or maintenance problem.	X	
4 Noise Barrier can be constructed given topography, drainage, utilities, etc.	X	
5. Noise Barrier will adversely impact on Section 4(f) resource.		X
6. There are non-highway noise sources that would reduce barrier effectiveness.		X
Reasonableness Criteria	**Yes**	**No**
1. The majority of impacted residences will receive at least a 7 dBA noise reduction.	-	-
2. 75% or more of impacted and benefitted residents approve of proposed noise abatement.	-	-
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 effect of highway improvements on the design year noise levels at receptors that existed when prior improvements were made is equal to or greater than 3 dBA.	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 the noise abatement is equal to or less than $50,000 per residence, impacted and benefitted.	-	-
6. There is special circumstances, i.e., historical/cultural significance at this receptor.		X

Table IV-20P:
Criteria for Determining Feasibility and Reasonableness of Noise Abatement
NOISE RECEPTOR 7-11

Feasibility Criteria	Yes	No
1. Noise Levels can be reduced by 7 dBA or more at impacted receptors.	-	-
2. Placement of barrier will restrict pedestrian or vehicular access.	X	
3. Construction of a barrier will cause a safety or maintenance problem.	X	
4 Noise Barrier can be constructed given topography, drainage, utilities, etc.	X	
5. Noise Barrier will adversely impact on Section 4(f) resource.		X
6. There are non-highway noise sources that would reduce barrier effectiveness.		X
Reasonableness Criteria	**Yes**	**No**
1. The majority of impacted residences will receive at least a 7 dBA noise reduction.	-	-
2. 75% or more of impacted and benefitted residents approve of proposed noise abatement.	-	-
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 effect of highway improvements on the design year noise levels at receptors that existed when prior improvements were made is equal to or greater than 3 dBA.		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 the noise abatement is equal to or less than $50,000 per residence, impacted and benefitted.	-	-
6. There is special circumstances, i.e., historical/cultural significance at this receptor.		X

Table IV-20Q:
Criteria for Determining Feasibility and Reasonableness of Noise Abatement
NOISE RECEPTOR 7-12

Feasibility Criteria	Yes	No
1. Noise Levels can be reduced by 7 dBA or more at impacted receptors.	-	-
2. Placement of barrier will restrict pedestrian or vehicular access.	X	
3. Construction of a barrier will cause a safety or maintenance problem.	X	
4 Noise Barrier can be constructed given topography, drainage, utilities, etc.	X	
5. Noise Barrier will adversely impact on Section 4(f) resource.		X
6. There are non-highway noise sources that would reduce barrier effectiveness.		X
Reasonableness Criteria	**Yes**	**No**
1. The majority of impacted residences will receive at least a 7 dBA noise reduction.	-	-
2. 75% or more of impacted and benefitted residents approve of proposed noise abatement.	-	-
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 effect of highway improvements on the design year noise levels at receptors that existed when prior improvements were made is equal to or greater than 3 dBA.	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 the noise abatement is equal to or less than $50,000 per residence, impacted and benefitted.	-	-
6. There is special circumstances, i.e., historical/cultural significance at this receptor.		X

Table IV-20R:
Criteria for Determining Feasibility and Reasonableness of Noise Abatement
NOISE RECEPTOR 7-13

Feasibility Criteria	Yes	No
1. Noise Levels can be reduced by 7 dBA or more at impacted receptors.	-	-
2. Placement of barrier will restrict pedestrian or vehicular access.	X	
3. Construction of a barrier will cause a safety or maintenance problem.	X	
4 Noise Barrier can be constructed given topography, drainage, utilities, etc.	X	
5. Noise Barrier will adversely impact on Section 4(f) resource.		X
6. There are non-highway noise sources that would reduce barrier effectiveness.		X
Reasonableness Criteria	**Yes**	**No**
1. The majority of impacted residences will receive at least a 7 dBA noise reduction.	-	-
2. 75% or more of impacted and benefitted residents approve of proposed noise abatement.	-	-
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 effect of highway improvements on the design year noise levels at receptors that existed when prior improvements were made is equal to or greater than 3 dBA.	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 the noise abatement is equal to or less than $50,000 per residence, impacted and benefitted.	-	-
6. There is special circumstances, i.e., historical/cultural significance at this receptor.		X

Table IV-20S:
Criteria for Determining Feasibility and Reasonableness of Noise Abatement
NOISE RECEPTOR 7-14

Feasibility Criteria	Yes	No
1. Noise Levels can be reduced by 7 dBA or more at impacted receptors.	-	-
2. Placement of barrier will restrict pedestrian or vehicular access.	X	
3. Construction of a barrier will cause a safety or maintenance problem.	X	
4 Noise Barrier can be constructed given topography, drainage, utilities, etc.	X	
5. Noise Barrier will adversely impact on Section 4(f) resource.		X
6. There are non-highway noise sources that would reduce barrier effectiveness.		X
Reasonableness Criteria	**Yes**	**No**
1. The majority of impacted residences will receive at least a 7 dBA noise reduction.	-	-
2. 75% or more of impacted and benefitted residents approve of proposed noise abatement.	-	-
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 effect of highway improvements on the design year noise levels at receptors that existed when prior improvements were made is equal to or greater than 3 dBA.		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 the noise abatement is equal to or less than $50,000 per residence, impacted and benefitted.	-	-
6. There is special circumstances, i.e., historical/cultural significance at this receptor.		X

Table IV-20T:
Criteria for Determining Feasibility and Reasonableness of Noise Abatement
NOISE RECEPTOR 7-15

Feasibility Criteria	Yes	No
1. Noise Levels can be reduced by 7 dBA or more at impacted receptors.	-	-
2. Placement of barrier will restrict pedestrian or vehicular access.	X	
3. Construction of a barrier will cause a safety or maintenance problem.	X	
4 Noise Barrier can be constructed given topography, drainage, utilities, etc.	X	
5. Noise Barrier will adversely impact on Section 4(f) resource.		X
6. There are non-highway noise sources that would reduce barrier effectiveness.		X
Reasonableness Criteria	**Yes**	**No**
1. The majority of impacted residences will receive at least a 7 dBA noise reduction.	-	-
2. 75% or more of impacted and benefitted residents approve of proposed noise abatement.	-	-
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 effect of highway improvements on the design year noise levels at receptors that existed when prior improvements were made is equal to or greater than 3 dBA.	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 the noise abatement is equal to or less than $50,000 per residence, impacted and benefitted.	-	-
6. There is special circumstances, i.e., historical/cultural significance at this receptor.		X

Table IV-20U:
Criteria for Determining Feasibility and Reasonableness
of Noise Abatement
NOISE RECEPTOR 7-16

Feasibility Criteria	Yes	No
1. Noise Levels can be reduced by 7 dBA or more at impacted receptors.	-	-
2. Placement of barrier will restrict pedestrian or vehicular access.	X	
3. Construction of a barrier will cause a safety or maintenance problem.	X	
4 Noise Barrier can be constructed given topography, drainage, utilities, etc.	X	
5. Noise Barrier will adversely impact on Section 4(f) resource.		X
6. There are non-highway noise sources that would reduce barrier effectiveness.		X
Reasonableness Criteria	**Yes**	**No**
1. The majority of impacted residences will receive at least a 7 dBA noise reduction.	-	-
2. 75% or more of impacted and benefitted residents approve of proposed noise abatement.	-	-
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 effect of highway improvements on the design year noise levels at receptors that existed when prior improvements were made is equal to or greater than 3 dBA.	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 the noise abatement is equal to or less than $50,000 per residence, impacted and benefitted.	-	-
6. There is special circumstances, i.e., historical/cultural significance at this receptor.	X	

M. Visual Quality

The No-Build and TSM alternatives would not have directly alter any visual resources. The quality of travelers' and residents' view sheds would have deteriorated to the extent that traffic congestion would have increased.

Dualization along the existing alignment (the Alternatives 3S, including the **Southern Preferred Alternative,** and 3N) would more than double the pavement width, increasing the scale of the roadway. Viewsheds along the alignment would include the expanded roadway. Alignments which involve the taking of strips of vegetated areas do not eliminate the full depth of vegetation and therefore will not substantially impact the visual character of these areas. Alternatives 3N, would be within the viewsheds of five historic properties. Visual impact on historic properties is presented in Section IV.C of this Final EIS.

Dualization on new alignment (Alternatives 4N Modified) would involve the construction of a new four-lane divided roadway away from the existing facility. The roadway would be constructed on new location to minimize impacts to residential and commercial properties. The new alignment is primarily through vegetated areas creating a viewshed similar to much of the existing alignment. Alternatives 4N Modified would be within the viewshed of one historic property; the Transpeninsular Line Marker located near the Delaware state line. This property is located along the existing roadway. The proposed alignments would maintain the existing distance from the historic property. Visual impact to this property may be minimized through landscaping designs at this location to be determined during later phases of this project.

Alternatives 3N/4N Modified (including the **Northern Preferred Alternative**) combine sections of the 3N and 4N Modified alternatives to avoid impacts to areas of environmental concern. These alternatives follow the Alternative 4N alignment from the southern limit of the northern study area, north to Jarvis Road where it follows the Alternative 3N alignment north to the Maryland/Delaware state line. The impact of these alternatives on visual quality is as described for the sections of Alternatives 3N and 4N Modified that it utilizes.

The **Preferred Alternatives** involve the visual impacts as described above for Alternatives 3S and 3N/4N Modified. Specifically regarding visual impacts to historic properties, the **Northern Preferred Alternative** would impact the St. Martin's Church and the Transpeninsular Line Marker only. The Maryland Historical Trust has determined the visual effect to St. Martin's Church to be adverse and together with State Highway Administration has written a Memorandum of Agreement (MOA) to mitigate this effect, as described in Section IV.C, Cultural Resources and presented in Appendix D.

N. Municipal, Industrial and Residual Waste Sites

As noted in Section III.M, a preliminary field reconnaissance revealed 23 potentially contaminated sites in the vicinity of either the southern and northern study areas. Three of these sites have a high potential for liability and if impacted warrant formal Phase I study and will probably require Phase II investigation. Sixteen sites possess a moderate potential for liability and if impacted will need formal Phase I study. These sites will probably not require a Phase II investigation. Four additional sites have a low liability potential and should not require any additional investigation after the formal Phase I studies (see Table III-19). A definition of high, moderate, and low potential for liability is provided in Section III.M of this Final EIS.

The No-Build, the TSM, and the Alternative 2S-20' Median will not impact any of the potential waste sites identified.

None of the nine potential sites in the vicinity of the Alternative 3S alignments (including the **Southern Preferred Alternative**) will be impacted by that alternative. Of the fourteen sites in the vicinity of the Alternatives 3N alignments, eight may be impacted by the proposed alignment. Two of these sites have low potential for liability, five have a moderate potential for liability, and one site has a high potential for liability. The alignment of Alternatives 4N Modified may involve four sites. Of these sites, one has a low potential for liability, two sites have a moderate potential for liability and one site has a high potential for liability. The Alternatives 3N/4N Modified, including the **Northern Preferred Alternative**, may impact five sites. Two of these sites have a low potential for liability, two sites have a moderate potential for liability and one site has a high potential for liability. Table III-19 lists the identified potential waste sites along with the potential for liability. The locations of these sites are shown on Figures III-14A through 14D.

Phase II - Screening Investigations (see Table IV-21) determined that no further action was necessary on any of the sites possibly impacted by the **Preferred Alternatives**, with the exception of a new site, identified as Site 25, in the vicinity of Site 5, at the northwest corner of the intersection of US 113 and Bishopville Road. Phase II reconnaissance located the apparent remnants of an abandoned razed service station for which no record was obtained in previous database searches. Although there were no major concerns noted in the field and it was thought to have low liability potential, the site was referred to MDE for a detailed records re-investigation. The site was submitted to Maryland Department of the Environment for a records search and no records or data for this site were found. Therefore Site 25 was removed from further study. The PSI, published in December 1997, resulted in the findings of No Further Action Required for all 25 sites included in the investigation (Gannett Fleming, 1997).

Table IV-21: Results of Screening Investigations

Site #	Site Name	Haz. Rank	Findings/ Recommendation
1	Ocean Designs	M	NFA
2	Cross Roads Cafe	L	NFA
4	TMT designs	L	NFA
5	Sharpgas Enclosure	L	NFA
6	Open Field	M	NFA
7	Kary Asphalt	M	NFA
8	Perdue Hatchery #7	H	NFA[1]
9	Hammonds Store	M	NFA
10	Showell Poultry	H	NFA
11	Davis Electric	M	NFA
12	Vic's Country Store	M	NFA
13	Sandbar Marine	M	NFA
14	9941 Deer Park Road	M	NFA
15	Little Country Deli	L	NFA
16	Newark Station Shops	M	NFA
17	Air Illusions Paint	M	NFA
18	Screen Printing	M	NFA
19	Newark Sewage Pond	M	NFA
20	Residential Property	M	NFA
22	Worcester Co. DPW	M	NFA
23	Duck-In store	M	NFA
24	Unidentified Drums	N/A	NFA
25	Demolished Enterprise	N/A	NFA

NOTES

H High potential to pose a hazardous materials liability.
M Moderate potential to pose a hazardous materials liability.
L Low potential to pose a hazardous materials liability.
N/A Not applicable. This site was not assessed in the Phase I report.
NFA No Further Action Required
FA Further Action Required
[1] This site contains septic fields and vents within the proposed right-of-way. Septic fields do not present a hazardous materials liability.

As part of final design, any site still suspect will be thoroughly investigated and necessary site specific measures to minimize impacts will be identified. This will most likely involve the removal and disposal of the waste at an authorized and permitted disposal facility.

Any solid waste including construction, demolition and land clearing debris, from this project shall be properly disposed at a permitted solid waste acceptance facility or recycled if possible.

Table IV-22, identifies the sites potentially affected by each of the dualize alternatives.

Table IV-22: Potential Waste Sites Affected by Each Build Alternative

Alternative	Site ID	Potential Site	Potential Liability
3N-20' Median (50 MPH) 3N 34' Median (50 MPH) 3N-20' Median (60 MPH) 3N-34' Median (60 MPH) 4N Modified-20' Median 4N Modified-34' Median 3N/4N Modified-20' Median 3N/4N Modified-34' Median **Preferred Alternative**	1	Ocean Designs Fiberglass and Boat Works	Moderate
3N-20' Median (50 MPH) 3N 34' Median (50 MPH) 3N-20' Median (60 MPH) 3N-34' Median (60 MPH) 3N/4N Modified-20' Median 3N/4N Modified-34' Median **Preferred Alternative**	2	Cross Roads Carry Out	Low
3N-20' Median (50 MPH) 3N 34' Median (50 MPH) 3N-20' Median (60 MPH) 3N-34' Median (60 MPH) 4N Modified-20' Median 4N Modified-34' Median 3N/4N Modified-20' Median 3N/4N Modified-34' Median **Preferred Alternative**	4	12829 Worcester Highway	Low
4N Modified-20' Median 4N Modified-34' Median **Preferred Alternative**	5	Sharpgas Propane Tank Enclosure	Low
4N Modified-20' Median 4N Modified-34' Median **Preferred Alternative**	new	??? **BY SHA**	Low
3N-20' Median (50 MPH) 3N 34' Median (50 MPH) 3N-20' Median (60 MPH) 3N-34' Median (60 MPH) **Preferred Alternative**	8	Perdue Farms Hatchery #7	High
3N 34' Median (50 MPH) 4N Modified-20' Median 4N Modified-34' Median 3N/4N Modified-20' Median 3N/4N Modified-34' Median **Preferred Alternative**	9	Hammonds Store	Moderate
3N-20' Median (50 MPH) 3N 34' Median (50 MPH) 3N-20' Median (60 MPH) 3N 34' Median (60 MPH) **Preferred Alternative**	12	Vic's Country Store	Moderate
3N-20' Median (50 MPH) 3N 34' Median (50 MPH) 3N-20' Median (60 MPH) 3N 34' Median (60 MPH) **Preferred Alternative**	13	Sandbar Marine	Moderate

O. Energy

A comparison of the energy usage requirements for the operation, maintenance and construction of the alternatives was completed for the Draft EIS. This comparison found that the long term energy requirements of the No-Build, TSM, and 2S-20' Median alternatives will be similar. Although the energy requirements for construction are not applicable for the No-Build Alternative, this savings will be off-set somewhat by the increased energy consumption due to projected traffic congestion in the design year. The TSM Alternative and the 2S-20' Median alternative will require a relatively low amount of energy for construction but some long term savings will be realized through the reduction of traffic congestion.

It has been determined that each of the dualize alternatives and the **Preferred Alternatives** will have similar energy requirements. Each dualize alternative will require the expenditure of energy for the manufacture of construction materials, the transportation of the materials to the site, and the construction of the roadway. Maintenance energy requirements for the dualize alternatives will be similar to those of the No-Build, TSM alternatives, and Alternative 2S-20' Median. Operational energy expenditures for the dualize alternatives will be lower than those for the other alternatives because the traffic congestion will be reduced and safety will be greatly improved reducing the need for emergency services.

The No-Build Alternative will require the least amount of expended energy over the design life of this project. The TSM Alternative will require slightly more energy than the No-Build for the construction of the additional intersection improvements. The Dualize Alternatives (including the **Preferred Alternatives**) will require the greatest amount of energy, with Alternatives 4N Modified needing more energy than Alternative 2S-20' Median or Alternatives 3N because less of the existing road will be retained. The 3N/4N Modified-34' Median alternatives (including the **Northern Preferred Alternative**) will have energy requirements intermediate to those of Alternatives 3N and 4N Modified.

P. Construction Impacts

Construction activities for the **Preferred Alternatives** will have temporary impacts to resources, residences, and travelers within the immediate vicinity of the project. These impacts will include traffic detours, potential air and fugitive dust emissions, increased noise levels, natural resources, and visual quality. Because the funding schedule for right-of-way acquisition and construction of the **Preferred Alternatives** is anticipated to extend over many years, construction activities will likewise extend over many years. For example, construction of the **Northern Preferred Alternative** is anticipated to be accomplished in three separate construction contracts, each approximately 2½ miles in length. Similarly, construction of the **Southern Preferred Alternative** will be divided into several construction contracts. Completion of each individual construction contract should take approximately 18 to 24 months. Therefore, the following discussion of construction impacts should be viewed as occurring in discrete 2½ to 4 mile segments for a period of 18 to 24 months.

1. Traffic Detours

Detours and road closures during construction of the **Preferred Alternatives** will create temporary inconveniences for residents, business owners and travelers. Maintenance and protection of traffic plans will be developed during final design to mitigate access impacts

and to minimize delays throughout the project. These plans will include appropriate signs, pavement markings, and media announcements. Access to all businesses and residences will be maintained through construction scheduling. At the present time, construction activities are not anticipated to require closure of existing US 113.

2. Air Emissions

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

Measures will be taken to reduce fugitive dust and other emissions generated during construction by wetting disturbed soils, staging soil-disturbing activities, and prompt revegetation of disturbed areas. Emissions from construction equipment will be controlled by the contractors in accordance with state and federal regulations.

3. Construction Noise Impacts

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

Several mitigation procedures can be followed to assist in minimizing the temporary impacts of construction noise. Adjustments to the equipment, varying the construction activity areas to redistribute noise events, good communication with the public, and monetary incentives to the contractor could be considered to lessen the temporary noise impacts. These mitigation measures will be examined during final design to minimize public impacts and annoyances during construction.

Construction noise impacts are also addressed in Section IV.L.

4. Natural Resources - General

Temporary construction-related impacts to soils, surface waters, and wetlands are anticipated to occur as the result of this project. Temporary and permanent impacts to these resources have been addressed in throughout Chapter IV.

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

Temporary impacts to surface water resources are also anticipated from construction-related activities. Temporary impacts would result from temporary stream crossings, dikes and coffer dams, temporary channel relocations, and suspended solids from increased erosion and

sedimentation. Runoff from disturbed areas may contain high sediment loads, which can reduce both the diversity and numbers of organisms in the aquatic environment. Physical impacts such as temporary stream crossings and coffer dams, disrupt the stream substrate and could affect fish migrations through these areas. This will eliminate benthic macroinvertebrate populations in this portion of the stream during the construction period, and for a short period after construction until migration and drift allow for the re-colonization of the area. Changes to the channel widths resulting from coffer dam construction may generate excessive scouring of the substrate and generate sediment impacts immediately downstream of the construction area.

5. Wetlands and Waters of the U.S.

Temporary construction-related impacts to wetlands include increased sedimentation, in-stream and in-wetland work for the construction of abutments and other structures, and temporary construction crossings. The use of surface mats, clean rock fills, and other measures to be determined at final design will be used to minimize temporary impacts to wetlands. Original grades will be restored in temporary wetland impact areas and native vegetation will be re-established. The following Best Management Practices will be observed to avoid and minimize environmental impacts while working in wetlands and Waters of the United States:

- Operation of heavy equipment will not extend beyond the limit of construction where practicable and, if required, will minimize soil and vegetation disturbance by using techniques such as construction mats, geotextile fabric, and low pressure tire vehicles. Temporarily disturbed areas in wetlands will be restored to preconstruction contours upon completion of the work. Work within Wetland W-8 (Bald Cypress Swamp) will be prohibited beyond the limit of construction.

- To protect important aquatic species, in-stream work will be prohibited during the stream closure dates as determined by the classification of the stream. Discharge in fish and shellfish spawning or nursery areas during the spawning season will be avoided, and impacts to these areas will be avoided or minimized to the maximum extent practicable during all other times of the year.

- Construction activity in wetlands and waterways will adhere to the time of year restrictions specified as part of the Section 404 permit and Section 401 Water Quality Certification. Specific time of year restrictions will be developed by the Corps and MDE during the permitting process, in consultation with the National Marine Fisheries Service, U.S. Fish and Wildlife Service, and Maryland Department of Natural Resources.

- No excess fill, construction material, or debris will be stockpiled or stored in the wetlands or buffer. Material placed at an upland site will be suitably contained to prevent erosion and transport to a wetland or waterway.

- Excavated material will not be used as backfill if it contains waste metal products, unsightly debris, toxic material or any other deleterious substance which may adversely impact surface or subsurface flow into and out of the wetlands.

- Sedimentation during the construction period will likely increase turbidity and suspended solids in receiving streams and wetlands and can have negative impacts on aquatic biota. The turbidity and suspended solids can interfere with the photosynthetic process, smother fish eggs and other aquatic organisms, and abrade fish gills (Barrett, et al., 1993). Although the period of active erosion and sedimentation should be limited to the construction period, the negative effects of sediment deposition in streams and wetlands may persist long after construction area is vegatatively stabilized.

- Adequate sedimentation and erosion control management measures, practices and devices, such as vegetated filter strips, geotextile silt fences, phased construction, or other devices, will be installed and properly maintained to reduce erosion and retain sediment on-site during and after construction. These devices will be removed upon completion of work and the disturbed areas will be permanently stabilized at the earliest practicable date.

- The stormwater management plan for this project will include both quantity and quality management of stormwater runoff prior to discharge into receiving waters. The facilities will be placed outside of stream channels and wetlands and will be planned to minimize hydrologic alternatives to receiving streams.

6. Floodplains

During final design, detailed hydrology and hydraulic analyses will be completed for each stream crossing and floodplain involvement. In accordance with Executive Order 11988 addressing flooldplain impacts (including the booklet "Floodplain Management Guidelines For Implementing E.0.11988"), Maryland State Highway Administration will complete final design and construction of the **Preferred Alternatives** with full consideration of flood hazards and flood plain management. At the conclusion of design, all supporting technical data will be submitted to the Federal Energy Management Agency (FEMA) for the purpose of revising the effective Flood Insurance Rate Map as appropriate.

7. Visual Quality

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

8. National Geodetic Survey Monuments

Maryland SHA's design engineers and contractors will utilize the National Geodetic Survey's (NGS) monuments for project survey controls. Should construction activities require the relocation of one of these monuments, SHA will so advise NGS no less than 90 days prior to this impact.

9. Hazardous Materials

During construction, SHA's contractor will properly dispose of all demolition and land clearing debris generated by individual construction contracts at permitted solid waste acceptance facilities (or recycled if possible). Furthermore, in the event that spills or other releases of petroleum or hazardous materials occur from construction activities, Maryland Department of the Environment (MDE) will be promptly notified.

Q. Cumulative Effects

1. Introduction

The Council on Environmental Quality's (CEQ) regulations for implementing the National Environmental Policy Act (NEPA) define cumulative effects as:

> the impact on the environment which results from the action when added to other past, present and reasonably future actions regardless of what agency (Federal, or non-federal) or person undertakes such actions (40 CFR § 1508.7), 1997.

A cumulative effects analysis begins with identifying the scope of the analysis for a particular project. Scoping consists of identifying the issues to be addressed, the time frame, and the geographic boundaries for the analysis. The cumulative effects methodologies are then chosen based upon issues included in the scope. Both the scope and the methodologies for the cumulative effects analysis of US 113 described below were developed in close consultation with Federal and state resource agencies. The purpose of this analysis is to discuss the potential for cumulative effects.

2. Scoping

a. Issues

Based on comments from the Federal and state resource agencies, resource issues that are of potential concern for a cumulative effects analysis have been identified based on the list of resources described in Chapter III, Affected Environment. The issues are described in the following section.

Land Use

Previous changes in land use in Worcester County have affected the natural and socioeconomic environment of the county. Future changes in land use will continue to create impacts, both positive and negative.

- **Residential, Commercial and Industrial Development**
  The conversion of forests, agricultural, and wetlands to residential, commercial and industrial development have been studied. To understand potential development, County projections for development have been supplemented by information collected from state, regional and local sources. The potential for development has been estimated both with and without taking into account the proposed US 113 project.

- **Agricultural Lands**
  The protection of farmland is related to concerns for the rapid conversion of agricultural land to nonagricultural uses and for the conservation of highly productive agricultural land and thereby the maintenance of sustainable food production for the region. Farm land and soils conservation legislation, as well as farmland conservation programs in the county have been reviewed to further determine potential changes to this land use in Worcester County.

- **Forested Lands**
  Forests are highly efficient at recycling nutrients and conserving water and soil. The importance of forest lands also lies in their importance as vegetative communities which serve as wildlife habitats. Wildlife depend on forests for feeding, nesting, cover, and travel corridors. The historic changes in forested areas of the county have been studied. Potential development has been analyzed to determine this resource. Recent legislation regarding forest conservation have been reviewed to further determine the likely effect implementing these statutes will have on potential effects on potential changes to forested areas in Worcester County.

Waters of the U.S.

The quality of aquatic resources associated with Worcester County stream and coastal bays has been examined on the basis of historic trends and current status. Potential impacts have been assessed based on expected growth in the county.

- **Wetlands**
  Wetlands have been evaluated because of the recognized importance of the functions wetlands provide and their relative susceptibility to direct and indirect disturbance by development.

- **Floodplains**
  Because of the potential for increased upstream and downsteam flooding due to floodplain modification, the effect of past loss of floodplains has been examined. The potential for future loss of floodplains in light of current regulations regarding construction in flood prone areas has also been examined.

Other resources that were not addressed in the present cumulative effects analysis include:

Cultural Resources - Although the nature of Worcester County has historically been rural in character and focused on agriculture and fisheries, cultural resources including standing historic structures and archeological remains are coming under increasing pressure. Cultural resources are non-renewable, and cannot be replaced if they are lost. Only federally funded actions are subject to Section 106 of the National Preservation Act unless a federal permit is required. Therefore damage or the destruction of cultural resources can occur due to non-federal actions. While archeological investigations associated with federal actions or projects can record important information about the history and prehistory of Worcester County, archeological site information can be lost by inadvertent destruction. Additionally, archeological information can be lost when sites are subjected to collection without recording the "provenience" or locations from which artifacts were collected. Cumulative effects to cultural resources can be addressed by preparation of Cultural Resource Management Plans, typically done by a State Historic Preservation Office (SHPO). A management plan has not yet been prepared

for the Eastern Shore. Cumulative effects can also be addressed by thoughtful application of information derived from research conducted as required by law for projects such as the US 113 Planning Study. Development which may occur in the county, with or without this project, may impact cultural resources. The County, through their 1989 Comprehensive Development Plan and its 1997 Supplement have reconfirmed commitment to maintaining the rural nature, as discussed in the cumulative effects analysis of land use.

Topography, Geology, and Soils - The topography of Worcester County is very flat and generally requires minimal modification for any development project. Although Worcester County has identified steep slopes as a sensitive area of concern for the county, steep slopes represent 0.3% of the land in Worcester County and are not in the impact area of this project. Development on steep slopes is regulated for the purpose of soils protection and therefore future impact on this resource is expected to be minimal. Impacts to geology and soils are generally minimal as a result of development projects. The greatest potential impact is by soil erosion. Maryland's strict erosion and sediment control regulations are designed to minimize these adverse impacts and are applicable to any project disturbing more than 5,000 square feet.

Vegetation and Wildlife - Vegetation, wildlife, wildlife habitat, and rare, threatened and endangered species are indirectly addressed within the land use (forest lands) and Waters of the U.S. cumulative effects analyses.

Air Quality - The air quality analysis presented in this Final EIS (Chapters III and IV) shows that none of the alternatives studied would result in a violation of the State and National Ambient Air Quality Standards. Also, Worcester County is not a non-attainment area for carbon monoxide, dioxide and ozone. This finding is based on the regional model used by Maryland Department of the Environment (MDE) which is itself an analysis of cumulative effects. Therefore, this item was not included in the scope of this analysis.

Noise Quality - Noise impacts are discussed in Chapter IV of this Final EIS. While specific locations will experience noise impacts, these impacts are location specific and therefore have not been addressed in the cumulative effects analysis for US 113.

Visual Quality - Cumulative visual changes to the landscape due to individual development projects have, and may continue to occur in Worcester County. The cumulative impacts of land use changes indirectly addresses the visual nature of the area. However, the relevance of these visual changes to this particular project, the lack of available data and assessment tools regarding this resource have led to the determination that cumulative effects have not been analyzed for this issue for US 113.

Municipal, Industrial and Residual Waste Sites - Impact to municipal, industrial, and residual waste sites by public or private development requires the clean up of these sites. Therefore cumulative impacts of municipal, industrial and residual waste issues that have and may continue, to occur in Worcester County have not been addressed in the cumulative effects analysis for US 113. Waste sites in the US 113 corridor were identified (see Final EIS Chapters III and IV) and the proposed design was guided in part by this information. As part of final design, the area of contact with any of the sites will be thoroughly investigated and necessary site specific measure(s) to minimize impacts will be identified.

b. Time Frame

The time frame covered by the cumulative effects analysis for US 113 was determined to be from the early 1970's through the design year, 2020. This time frame covers approximately 25 years of historic development and 25 years of future development in Worcester County. The time frame was determined by reviewing recent and historic growth trends, the initiation of environmental protection policies; the implementation of other area transportation improvement projects; available data; and, the project's design year. More specifically, the following factors were considered:

- Large changes in population (26.4 percent) in the 1970's, due in part to the development of water and sewer treatment facilities(see Table III-1, Worcester County Population Growth.
- The parallel bridge of the Chesapeake Bay Bridge opened on June 28, 1973. This transportation project affected the recreation choices of the Baltimore and Washington Metropolitan area populations by improving access to the Atlantic coast resort areas of Delaware and Maryland. This also changed the market for agricultural products from the county by improving access to the markets in the Baltimore-Washington area.
- The 1970's were a time of increased environmental awareness, with legislative support, to protect our nation's natural and cultural resources. The National Environmental Policy Act (NEPA), passed in 1969, provided the legislation and guidelines that have enabled the identification and protection of our nation's resources;
- The development of an extensive data base of Worcester County by the county and the Maryland Office of Planning in the 1970's. The Maryland Office of Planning in particular has studied development changes throughout Maryland, including Worcester County, between 1973 and the present;
- Additional highway projects constructed in the 1970's, namely the Snow Hill bypass, MD 90, and the dualization of US 113 around Berlin.

c. Geographic Boundary

The geographic boundary for a cumulative effects analysis is typically larger than for the analysis of direct impacts. Geographic boundaries can be either political or resource based. Boundaries may also be determined by the availability of data. Therefore, the choice of boundaries was kept flexible.

Land use changes have been studied on a county-wide basis because US 113 is a major north-south route through Worcester County. The analysis boundary for wetlands focuses on upper and lower portions of the Pocomoke River, Newport Bay and Isle of Wight Bay sub watersheds for potential impacts while considering wetland impacts throughout Worcester County for past impacts (primarily due to the lack of sub watershed data for the 1970's and 80's).

The evaluation boundary considered historic trends of wetland loss in the watersheds and sub watersheds, the current status and functions of wetlands, and the potential for loss of wetlands and wetland function. The cumulative effects boundary for floodplains and other Waters of the U.S. was the whole County.

3. Methodology

Various methods are available for conducting cumulative effects analyses. Each method is appropriate for analyzing specific issues. Some methods require a specific data base and/or technology to be

employed. A concise description of analysis methods is provided in the Council on Environmental Quality (CEQ) handbook entitled Considering Cumulative Effects Under the National Environmental Policy Act, January 1997, Table 5-3. A combination of methods was used for this study to produce the most complete analysis. The cumulative effects analyses are based on data that was readily available and not based on a comprehensive data set. Therefore, conclusions drawn from this analysis are generally qualitative. Below is a review of the methods used for this analysis:

- Trends analysis - used to identify cumulative effects over time and to project future cumulative effects. Historic data was collected and compiled to understand past cumulative effects and the rate at which these effects occurred. This information was then used to project future effects.
- Interviews - allow the collection of information not readily available in published documents. This was especially helpful in critically reviewing potential and forecasted development.
- Ecosystem Analysis - used to address ecosystem sustainability and was employed for analyzing the cumulative effects to wetlands.

4. Cumulative Effects Analysis

Land Use

Land development in Worcester County has occurred through the conversion of forests, agricultural lands, and wetlands. This conversion has affected the natural and socioeconomic environments of the county, resulting in both positive and negative impacts. According to County officials (Rosenthal, 1997), overall development growth is expected to be slow along US 113 because of the lack of water and sewage infrastructure. The soils along the route are not of a consistent quality for infrastructure placement. Therefore, developers will be responsible for building and purchasing their own systems. Well water permits have not been in high demand according to the county's environmental permit office. However, developers have requested well water permits for existing residential development projects.

The Maryland Office of Planning (MOP) is the key state agency responsible for ensuring that county and local plans are consistent with State land use and growth policies. The MOP is charged with providing tools necessary for County and municipal policy makers to make decisions related to land use and development. For this purpose, the MOP provides population, geographical, logistical and land use planning information. In addition, the MOP is the principal enforcer of the 1992 Economic Growth, Resource Protection and Planning Act and the Smart Growth Act of 1997.

Publications from MOP regarding past and future land use are: Maryland's Land, 1973-1990, A Changing Resource, published in October 1991, and Maryland Land Use/Land Cover 1990-2020 Forecast, published in 1992. Data presented in Maryland's Land 1973-1990 'A Changing Resource' is based on photo interpretation. To check the reliability of this methodology, data from 1985 through 1990 were compared to data available through the Maryland Department of Assessments and Taxation (MDAT). MDAT data was available starting only in 1985. The two data sets were found to be in substantial agreement. The forecasts presented in Maryland Land Use/Land Cover 1990-2020 Forecast are based on household projections and residential parcel size. The commercial and industrial development is projected in proportion to the residential development. Forest and agriculture land uses are assumed to change in relation to the acreage used by development.

Both the 1991 and the 1992 MOP documents reflect the legislative acts and regulations, and land use plans as of 1990. The numerous legislative acts and public policies, on the Federal, state and local level which have been initiated since then affect MOP projections. Following is an analysis of these initiatives and their effect on land use changes projected for Worcester County. In addition, information on building activity and permits in the county since 1990 has been reviewed and compared to the projections made by MOP.

- **Residential, Commercial and Industrial Development**

The conversion of forests, agricultural lands, and wetlands to residential, commercial and industrial development has been studied for cumulative effects. To understand potential development, county projections for development have been supplemented by information collected from state, regional and local sources.

Between 1973 and 1990, Worcester County experienced a 33% increase in total development, most of which was residential development (see Table III-9). This corresponds to less than 2% growth per year over this 17 year period. The MOP land use forecasts for 1990 through 2020 indicate there will be a 27.5% increase in total development in the county, about 1% growth per year for the 30 year period. This forecast assumes that similar to the past land use changes, future development will be predominantly residential (see Table III-10). Worcester County Department of Economic Development has compiled new residential construction building permits which also projects an annual percentage change of 1%.

Maryland Office of Planning has published an additional study regarding Worcester County residential development; The Potential for New Residential Development in Maryland: An Analysis of Residential Zoning Patterns. County zoning maps, water and sewerage plans, and land use information were used as the source data for this analysis. This report projects 6,683 housing units for Worcester County by 2020, and that the development potential is 53,000 housing units. This potential for residential development was derived based on the assumption of one unit for every eleven acres of land and taking into consideration Worcester County's zoning which allows for only minor subdivisions of five units or less per agricultural parcel, regardless of the parcel size. Worcester County recently amended this zoning to allow for 19 units or less to be developed, however, this is not anticipated to alter the projections for residential development.

The Worcester County Planning Commission adopted their Supplement to the 1989 Comprehensive Plan in September 1997. The Supplement addresses issues identified in Maryland's Economic Growth, Resource, Protection and Planning Act of 1992.

A majority of the development in the county has occurred in the Ocean City and Ocean Pines areas (Worcester County, Department of Economic Development). Additional large growth areas in the county are Berlin and Newark. The County plans to direct future growth in these locations to areas surrounding them because they are developed consistent with 1992 State Growth Management Act.

Figure III-4B illustrates the zoning classifications around the Newark area. Newark is considered an unincorporated crossroad community. The primary zoning for the area is Agricultural (A-1) and Village (V-1). As shown in Table III-8: Zoning Classifications, the A-1 zoning classification states that "agriculture and forestry are preferred land uses; minor subdivision of up to five dwelling units per parcel permissible". According to County planning officials, the minor subdivision requirement

is a tool for planners to curb growth in agriculturally zoned land areas without fully prohibiting development. The County believes that development growth can be better controlled if it is allowed on a smaller scale. Through this zoning classification, small single family residential developments are allowed. The V-1 zoning classification "provides for and preserves the character of the existing non-incorporated population center. Mixing of land uses should not be permitted unless deemed consistent with the existing community character".

It has been noted in Chapter III, that "new development is to be carefully considered for its impact on the existing community character". Evaluation of the existing land use and zoning for the area indicates that growth will be limited in accordance with the zoning requirements, unless the Worcester County Planning Commission changes the zoning classifications to encourage higher density development. It is important to note that Newark's growth is consistent with the county's policy to redistribute growth to already developed areas of the county.

South and north of Berlin, prime commercial properties are available for development but there is little infrastructure to support development (Rosenthal, 1997). Redevelopment is taking place in Berlin at US 113 and MD 50, outside the US 113 project study area (Rosenthal, 1997).

According to economic development officials in the county, industrial development sites are available at two locations adjacent to or near US 113. One site is located in the Pocomoke City Industrial Park in Pocomoke City. The Park has made 60 acres of industrial land available for immediate sale. The industrial park is served by all municipal utilities and a community rail dock on the Eastern Shore Railroad line (including connections to Norfolk Southern and Conrail). The location of this site, one mile from U.S. 13 (which connects to southern study area of U.S. 113), makes it attractive because of the direct north-south access to Norfolk, Virginia and Wilmington, Delaware. In addition, the Pocomoke City Industrial Park is part of the Maryland State Enterprise Zone (Worcester County Department of Economic Development, 1997). This program offers corporate income and property tax credits to qualified firms. Currently there is a 25,000 square foot industrial shell building available on the site (Worcester County Department of Economic Development, 1997).
The other site along US 113 is an abandoned industrial site owned by Tyson Foods, at the intersection of US 113 and Business 113 in Snow Hill (Rosenthal, 1997). The site is described as being "suitable for development" due to the available infrastructure. Currently, the site remains unsold due at least in part to the high asking price (Rosenthal, 1997).

Maryland real estate and development professionals concur that Worcester County is not in high demand for development activity. Representatives from Colliers Pinckard, Hammer, Siler, George, and Legg Mason have stated that most of the development activity in the State of Maryland has remained between the Baltimore and Washington corridor. These organizations have not prepared any market analyses for potential development in response to interest in opportunities in Worcester County.

One method of monitoring development growth consists of examining the number of municipal development permit requests within a given time period. Within the last five years, there has not been any municipal development permit requests processed for areas within Worcester County (Luckman, 1997). In the past, these permit requests for water treatment facilities (wells, septic systems, or public water systems) have been processed by the Maryland Department of the Environment (MDE). MDE does not monitor development trends or control development in any jurisdiction (Luckman, 1997).

However, since the passage of Maryland's Smart Growth Act in 1997, MDE's role in this regard will change for state funded projects in that MDE will have to determine whether proposed projects comply with provisions of the Act.

An important development in Worcester County is the upgrading of the waste water treatment facility by Perdue, Inc. The present facility, located off of Pitts Road about 1/4 mile west of US 113, is considered to be antiquated and not capable of complying with Maryland Department of the Environment's (MDE's) current discharge limits (Parsons, 1997). In addition, the chicken processor anticipates an increase in discharge. County officials approached Perdue regarding the possibility of using a portion of the upgraded waste water treatment facility to accommodate future development but no agreement was reached (Rosenthal, 1997). Perdue contends that the upgrade will be used solely to serve their own operations and will not be available to support other development. The upgrade is currently under construction and expected to be operational by the spring of 1998. An increase in personnel is not anticipated to result from the upgrade of the facility. The County will review and issue the necessary permits for Waste Water Treatment Facility upgrades and evaluate their consistency with County water and sewage plans (Rosenthal, 1997).

Based on recent legislation and Worcester County's 1997 Supplement to the 1989 Comprehensive Development Plan development will be encouraged in the existing town centers and in the northeast quadrant of the county. The Supplement encourages that impacts to natural resource be avoided to the extent possible and unavoidable impacts to natural resources will be mitigated (Worcester County Planning Commission, 1997).

Residential, Commercial and Industrial Development Conclusions

As shown in Section IV-B of the Final EIS, the **Preferred Alternatives** for the US 113 project will have minimal direct impact on development in the study area. Development pressures are not driven by roadway capacity for this particular project, and, other constraints on development exist in the county. While the overall potential for conversion of farmlands and other natural resources to urban land uses exists, the market pressure to develop in Worcester County is minimal other than in the vicinity of the coast. The county has the authority to guide and direct and should be encouraged to follow state and federal regulations protecting the natural resources found in Worcester County. Access control plans for the Preferred Alternatives are discussed in Section IV-B.3.b.

- **Agricultural Lands**

The protection of farmland is related to concerns for the rapid conversion of agricultural land to nonagricultural uses and for the conservation of highly productive agricultural land and thereby the maintenance of sustainable food production for the region. Farm land and soils conservation legislation as well as farmland conservation programs in the county have been reviewed to further determine potential changes to this land use in Worcester County.

Historic and projected loss of farmlands in Worcester County are presented in Chapter III, Tables III-9 and III-10. Between 1973 and 1990, 0.8 percent of the county's agricultural land was converted to other uses. This compares to 11 percent of the State's agricultural land which was converted to other uses during the same time period. The County is projected to convert an additional 2,523 farmland acres, (2.5 percent) between the years 1990 and 2020, while the State is projected to convert 231,781 acres (11 percent) during those years. The **Preferred Alternatives** for US 113 will directly and

indirectly impact 215 acres of farmland. This represents less than 0.09 percent of the county's projected loss.

The County projections were forecasted by the Maryland Office of Planning. Since this work was completed, Worcester County has adopted the Supplement to their 1989 Comprehensive Development Plan. In the Supplement they recognize the importance of farming to their economic base (50%) and reaffirm their commitment to the preservation of agriculture both as an economic base and as a way of life for Worcester County. The Worcester County 1989 Comprehensive Plan states that "to avoid conflicting land uses within agricultural areas and to permit Worcester County farmers to mechanize their operations as competitive conditions warrant, the county should provide special agricultural zoning which gives preference to farm operations above all other uses." According to the Supplement, the county will employ the following tools to preserve farmlands: agricultural easements, conservation easements and the Maryland Agricultural Land Preservation Program. County planning officials also state that a consideration will be made to utilize Maryland's Rural Legacy Program (WCPPI, 1997).

One result of Maryland's 1997 Smart Growth and Neighborhood Conservation initiatives, the Rural Legacy Program was developed to protect and preserve the State's most important natural features and resources, agricultural lands among them. Through this program, local governments and private land trusts select "Rural Legacy" areas. Once the areas have been identified, local governments and private land trusts can apply for competitive funding to assist present and create new conservation activities. The State is optimistic that the program "will save thousands of acres of large contiguous tracts of farms surrounding Maryland's cities, towns and villages". Furthermore, the State will have the ability to buy public land and voluntary conservation easements at a faster rate while protecting land from development. Through the Rural Legacy Program, Worcester County may be able to help fund the plan to protect farmlands along US 113 from future development.

Another farmland preservation program, the Maryland Agricultural Land Preservation Foundation, was created by the Maryland General Assembly in 1977. The Foundation created the Agricultural Land Preservation Program to preserve agricultural lands and to ensure the production of food and fiber for the residents of Maryland. Through this program, the State of Maryland has purchased 884 Permanent Development Rights Easements or 128,031 Easement Acres across the state since 1987. According to the Foundation, "preservation of agricultural land and woodland helps to curb the expansion of random development, protects wildlife and preserves the environmental quality of the Chesapeake Bay and its' tributaries".

Landowners must establish an Agricultural Land Preservation District in order to participate in the Foundation's program. After assessing the landowners property for the program's minimum criteria, a voluntary document is signed by the landowner agreeing to maintain the land for agricultural use exclusively for a minimum five year period. This agreement prohibits the property from being subdivided for residential, commercial or industrial use while under the Agricultural Land Preservation District status. After the Agricultural Land Preservation District status has been met, the landowner maintains the right to sell an agricultural land preservation easement to the State through the Foundation.

According to State officials, each year the same landowners in Worcester County participate in the program. Between 1993 and 1997, seven Snow Hill, one Berlin and two Pocomoke City landowners participated in the program (MD Dept. Of Agriculture, 1997). Six agricultural land preservation easements were purchased by the State from Worcester County landowners between 1994 and 1997

(MD Dept. Of Agriculture, 1997). Four of these easements were purchased from land owners who own property in the town of Snow Hill. For the fiscal year 1998, three Snow Hill area land owners have applied to the state to sell their agricultural land preservation easements (MD Dept. Of Agriculture, 1997).

As discussed under Land Use, the lack of infrastructure (water and sewer treatment facilities) and the poor suitability of soils for on site septic disposal in the county will inhibit future conversion of farmlands.

Agricultural Lands Conclusions

The **Preferred Alternatives** of the US 113 project will directly and indirectly impact a total of 215 ± acres of active farmland during the 10 to 15 year construction period. This total represents less than 0.09 percent of the county's projected total loss for the 1990 to 2020 time period. Agriculture land preservation programs enacted since land use projections were calculated in 1990 can effectively slow or stop the projected loss of agricultural land of 0.08 percent per year. As described in this cumulative effects analysis, numerous programs have been initiated to encourage the preservation of agricultural lands and to ensure the continued production of agricultural products. These federal and state programs should be encouraged and supported by county land use planners to further reduce the conversion of farmland to non-agricultural uses.

- **Forested Lands**

Forests are highly efficient at recycling nutrients and conserving water and soil. The importance of forest lands also lies in their importance as vegetative communities which serve as wildlife habitats. Wildlife depend on forests for feeding, nesting, cover, and travel corridors. Large, undisturbed forested tracts as described in Section III-I of this Final EIS are essential habitat for forest interior dwelling bird species (Maryland Department of Natural Resource, 1986). The continued existence of these species are dependent on the preservation of these unfragmented forest lands.

The historic changes in forested areas of the county and future development have been analyzed to determine cumulative effects on this resource. Recent legislation regarding forest conservation have been reviewed to further determine the likely effect implementing these statutes will have on projected changes to forested areas in Worcester County.

Forestry is one of the most important industries of Worcester County (Worcester County Planning Commission, 1997). Worcester County has been aggressive in its conservation and protection of forest lands. The county acknowledges that its commitment to this industry means a continued commitment to the maintaining rural landscape. The county has made aggressive use of legislation and conservation programs to realize this commitment. Utilizing Worcester County's Forest Conservation Law and the Maryland Seed Tree Law, Worcester County has the highest rate of reforestation in the State of Maryland.

Between 1973 and 1990, 2.8 percent of Worcester County's forest lands were converted to residential, commercial, industrial, agricultural and other uses. The County is projecting the conversion of 4,186 additional acres, (2.5 percent) between the years 1990 and 2020. In Chapter III, Tables III-9 and III-10 the historic and projected loss of forest lands in Worcester County are presented. These projections were forecasted by the Maryland Office of Planning. Since this work was completed, Worcester

County has adopted a Supplement to their 1989 Comprehensive Development Plan. Worcester County understands the importance of the maintenance and preservation of their ecosystems, including forests. The County will seek methods to alleviate any long-term and cumulative human impacts to forests among other ecosystem units (Worcester County, 1997).

Regulations that protect forested lands and enforce mitigation are briefly described below.

- 1989 Maryland Reforestation Law as described in Article 5-103 of the Annotated Code of Maryland. This law states that all highway construction projects utilizing a dollar or more of State funding must implement forest mitigation as a result of the impact.

- Maryland State Forest Conservation Act, created in 1990, requires reforestation and/or afforestation when forest land is lost as a result of new development including roadway construction. According to the Maryland Department of Natural Resources, The Maryland Forest Conservation Act "requires (the) identification of existing forest stands, protection of the most desirable forest stands and establishment of areas where new forests can be planted. Forest conservation planning occurs during the initial design or site plan of a proposed development, when forest conservation can occur without causing undue economic costs." Sensitive areas as identified by the local planning or comprehensive land use process are also protected by the Act. The Maryland State Forest Conservation Act applies to any action that requires a permit for subdivision, grading permit, or sediment control permit "on areas 40,000 square feet or greater is subject...and will require a forest conservation plan." A Forest Stand Delineation and a Forest Conservation Plan is required of any individual who applies for a subdivision, grading permit or a sediment control plan.

- The Chesapeake Bay Critical Area Program provides protection to 10,000 acres of mostly forested land along Pocomoke River.

- The Chesapeake Bay Critical Area Program further restricts development by requiring buffers and filter strips around tidal waters, wetlands, and tributary streams within 1,000 feet of the tidal limit within the Pocomoke River watershed.

- The Chesapeake Bay Critical Area Program requires that protection be provided to forest interior dwelling birds and their habitat. Management and protection measures should be considered for large forested tracts within the Chesapeake Bay Critical Area that contain forest interior dwelling species

- Maryland Seed Tree Law - provides for the maintenance and reproduction of the pine resources to provide significant recreational, aesthetic, wildlife, and environmental benefits as well as wood fiber essential to commerce and industry.

- The Maryland Agricultural Land Preservation Program, as described in the farmlands section of this analysis, also preserves and protects forest lands. Again, the participating landowners properties must meet the minimum State criteria for an Agricultural Land Preservation District.

Forested Lands Conclusions

The **Preferred Alternatives** for US 113 will impact 108 acres of forest land (See Table IV-13). This represents less than 0.03 percent of the county's projected loss. The Maryland Reforestation Law requires SHA to replace the 108 acres impacted by this project, see Section IV- J of this Final EIS. The County's commitment to forest land preservation and the constraints of water and sewer treatment facilities together with the Maryland State Forest Conservation Act of 1990 suggests that the projections of future forest land conversions are overestimated. Specifically, the Maryland Seed Tree Law, the Maryland Reforestation Law, the Maryland Forest Conservation Act, and the Chesapeake Bay Critical Area Program, all have provisions to protect existing forest lands and replace forests which are impacted by development. The Maryland Forest Conservation Act requires reforestation/ afforestation for all other public and private development impacting forested lands.

SHA's replacement/mitigation of the 108 acres of forest land impacted by the US 113 Preferred Alternatives will reduce to some extent reasonably foreseeable cumulative effects to this resource. The cumulative effects on this resource by other projects will be reduced by the enforcement of the laws and programs outlined above. The enforcement of these laws is encouraged and should be supported by all state and local agencies. Other programs such as the Chesapeake Bay initiatives which include the restoration of forest lands should also be supported and encouraged within Worcester County.

Waters of the U.S.

- **Water Quality**

Streams, the Atlantic coastal bays and other water bodies are important economic, recreational and aesthetic resources in Worcester County. The maintenance of good water quality is vital to the health of these ecosystems.

The streams in Worcester County support hunting, recreational fishing, boating, bird-watching, photography and provide spawning areas to support a large commercial fishery. These stream corridors also support a wide variety of plant and animal species which contributes to the area's biodiversity (Worcester County Planning Commission, 1997).

The coastal bays and barrier islands which form them attract millions of visitors each year. Ocean City is a popular vacation destination and Assateague Island (a National Seashore) is an important outdoor recreational resource. The tourism industry associated with the entire coastal bay/barrier island system adds in excess of $2.1 billion to the local economy. The maintenance of this economic activity is dependent on the maintenance of the ecological health and water quality of the estuary (Worcester County Planning Commission, 1997).

Sources of pollutants impacting the water quality of Worcester County include both point and non-point sources. Excess nutrients from agricultural and urban runoff (causing eutrophication), chemicals (pesticides, PCBs, heavy metals, etc.), fecal coliform contaminated runoff from livestock feeding operations, and discharges from waste water treatment plants and septic systems are the main threats to water quality in the area (Bohlen et al., 1997).

According to a recent water quality inventory for the Pocomoke River watershed, water quality in the river is generally considered to be good to fair throughout the basin (Maryland Department of the Environment, 1996). Worcester County's lower coastal bays are currently relatively healthy and some key indicators of aquatic health such as seagrass distribution are on the increase. There are reasons for concern (Bohlen et al., 1997). These concerns are highlighted by eutrophication and the recent fish kills in the Pocomoke River (Shelsby and Dresser, 1997), eutrophication in the coastal bays and the Pocomoke River, and the precautionary closure of several areas for shellfish harvesting due to fecal coliform contamination (Bohlen et al., 1997; Maryland Department of the Environment, 1996).

Although the cause of the recent fish kill by *Pfiesteria* in the Pocomoke River is still under investigation, the available evidence points to the cumulative effect of various stresses on the system including eutrophication from runoff. A discussion of *Pfiesteria* and eutrophication in the Pocomoke River basin and actions currently being undertaken to combat problems can be found in Section III.F.1 and IV.G of this FEIS.

Eutrophication is also the greatest environmental concern for the coastal bays area. The northern bays (Assawoman and Isle of Wight Bays), their major tributaries (St. Martin River, Turville Creek, and Trappe Creek) and artificial canals (built to provide boat access to waterfront properties) are more degraded than the southern bays which still have relatively good health. This north/south gradient reflects the pattern of decreasing population from north to south (Bohlen et al., 1997).

Chemical and pathogenic contamination also threaten the health of the coastal bays. These threats are likely to increase with population growth especially in the watershed of the northern bays (Assateague and Isle of Wight) (Bohlen et al., 1997).

Another threat to the health of water resources in Worcester County is the loss of natural terrestrial and aquatic habitat. The loss of forested and wetland buffer areas along the streams and bay shores makes these water resources more susceptible to degradation by changes in land use. These buffers of natural vegetation help to filter nutrients, sediments, and other pollutants before they reach the water. These buffer areas also provide habitat for a wide variety of plants and animals (Bohlen et al., 1997; Worcester County Planning Commission, 1997).

Water quality data collected for the St. Martin River, Isle of Wight Bay and Assawoman Bay in the summer of 1983 and 1992 show somewhat similar conditions. Table IV-22A shows water quality constituent and parameter data for a selected monitoring station located in the Isle of Wight Bay near the mouth of the St. Martin River. This monitoring station was chosen for inclusion here because of it's location relative to both the St. Martin River and the Isle of Wight Bay (giving an indication of water quality in both water bodies) and the completeness of the its monitoring record (not all constituents and parameters were collected at all of the stations in both years). Although overall nutrient concentrations throughout the water bodies were lower in 1992, further examination revealed that the spring of 1983 had substantial runoff increasing nutrient loads whereas the summer of 1992 was preceded by below average runoff and higher summer flows may have diluted nutrient concentrations. One positive factor was that nutrient loads from point sources were lower in 1992 (Lung, 1994). Although the reduction of nutrient loads between 1983 and 1992 appears to be positive, actual water quality trends are impossible to establish from this limited data.

Table IV-22A - 1983 and 1992 Water Quality Constituents and Parameters for a Selected Monitoring Station in the Isle of Wight Bay*

Water Quality Constituents and Parameters	Summer 1983 Sampling	Summer 1992 Sampling
Temperature (°C)	24.6	24.46
Salinity (ppt)	28.3	25.63
Total Kjeldahl Nitrogen (mg/L)	0.79	0.70
Ammonia (mg/L)	0.12	0.07
Nitrite/Nitrate (mg/L)	0.15	0.01
Total Phosphorus (mg/L)	0.12	0.12
Orthophosphate (mg/L)	0.01	0.01
Chlorophyll a (g/L)	15.3	17.06
Dissolved Oxygen (mg/L)	7.0	6.37

*Source: Lung, 1994

The current status of the water resources of Worcester County can be viewed as the net result of past land use changes throughout the county. Prior to the 1970's, most of the loss of wetlands and forests was due to the conversion of land to agricultural production (Tiner and Burke, 1995; Bohlen et al., 1997). Runoff from these agricultural lands increased the nutrient loads received by the county's streams, rivers and bays. Population growth during this period was very slow (less than 5 percent annually between the 1940's and 1970's) and urbanization accounted for a small percentage of the natural habitat loss (WCPPI, 1997; Tiner and Burke, 1995; Bohlen et al., 1997).

During the 1970's, the county's population began to grow rapidly, mostly with the development of the tourism industry associated with the Ocean City resort in the northern coastal bays area. With this population growth and urbanization came additional impacts to natural habitats, increased runoff from developed areas, and increased sewage discharges (Bohlen et al., 1997). Current surveys of the relative health of the aquatic resources of Worcester County show that eutrophication due to excess nutrients from runoff is the major cause of water quality degradation throughout the county (Bohlen et al., 1997: Maryland Department of the Environment, 1996). In fact, eutrophication in the Pocomoke River has been potentially linked to the recent *Pfiesteria* outbreak and fish kill (Shelsby and Dresser, 1997). The development of the Ocean City resort area, the Ocean Pines community and other developments has caused the loss of aquatic and adjacent terrestrial habitats, an increase in non-point source urban runoff, and an increase in sewage discharge in the northern coastal bays and their tributaries. This has resulted in the further degradation of water quality. The southern bays, which lack this urbanization in their watersheds, remain relatively healthy (Bohlen et al., 1997).

Traffic volumes for the dualized US 113 are expected to increase by approximately 1% over the No-Build design year 2020 condition. This is expected to result in little increase in pollutant loadings for the dualized vs. No-Build condition. The dualization of US 113 will however increase the impervious

area and therefore stormwater runoff volume is expected to increase. Stormwater management facilities constructed as part of this project should reduce peak runoff discharges to approximate pre-project conditions and also have the added benefit improving water quality through best management practices.

With population growth projected in Worcester County between 1990 and 2020 (with or without the US 113 project), the county and environmental resource agencies recognize the potential for future threats to water quality and have identified a number of policies and actions to maintain good water quality which strengthen existing regulations protecting water resources. A discussion of some of these policies and actions follows.

The Pocomoke River system is designated a "scenic river" under the state's scenic river program. This designation includes a 100-foot wide buffer zone along the river. The river corridor is also zoned C-1 (conservation) by the county with the goal of limiting the scope and potential negative impact of development. The Nassawango Creek corridor (a major tributary of the Pocomoke) is almost entirely owned and protected by The Nature Conservancy. The Chesapeake Bay Critical Area Program further restricts development by requiring buffers and filter strips around tidal waters, wetlands, and tributary streams within 1,000 feet of the tidal limit within the Pocomoke River watershed. The Great Cypress Swamp area and a portion of the Pocomoke State Forest were designated as State Wildlands in 1980, further protecting part of the Pocomoke River watershed (Worcester County Planning Commission, 1997). The Natural Resource Conservation Service also recently announced an incentive program to convert up to 100,000 acres of farmland and other land to forests and wetlands within the Chesapeake Bay watershed (including a portion of Worcester County) to help reduce nutrients in agricultural runoff (Shelsby and Dresser, 1997). The Lower Eastern Shore Tributary Team was formed to assist the state in improving the water quality of tributaries to the Chesapeake Bay and is made up of representatives from Federal, state, and local government as well as academia, business, industry, environmental organizations, and private citizens. The team identifies and recommends appropriate best management practices for use in the watershed and monitors their implementation and effectiveness (Lower Eastern Shore Tributary Team, 1996).

The county's shoreline protection setback regulations require that a 25-foot vegetated buffer be maintained on lots, created after 1992, which lie along the tidal waters of the coastal bays and their tributaries (Worcester County Planning Commission, 1997).

Best management practices are also required for a variety of land development and land disturbance activities throughout the county. For forestry operations, an uncut stream buffer is required (typically 50-feet) by the county's forestry manager. For all but the smallest development projects, erosion and sediment control and stormwater management control techniques are required to reduce sediment loss and storm runoff. The Soil Conservation District encourages farmers to maintain vegetated strips along drainage ditches as part of a voluntary nutrient management program (Worcester County Planning Commission, 1997). The Lower Eastern Shore Tributary Team (1996) has found that the voluntary implementation of best management practices on farms to be very high (Lower Eastern Shore Tributary Team, 1996).

There are numerous other regulations which have a role in protecting the water resources of the county. State and federal water quality protection laws require permits for the discharge of pollutants (including dredged and fill material) into Waters of the U.S. and the state, including jurisdictional wetlands. The county also strongly discourages any development which will disturb "Wetlands of

Special State Concern" and wetlands of "Significant Plant or Wildlife Value". The county's Floodplain Management Law of 1992, in accordance with federal policy, encourages the preservation and enhancement of "natural floodplain characteristics" and further requires that development and structures built in the 100-year floodplain meet certain flood protection measures. The county also encourages the dedication of the 100-year floodplain for open space for new subdivisions where feasible. The Worcester County Forest Conservation Law identifies streams and their 50-foot buffer as "retention priority areas" to further encourage the retention of natural habitats to protect the county's water resources (Worcester County Planning Commission, 1997). Most of these County environmental protection and land use planning mechanisms are still exploratory or in the early stages of development and therefore their effectiveness cannot yet be measured (Lower Eastern Shore Tributary Team, 1996). Other on-going restoration programs include the Ocean City Water Resources Study by the US Army Corps of Engineers which involves beach replenishment, habitat restoration, and maintenance of navigation.

The 1989 Worcester County Comprehensive Development Plan has identified several planned growth areas in the county including the existing town centers of Ocean City, Berlin, Snow Hill, and Pocomoke City and the entire northeast quadrant of the county (Lower Eastern Shore Tributary Team, 1996; Worcester County Planning Department, 1989). With the preponderance of the planned growth projected to occur in the Northern Coastal Bays Watersheds, the potential cumulative degradation of water quality in the remaining portions of the county due to development are somewhat ameliorated (Lower Eastern Shore Tributary Team, 1996).

Water Quality Conclusions and Recommendations

With the projected population growth in the already stressed northern coastal bays watershed, there is the continued possibility of further degradation of water quality. The development associated with this growth will have a number of negative impacts on the health of the northern bays and their tributaries. First, runoff from these new urban lands will likely contain higher levels of nutrients, sediments, chemical contaminants, and pathogens from septic tank leachate, wastewater treatment plant discharges, and roadway and parking lot runoff. Second, the development will increase impervious surfaces, decreasing groundwater infiltration and increasing the volume of runoff. Third, the development is likely to result in additional losses of wetlands and forests in the watershed which provide valuable habitat and help protect water quality by filtering pollutants and absorbing runoff (Bohlen et al., 1997). However, given the current level of concern for the health of these aquatic systems; the variety of federal, state, and local regulations and policies currently in place, including the National Pollutant Discharge Elimination System (NPDES), which protect water resources; and the number of programs to restore degraded habitats it is likely that the current trend of aquatic resource degradation will at least slow. In light of the recent water quality issues in this area, it is recommended that all projects be reviewed by the federal and state groups organized to address these concerns. Programs that are aimed at restoring and improving water quality in the region should be encouraged. SHA's participation in this effort is exemplified by the commitments to encourage the restoration and improvement of water quality during the construction of the **Preferred Alternatives**, as specified throughout this document. The implementation of these commitments will reduce the cumulative impacts on water quality.

- **Wetlands**

By the 1960's and 1970's, wetlands were becoming increasingly recognized for the economic and ecological benefits they provide. Wetlands have been evaluated because of the recognized importance of the functions wetlands provide and their relative susceptibility to direct and indirect disturbance by development.

In 1970, Maryland passed a law protecting coastal (tidal) wetlands. The federal government began regulating impacts to wetlands with the passage of the Federal Water Pollution Control Act of 1972 (later amended as the Clean Water Act of 1977). In the 1989, Maryland also passed legislation protecting non-tidal wetlands in the state (Tiner and Burke, 1995). Prior to the passage of these wetland protection laws, the annual loss of wetlands in the State of Maryland was estimated at as much as 1,000 acres per year primarily due to the conversion of wetlands to agricultural production. With this legislation in place, however, the estimated loss has slowed to approximately 20 acres per year in the state (Tiner, 1987).

The estimation of past wetland losses is exceedingly difficult due in-part to the difficulty of obtaining accurate and appropriate estimations of the previous extent of wetlands. Many sources contain contradicting information and estimates are often not consistent over time.

In 1982, it was estimated that Worcester County had approximately 59,486 acres of tidal and non-tidal wetlands according to the US Fish and Wildlife Service's National Wetlands Inventory. Wetlands accounted for approximately 19.6 percent of the county's land area (Tiner and Burke, 1995).

Prior to the early 1970's, ditching and channelization, agricultural development, and the creation of farm ponds accounted for approximately 90 percent of wetland losses. Beginning in the 1970's, urbanization started to play an increasing role in wetland losses in Worcester County, especially in the Ocean City and Ocean Pines areas.

Between 1955 and 1978, Worcester County lost approximately eight percent of its estuarine wetlands and six percent of its palustrine wetlands representing the loss of about 4,000 acres of tidal and non-tidal wetlands. This translates to an annual loss of about 170 acres per year in the county. During the period from 1982 to 1989, wetland losses in the county were substantially reduced with an additional loss of 0.5 percent of its estuarine wetlands and 1.4 percent of its palustrine wetlands. This represented a loss of approximately 650 acres of tidal and non-tidal wetlands or about 93 acres annually (Tiner and Burke, 1995). From 1991 through 1996, during which time Maryland has had regulatory authority of over non-tidal wetlands in the state, Worcester County has experienced the loss of approximately 30 acres of additional tidal and non-tidal wetlands (about five acres per year annual loss). Most of these wetlands impacts were in non-tidal wetlands. The most heavily impacted area in the county was the Isle of Wight Bay watershed, which includes the Ocean Pines area, which accounted for nearly 20 of the 30 acres impacted (Walbeck, 1997).

Although the population growth in the county has greatly increased in the past several years, annual wetland losses have been reduced as a result of increasing wetland regulation. Table IV-23 compares the rate of wetland loss with the population growth in the county.

Table IV-23 Comparison of Approximate Annual Population Growth Rate to Approximate Annual Wetland Loss

Time Period	1950 - 1980	1980 - 1990	1990 - 1996
Approximate Annual Growth Rate	1.3%	2.9%	2.4%
Approximate Annual Wetland Loss (acres)	170	93	5

To compensate for the wetland losses experienced between 1991 and 1996 the Maryland Department of the Environment has recorded nearly 27.5 acres of mitigation and other programmatic gains in the county. This results in a net loss of about 3.5 acres in the county for the period. The Isle of Wight Bay watershed sustained the greatest losses with a net loss of nearly 4.5 acres. During this period several watersheds in the county actually had net gains in wetland acreage (Sinepuxent Bay, 0.6 acres; Newport Bay, 0.6 acres; Chincoteague Bay, 1.9 acres; and Lower Pocomoke River area, 0.8 acres) (Walbeck, 1997).

The US 113 corridor is a very old north-south route along the high ground between the Pocomoke River and Sinepauxent Bay. A roadway was in-place by 1697. The roadway has undergone many minor and a few major relocations through the years. The construction of the modern roadway impacted wetlands, farmland, forests and other resources. In an effort to quantify the impacts to wetlands caused by the reconstruction projects along US 113 in this century, historical construction plans were reviewed and approximations of acres of wetlands impacted were made. Using the current wetland designations along existing US 113 (see the figures in Appendix A for these numbers) and grouped by subwatershed the following summarizes the wetland impacts associated with the existing two-lane highway for US 113:

Table IV-24: Approximate Wetland Impacts Associated With Existing US 113

Wetland Number	Wetland Impacts	Wetland Classification
◆ **Lower Pocomoke River & Tributaries:**		
W-1	0.2	PFO
W-2	1.5	PFO
W-3	0.05	STREAM
W-7	3.1	PFO
W-8	3.4	PFO (Cypress Swamp)
W-9	0.2	PFO
TOTAL	8.5± Acres	-
◆ **Upper Pocomoke River & Tributaries:**		
W-10	0.4± Acres	PFO
◆ **Newport Bay Area:**		
W-11	0.02	STREAM
W-12	4.8	PFO
W-13	0.9	PFO
W-14	NONE	
W-15	1.0	PFO
W-16	Combined with W-15	
W-17	NONE	
W-18	1.1	PFO
W-19	0.4	PFO
W-20	1.4	PFO
W-21	0.4	PFO
W-22	Combined with W-21	
TOTAL	10± Acres	-

Wetland Number	Wetland Impacts	Wetland Classification
◆ **Isle of Wight Bay Area:**		
W-23	0.3	PFO
W-24	NONE	
W-25	0.4	PFO
W-26	NONE	
W-27	NONE	
W-28	1.1	PFO
W-29	NONE	
W-30	0.02	STREAM
W-31	1.1	PFO
W-32	NONE	
W-33	NONE	
W-34	1.1	PFO
W-35	NONE	
W-36	0.5	PFO
W-37	1.0	PFO
W-38	Combined with W-37	
W-39	NONE	
W-40	0.5	PFO
Total	6± Acres	-
GRAND TOTAL	**25± Acres**	-

Some of this 25 + acres of historic impact occurred prior to 1950 and this loss is not counted for in this cumulative effects analysis. Other wetland impacts would have occurred during roadway improvements constructed between 1950 and the early 1970's and these wetland losses are accounted for in the 1950 to 1980 wetland loss figures shown in Table IV-24.

The build alternative, including the **Preferred Alternatives**, for US 113 will impact wetlands within four of the county's sub watersheds. The build alternatives for the southern study area, including the **Southern Preferred Alternative** will impact the Lower Pocomoke River drainage, the Upper Pocomoke River drainage of the Pocomoke River watershed, and the Newport Bay drainage of the Coastal Bays watershed . The alternatives for the northern study area, including the **Northern Preferred Alternative**, will impact the Isle of Wight Bay drainage of the Atlantic Coastal watershed.

These unavoidable impacts will be compensated by the creation of new wetlands at the same or greater ratios compared to that lost.

Wetland Conclusions

With the estimated population growth for Worcester County between 1990 and 2020, there will be a continued threat of additional wetland loss in the county, especially in the Isle of Wight Bay sub watershed where most of the projected development is to occur. Based on the past trends of the reduction of annual wetland loss and the fact that population growth is expected to slow somewhat in the next twenty years, it is likely that further wetland losses can be minimized.

Protection of the county's wetland resources could be accomplished through careful planning and stringent regulation. As shown in Section IV-I of the Final EIS, the 12 ± acres of direct wetland impacts of the **Preferred Alternatives** of the US 113 project will be mitigated through the creation of 25 ± acres of new wetlands. The proposed mitigation sites were chosen to maintain wetlands within the affected watersheds and for their potential to recreate the wetland functions impacted in each watershed (see Technical Report for Wetland Mitigation, 1998). The replacement of these impacted wetlands reduces the overall cumulative effect to this resource.

On-going restoration programs including the Ocean City Water Resources Study by the US Army Corps of Engineers and the Chesapeake Bay Watershed restoration incentive program by the Natural Resource Conservation Service and other programs may also serve to offset overall wetlands impacts in the drainage area.

- **Floodplains**

The potential for increased upstream and downsteam flooding due to floodplain modification have warranted a cumulative effects analysis of this resource. In light of current regulations, past loss and potential for future loss of floodplains regarding construction in flood prone areas have been examined.

The 100-year floodplain refers to an area which is inundated by a flood with the probability of occurring once every one hundred years. The 100-year floodplain is defined through engineering studies and statistical analysis. There are 100-year floodplains associated with both tidal and non-tidal waters (Worcester County Planning Commission, 1997).

An analysis of development in the floodplain compared to development in the county as a whole was completed. Acreage for all land use types in the county were quantified (301,532 acres total). The total acreage of floodplains in the county (65,886 acres, or 21.85% of the county) and the acreage of land use types within the floodplains was quantified. Developed land included low, medium and high density residential, commercial, and industrial land uses. Because virtually all of the barrier islands area (including Ocean City) is in the 100-year floodplain of Worcester County, that geographic area was excluded from the county and floodplain totals in order to better understand the development history in the remainder of the county. The ratio of development in the floodplain was compared to that in the county as a whole for each land use.

The issue of concern regarding development within floodplains is related to the amount of actual structures within the floodplain. To quantify this "built development," sample areas of the county were randomly selected and areas of development (low, medium, and high density residential, commercial,

and industrial land uses) were chosen. The footprint of structures inside and outside of floodplains was measured and applied to the county as a whole to determine the average area footprint per acre for each of these land uses (see Table IV-24). The results of this analysis are presented in Table IV-25.

The analysis, based on development as of 1989, indicates that the county has allowed a larger ratio of development within floodplains than has been developed for the county as a whole. When this development occurred is not known as photography of the county was available for 1989 only.

Table IV-25 - Average Percentage of Footprint of Development

Land Use	Percent of Development Per Acre
Low Density Residential	6.27
Medium Density Residential	6.77
High Density Residential	22.76
Commercial	27.82
Industrial	10.49

Table IV-26 Comparison Development in the County Versus the Floodplain

Land Use	Footprint * Acreage of Development in the County	Footprint of Development in the County (Percent) *†	Footprint * Acreage of Development in the Floodplain	Footprint of Development in the Floodplain (Percent) *†	Comparison of Percentages *†
Low Density Residential	410	36.1	95	38.1	5.54
Medium Density Residential	141	12.4	37	14.8	19.63
High Density Residential	88	7.8	5	2.0	-74.04
Commercial	490	43.1	112	44.8	3.88
Industrial	8	0.7	1	0.4	-50.39
Total	**1,138**	**100**	**250**	**100**	

* Excludes Barrier Island development.

† Percent of urban land uses only.

Data Sources: DNR Digital Orthophoto Quarter Quad Maps - April 1989
MOP Land Use and Land Cover - 1994
DNR Floodplain - 1995

There are a number of mechanisms in place to minimize adverse impacts to floodplains in Worcester County and protect their natural values. In 1992 the county adopted the Floodplain Management Law. The purpose of this ordinance is to protect human health and life; minimize property damage; protect water supply, sewage disposal, and natural drainage; promote construction practices that prevent future damage; and preserve the natural characteristics of floodplains and their water bodies. The ordinance meets the minimum federal requirements. While not restricting development in the 100-year floodplain, the ordinance requires that development and new structures in the floodplain meet certain flood protection measures. The county also encourages the dedication of the 100-year floodplain for open space for new subdivisions where feasible. The Worcester County Forest Conservation Law identifies streams and their 50-foot buffer as "retention priority areas" to further encourage the retention of natural habitats to protect the county's water resources. The state's Chesapeake Bay Critical Area Law and C-1 "Conservation" zoning also protect the floodplains along the Pocomoke River (Worcester County Planning Commission, 1997).

The current distribution of 100-year floodplains in Worcester County is depicted on based on FEMA flood insurance rate maps. The Nassawango Creek 100-year floodplain is almost entirely owned and protected by The Nature Conservancy. The county also supports and encourages land trusts and conservation organizations to acquire properties in the 100-year floodplain so that these areas can remain in or be returned to their natural condition.

Floodplains Conclusions

Adherence to the FEMA and Executive Order (EO) 11988 regulations ensure that the 100 year floodplain boundaries and elevations are maintained. The risk of loss of life and/or property damage is the concern behind this law and EO. As development of the **Preferred Alternatives** will not promote additional development in Worcester County this project will not add to the cumulative effects on floodplains. Local zoning and development permits are the strongest tool available to guide development outside of the floodplains. The county's Floodplain Management Law of 1992, in accordance with federal policy, encourages the preservation and enhancement of "natural floodplain characteristics" and further requires that development and structures built in the 100-year floodplain meet certain flood protection measures. The county also encourages the dedication of the 100-year floodplain for open space for new subdivisions where feasible. County efforts in this area can be strengthened and enforced through a commitment to zoning.

5. Conclusion

Data shows that development will occur in Worcester County. This development will be primarily residential development with supporting commercial services. Natural resources potentially impacted by future development will be either avoided or mitigated, where possible.

Agriculture land preservation programs enacted since land use projections were calculated in 1990 can effectively slow or stop the projected loss of agricultural land of 0.08 percent per year. Statewide, the Maryland Reforestation Law alone has resulted in the replacement of 1,110 forested acres of the 1,550 forested acres taken for highway construction since 1988. Together with the additional programs referenced above, the little or no cumulative effects on this resource should be anticipated. Wetland loss by development has decreased from approximately 170 acres per year in the 1950's through the 1970's to an average of 5 acres per year (without mitigation) during the 1990's. Fill on 100 year non-tidal floodplains is discouraged by state regulations. Any development that is allowed within these

areas is regulated to both protect the natural values of floodplains and to minimize the potential harm to life and property.

Federal, state and local agencies responsible for regulating impacts to natural resources through the permitting processes together with Worcester County's planning and zoning processes are in place to help in the protection of these natural resources. The permitting process is also the vehicle through which mitigation measures are identified to avoid or minimize cumulative effects of development.

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

The long-term benefits of the dualize alternatives would occur at the expense of short-term construction impacts in the immediate vicinity of project area. These short-term effects would include localized noise and air pollution, and minor traffic delays. With proper controls, they would not have a lasting effect on the environment.

The local short-term impacts by the construction of the dualize alternatives are consistent with the maintenance and enhancement of long-term productivity for the local area, state, and region. The Comprehensive Development Plan for Worcester County identifies US 113 as a key element of the county's regional arterial highway system. The Plan calls for US 113 to be upgraded to four lanes throughout its length. This project has been included in the Highway Needs Inventory (HNI) since the early 1960's and is consistent, therefore, with the Comprehensive Plan that encompasses the study area. The transportation improvements addressed in this document have been considered and proposed in accordance with the Comprehensive Plan.

The **Preferred Alternatives** upgrade US 113 to four lanes throughout its length, consistent with the Worcester County 1989 Comprehensive Development Plan and its adopted 1997 Supplement.

S. Irreversible and Irretrievable Commitments of Resources Which Would be Involved in the Proposed Action

The construction of any of the dualize alternatives (including the **Preferred Alternatives**) and the 2S-20' Median alternatives involve the irreversible and irretrievable commitment of various natural, human, and fiscal resources. The dualize alternatives and Alternative 2S-20' Median would require the commitment of land to new highway construction, which is considered an irreversible commitment during the time period that the land is used for a highway facility. If a greater need for the land be proven, or the highway proven to be no longer necessary, it is possible to re-convert the property to another use. It is not anticipated, however, that either of these two situations will occur.

Fossil fuels, labor, and construction materials will be used in considerable quantities for the Alternatives. In addition, labor and natural resources are also used in the quarrying, manufacturing, mixing, and transporting of construction materials. The materials used in the highway construction process are irretrievable, however, they are not in short supply and their use should not have an adverse effect on continued availability of these resources.

The **Preferred Alternatives** for US 113 involve the irreversible and irretrievable commitment of various natural, human, and fiscal resources including:

- the commitment of land to new highway construction,
- fossil fuels, labor, and construction materials,
- labor and natural resources used in the quarrying, manufacturing, mixing, and transporting of construction materials,
- state and federal funds for right-of-way acquisition, materials, construction, and annual maintenance,
- loss of tax revenues from private land taken for highway use.

The commitment of these resources is established on the premise that the local and regional residents, commuters, and business communities will benefit from the proposed highway improvements. Benefits would include increased safety, accident reduction, improvements to traffic flow, and reduction in travel time.